

Comparative Study of Automated Testing Tools: TestComplete and QuickTest Pro

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ABSTRACT

Testing automation tools enables developers and testers to easily automate the entire process of testing in software development. The objective of the paper is to conduct a comparative study of automated tools such as the Mercury QuickTest Professional and the AutomatedQA TestComplete based on criteria such as the efforts involved with generating test scripts, capability to playback the scripts, result reports, speed and cost. The 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. For the purpose of this project we took an existing VB based application that was inventory management and perform functional testing on it by these two automated testing tools.

Keywords

QuickTest Professional, TestComplete

1. INTRODUCTION

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 [1].

There are two ways of testing that are manual or automation.

Manual 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. They follow a written test plan that leads them through a set of important test cases [2].

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 [1].

Automation testing covers all the problems of manual testing [15] [16].

Automation testing automates the steps of manual testing using automation tools such as QuickTest Pro (QTP) and TestComplete (TC) [3].

It increases the test execution speed, more reliable, repeatable, programmable, comprehensive, and reusable.

2. PROBLEM STATEMENT

Testing is a critical part of the software development process. There are a lot of different automated software testing tools

currently on the market. Some of these are only able to perform specific kinds of testing and only work.

When we start or research for the right automated software testing tool, it is important to create a list of requirements to review when choosing a tool for evaluation. If we do not have list of requirements, we may waste time downloading, installing and evaluating tools that only meet some of requirements, or may not meet any of them.

This research evaluate two major tool vendors that are TestComplete (TC) and QuickTest Pro (QTP) on their test tool characteristics, test execution capability, test reporting capability, scripts reusability capability, playback capability, and vendor qualification [4] [5] [6].

2.1 Background

In this section, we listed the papers that reviewed during this project.

In recent years the importance of well-designed User Interfaces has increased a lot. If nothing else, it is the rise of Web 2.0 applications, the applications for everyone. Nowadays User Interfaces have to deal much more than before with untrained people sitting in front of their computers. So it is no wonder that not only the “automation behind the scenes” (Unit Testing for example) gained in importance, but also the automation of User Interface Tests with all its boon and bane [13].

The paper [7] surveys a set of tools that support the testing process in a variety of ways. Some tools simulate the final execution environment as a way of expediting test execution, others automate the development of test plans, and still others collect performance data during execution

In these tough economic times, software- development managers are pushing to get more and better testing done faster. Most recognize the automated testing tools facilitate higher quality and more productive testing, but acquiring such tools is often complicated. The paper [8] had given the evaluation criteria for selecting the testing tools.

The paper [9] gives a survey which tries to give an account of what type of trends exist today in software reuse and testing. The focus was to try to find out how developers use different tools today and what are lacking, especially in the field of reuse and testing.

The paper [11] classify and distribute a set of testing tools over the types of testing (testing methods) for three types of software

products (web application, application software, and network protocol).

The paper [12] told us if we've got a reasonably well structured system implementation, it is very easy to add in a mechanism to capture interactions with operations that system provides and to generate playback artefacts that are meaningful. Performing operation-centric capture/replay avoids many of the pitfalls of traditional GUI centric capture/replay.

3. EVALUATION STUDY

For this study we use the current version of TestComplete and QTP that are 8.0 and 11.0 respectively. Comparison between these two tools is made on the basis of following parameters [6]:

1. Recording Efficiency
2. Capability of generation of scripts
3. Data driven testing
4. Test result reports
5. Reusability
6. Execution speed
7. Playback of the scripts
8. Easy to Learn
9. Cost

3.1 Recording Efficiency

Both tools are recording and playback type tools. While recording commands are inserted to check the application works as intended. These commands also called verification points or check points.

TestComplete gives very easy access to controls. While recording, TC recording engine always present on the application and blink which means it recording the user actions. The recording toolbar has all the controls. So, we can easily apply the checkpoints, also add text and also see screen coordinates and window coordinates. TC provides different types of recording such as keyword, script, low level procedure based on screen or window coordinates, and HTTP task. TC provides an easy way to pause the recording in middle. So, we can manipulate the application under test or change the environment without recording any those actions into the script.

QTP does not provide easy access to controls. When we hit the record button, application is started. It records all the actions as performed by user. But we cannot insert the checkpoint during recording. We can only insert these after recording. QTP provides three kind of recording that are context sensitive mode, analog mode and low level recording. There is no way to pause the test in middle. So, 99% testers use the context sensitive mode because it only store the actions of application that is under test by ignoring system error messages.

Both tools also generate the automated documentation of the actions that performed by the users.

3.2 Capability of generation of Scripts

TC can generate five types of scripts i.e. VbScript, Delphi, C++, C#, and JScripts. If any application is based on any of them, then TC can easily generate the corresponding scripts. But QTP generates only VbScripts. The application that we used in our study is VB based.

3.3 Data-driven Testing

Nowadays data-driven testing (DDT) becomes very important part of testing. Instead of recording multiple tests to test multiple sets of input data, it is possible to make the scripts access the different sets of input data from external source like data tables, excel sheets etc. TC and QTP both provides the data-driven testing.

TC use the "data loop" for DDT(see fig.1). In keyword view, select all the items that want to test against external data. Then click right of mouse and choose option make data loop. Then a dialogue window open and ask for table name. After specify the name, click next, now select the external source i.e. excel sheet, CSV file, database, and data-tables. In our study, we choose excel sheet. After clicking the next button, the values of items mapped with the corresponding columns name of excel sheet. After mapping, we click the finish button. And press the playback button. We see application successfully done the DDT.

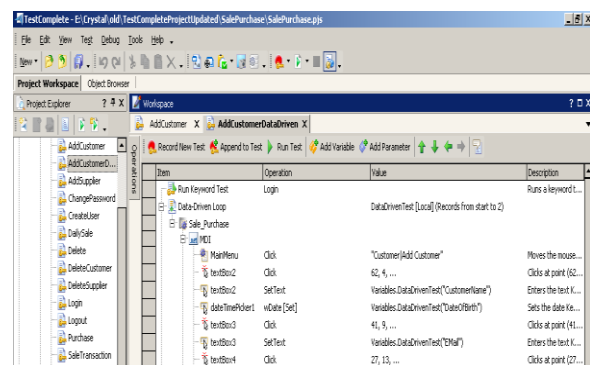


Fig 1: Data loop in TestComplete

QTP supports DDT by using inbuilt data tables which have functionality like excel sheet and easy to edit and update (see fig.2.). Using the data tables reduces efforts of maintaining excel sheets and easy mapping of columns to the input elements by even a novice user. We can insert data table parameters into our test so that it will run several times on different sets of data. Each test run on a different set of data is called *iteration*. Data tables are of two types: global data table and local data table. When we want a data table to be available to all the actions in our test, then it is called global data table. Local data table is available to only one action in our test. QTP can also access the external sources through data tables.

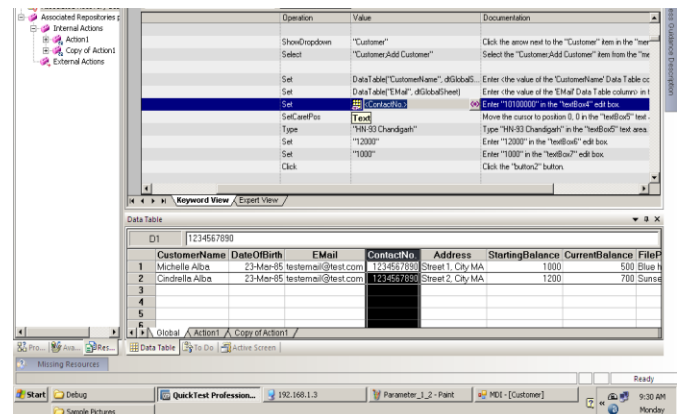


Fig 2: Data tables in QTP

3.4 Test Result Reports

After execution of the test script, it is necessary to get the results of execution for performing effective analysis whether test scripts have passed or failed while running a test suite.

QTP gives executive summary of the test. It shows the test steps in hierarchy tree and also provides the summary of each test step. It also provides information about checkpoints that applied during testing. QTP gives the statistics about the previous run and current run in the form of pie charts. These result reports are very user friendly and easy to understand (see fig.3).

TC also shows the result of execution. But it shows all events that occurred during play back in one pane ((See fig.4). It does not give info about each test step like in QTP. It also does not provide graphical representation of results.

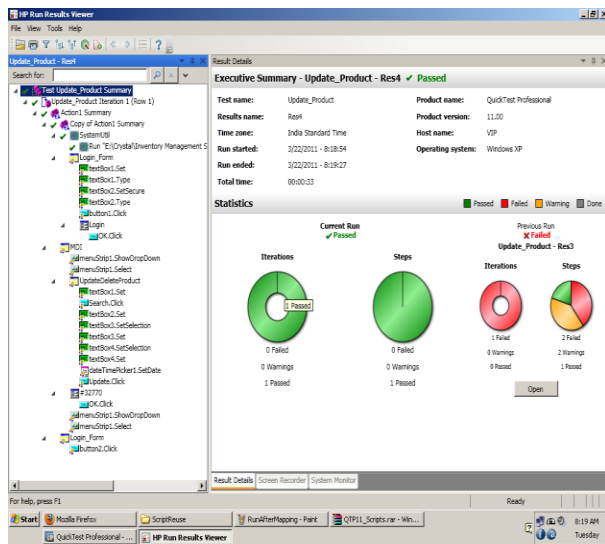


Fig 3: QTP Result Window

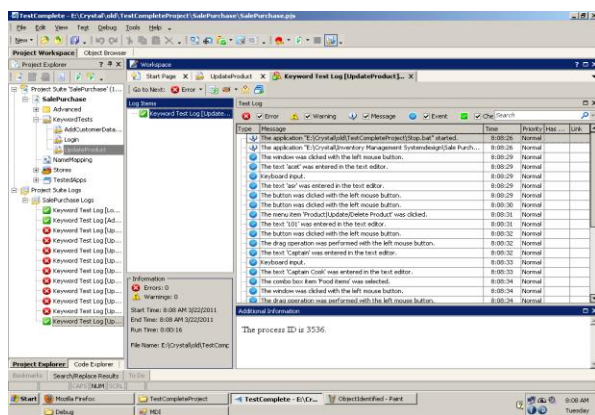


Fig.4: TestComplete Result Window

3.5 Script Reusability

Reusing testing logic repeatedly is the ultimate goal of test automation [14].

In our study, we change the name of update and delete form from “update/delete product” to “update/delete product”, and

“search” button of the form to “populate” button (see fig.5 and 6).

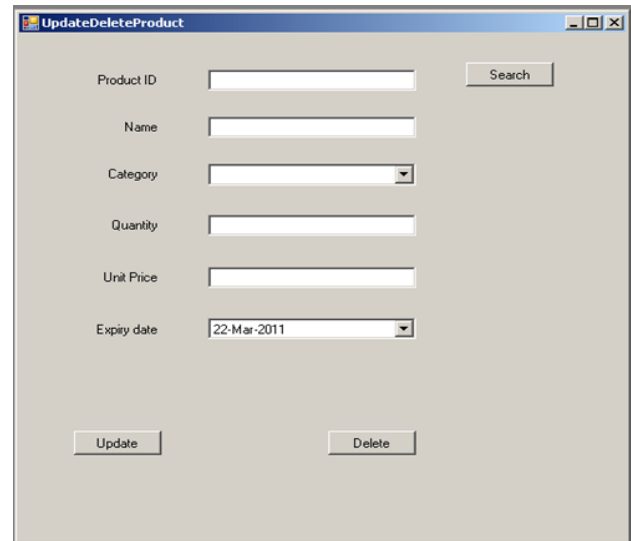


Fig 5: Before changing the form name and button name

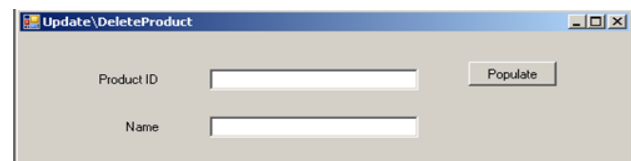


Fig 6: After changing the form name and button name

QTP has inbuilt function library. It forms the backbone of the automation in framework. All the coding logic is in the form of a user-defined VB scripts. All these functions are stored in the function library. It is the place where most of the scripts reside and the place where customization can be done in the script for that project. The common scripts are reused easily. When application was modified by changing some properties of the objects, the same script can be used on the new build. QTP has object repository where it recognizes and stores info such as object's properties, values etc. object repository has option of update the object from where we can easily update the property of the object and run the same script easily (see fig.7).

TC uses the name mapping function to change the property of the object. Name mapping shows all objects in tree view. We will select the object and change the property that shows on the right hand side. After making the changes, we can run the same script (see fig.8). Object repository is different from name mapping.

3.6 Execution Speed

Execution speed of TestComplete is come little bit faster than QTP in our case. We calculated the execution speed by taking total test run time of each user screen (i.e. start test run time + end test run time). Both QTP and TC result windows shows the start test run time and end time, and also total time taken.

In the case of QTP,

$$\text{Average time} = \sum t / n$$

$$= 418 / 11 = 38 \text{ sec}$$

Where t is the time taken by each user screen in sec and n is the total number of user screens.

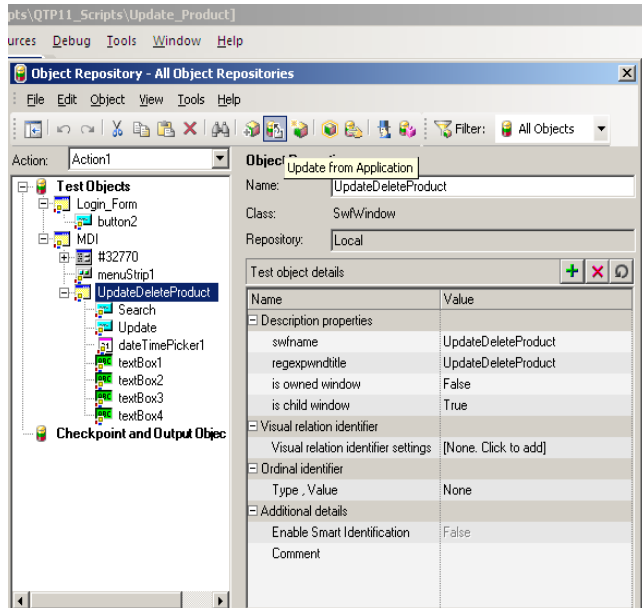


Fig 7: Object Repository of QTP

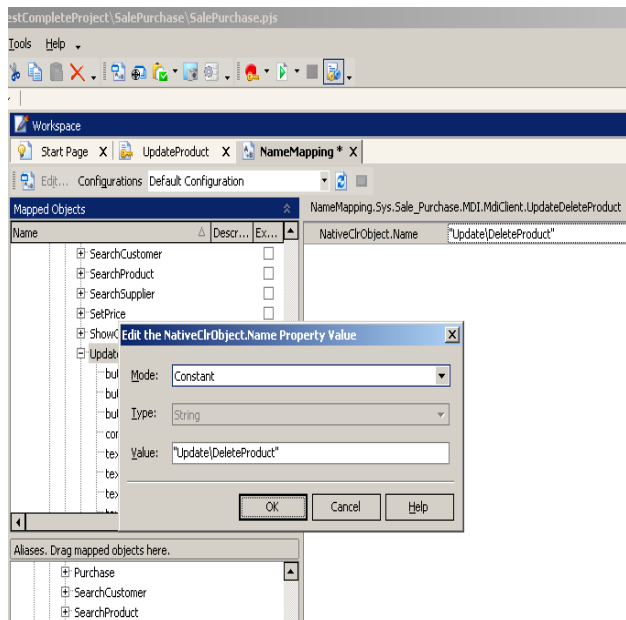


Fig 8: Name mapping function of TC

In case of TC,

$$\text{Average time} = \sum T / n$$

$$= 268 / 11 = 24.36 \text{ sec}$$

Where T is the time taken by each user screen in sec and n is the total number of user screens.

3.7 Playback Capability

When script is played back, it replays the user actions that performed by the user during recording. If object is not recognized during replay, it gives the error message as object is not found or not identified.

In our study, we seen both tools playback the scripts efficiently. Sometimes QTP did not recognize the objects during play backing. But the same problem also occurred with TC too.

QTP has three modes of replaying the test. These are not listed on the tool bar. When we hit the “run” button we get the “run” dialogue box, which gives us 2 options. Three modes are:

Verify mode: it save results in new run result folder for later comparison.

Debug mode: save the results in temporary run results folder overwriting the earlier results.

Update Run mode: when we need to run the test to update the checkpoints go to “automation” menu and select “update run mode”.

3.8 Easy to Learn

QTP takes more time than TC because it has more features, and more complicated than TC. QTP needs more time to explore each feature. For example, QTP has Object Repository and Recovery scenario

QTP works with Quality Centre (QC). TestComplete provides different types of testing such as Functional, Regression, Unit, Distributed, Load, Web, and Manual Testing. QTP provides only web service testing and others are part of QC functionality.

TestComplete has integrated version control facility but in QP, this is done through QC only. TestComplete provides separate TestExecute module to execute the test scripts. But QTP does not provide any such type module, we have to use full QTP install.

3.9 Cost

TestComplete is very cheaper than QTP. We gather their cost information from their respective centers. TestComplete has two editions one is Enterprise and second is Standard. The cost varies with their licenses. The following table shows the cost of TestComplete with their respective licenses:

Table1. Cost table of TestComplete

Licenses	Enterprise	Standard
Node-locked	\$1999	\$999
Floating	\$4499	\$2999

QTP is available through single-seat licenses, as well as floating or concurrent licenses. Their cost is varied from country to country. Till 2010, these licenses came in the range of (\$8,000-\$15000).

4. RESULTS

For the purpose of rating the comparison parameters, we have used 5-point scale i.e. 5, 4, 3, 2, 1 as Extremely Good, Fairly Good, Average, Fairly Bad, and Extremely Bad respectively.

In this, we will divide the each parameter into sub criteria to make clear distinguish and for easy rating. We assign the points to sub criteria based on their functionality. The total value of parameter is calculated by taking average of sub criteria values.

We had already discussed about each parameter in detail. The sub criteria have taken from them only and these are also discussed in their respective parameters.

Now, we will take each parameter and their sub criteria to calculate the overall performance of each parameter in both tools.

4.1 Recording Efficiency

Sub Criteria	QTP	TC	Comment
Insert Commands	1	5	In QTP, we cannot insert commands while recording
Recording Types	5	5	Both tools provide the facility to record the mouse movements, screen co-ordinates, keystrokes, and, objects and their properties
Access to record controls	1	5	The recording toolbar of TC always present at the application under test. So we can easily use the controls from it. This is not the case with QTP.
Pause	1	5	QTP does not provide this facility while recording
Auto Documentation	5	5	Both tools provide this facility

For QTP, the value of Parameter is

$$= 1+5+1+1+5/5 = 13/5 = 2.6$$

So, QTP is average in this parameter.

For TC, the value of parameter is

$$= 5+5+5+5+5/5 = 25/5 = 5$$

TC is extremely good in recording efficiency.

4.2 Capability of generation of Scripts

We assign pt. 4 to TC because it supports five languages but there are so many other languages which are not supported by it.

Sub criteria	QTP	TC	Comments
Languages	1	4	QTP supports only VbScript but TC supports five languages. QTP can support other languages but through add-ins.

4.3 Data-driven Testing

Sub criteria	QTP	TC	Comments
Access data from external sources	5	5	Both provides the access to different external sources like excel sheet, database etc.
Change the data in external sources without affecting the scripts	5	5	Both tools can keep the scripts separated from data.
Way of testing	5	4	QTP has inbuilt data tables which provides more easy way to DDT and for explanation read sec. 3.3

For QTP, the value of DDT is

$$= 5+5+5/3 = 15/3 = 5$$

QTP is extremely good in it.

For TC, the value of DDT is

$$= 5+5+4/3 = 14/3 = 4.6$$

TC is extremely good in it.

4.4 Test Result Reports

Sub criteria	QTP	TC	Comments
Report Presentation	5	4	QP gives executive summary of results. TC gives results in single pane. See fig
Info about applied checkpoints	5	5	Both provide this info
Graphical info of previous runs	5	1	Only QTP gives info about previous and current runs in pie charts

For QTP, the value of Parameter is

$$= 5+5+5/3= 15/3 = 5$$

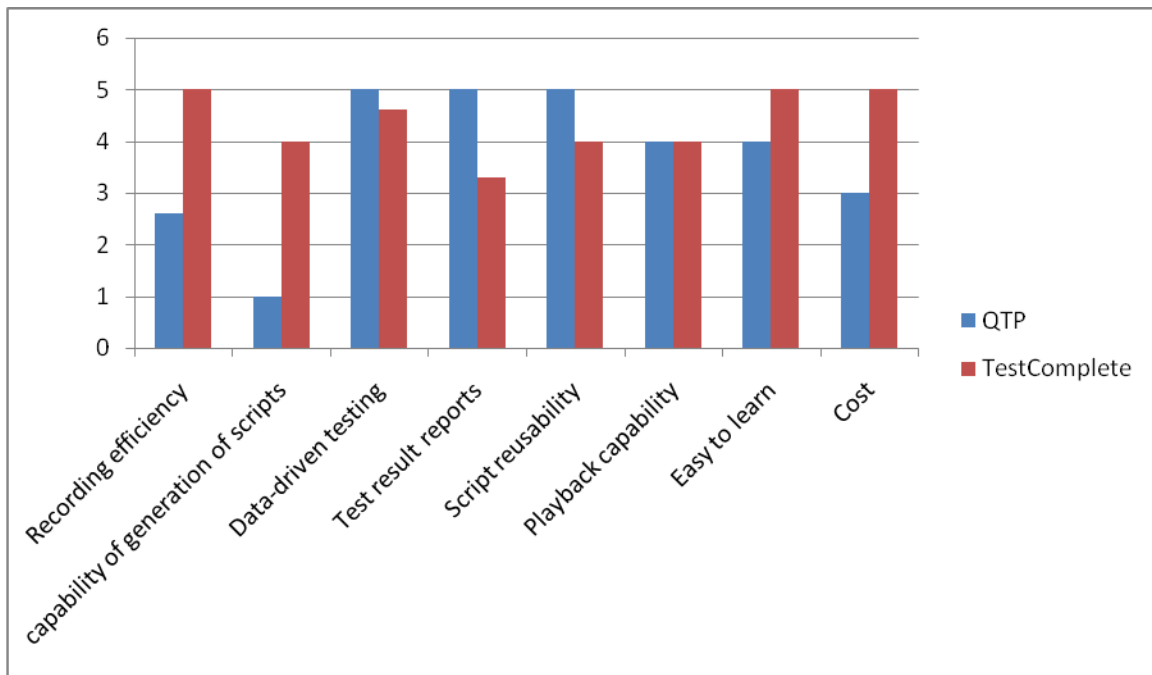


Fig 9: Comparison graph of QTP and TC

So, QTP is extremely good

For TC, the value of parameter is

$$= 4+5+1/3 = 10 / 3 = 3.3$$

TC is average.

4.5 Script Reusability

Both the tools have smart recognition features which permit reuse of the script on a new build.

In TestComplete, scripts can be called from one another and can be reused.

QTP allows creation of reusable actions which can be called from other actions and also passing parameters from one action to other actions. QTP can also create copy of existing actions in new actions.

The difference is that QTP has object repository concept which is different from the name mapping and it is the most powerful feature of QTP which helps in script reuse. Because of this, we rank the QTP as extremely good (pt.5) and TC as fairly good (pt. 4)

4.6 Execution Speed

The speed of TC is more than QTP as mentioned in sec 3.6. So we rank the QTP as fairly good (4pt) and TC as extremely good (5pt).

4.7 Playback Capability

In our study, both tools play backed the scripts efficiently. Sometimes, TestComplete did not recognize the objects but the same was also encountered with QTP too. So, we rank this parameter for both tools as fairly good (4pt).

4.8 Easy to Learn

QTP has more features and is more complex than TC, so it takes more time to learn than TC. Because of this, we rate the TC as extremely good (5pt) and QTP as fairly good (4pt).

4.9 Cost

QTP is more costly than TC. The cost of QTP is three or four times of TestComplete cost. Because of this, we rate the TC as extremely good (5pt) and QTP as average (3pt). Their respective costs are mentioned in sec 3.9.

4.10 Comparison graph based on results

The overall comparison graph is shown in Fig 9. This graph is based on parameters value that has been calculated previously.

5. CONCLUSION

Automated software testing has become necessity of companies because it saves both time and money. QTP and Test Complete both are very good tools for test automation, Test Complete has easy to use UI and efficient playback. Using one of them can be decided based on the application features and scope of testing. TestComplete will be best to use for applications with lesser security needs. QTP is best where data security is needed even while testing.

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7. REFERENCES

- [1] Innovative approaches of automated tools in software testing and current technology as compared to manual testing, Global journal of enterprise of information system, jan 2009-june 2009.
- [2] Manual Testing - http://en.wikipedia.org/wiki/Manual_testing
- [3] Software Test Automation - http://en.wikipedia.org/wiki/Test_automation
- [4] *Quick Test Professional entry in Wikipedia:* http://en.wikipedia.org/wiki/HP_QuickTest_Professional
- [5] *Mercury Quick Test Professional tutorial, version 8.0.* Mercury Interactive Corporation, Documentation, 2004.
- [6] Lino Tadros - Falafel Software Inc., *TestComplete user guide*, release 2009.
- [7] Mike Lutz, Rochester Institute of trchnology, "Testing Tools", IEEE, 0740-7459/90/0500/0053, May 1990.
- [8] Robert M. Poston and Michael P. Sexton, " *Evaluating and selecting Testing Tools*", Symposium on assessment of Quality software Development Tools, IEEE CS Presss, Los Alamitos, Calif., 1992.
- [9] R. Tokar and S. Mankefors, "A *Survey on Testing and Reuse*", SwSTE'03, IEEE conference, 0-7695-2047-2, 2003
- [10] Leckraj Nagowah and Purmanand Roopnah, "AsT -A *Simple Automated System Testing Tool*", IEEE, 978-1-4244-5540-9/10, 2010
- [11] Khaled M.Mustafa, Rafa E. Al-Qutaish, Mohammad I. Muhairat, "Cassification of *Software testing Tools Based on the Software Testing Methods*", 2009 second International Conference on Computer and Electrical Engineering, 978-0-7695-3925-6, 2009.
- [12] Michael Silverstein, "Record and playback at the *GUI level can often create more LOGICAL CAPTURE REPLAY*", STQE magazine, Nov-Dec. 2003
- [13] Mark Michaelis, "Boon and Bane of *GUI Test Automation*", The magazine for professional testers-www.testingexperience.com.
- [14] M.Grechanik, q. Xie, and Chen Fu, "Maintaining and Evolving *GUI- Directed Test Scripts*", ICSE'09, IEEE, Vancouver, Canada, 978-1-4244-3452-7, May 16-24, 2009.
- [15] Alex Cervantes, "Exploring the Use of a *Test Automation Framework*", IEEEAC paper #1477, version 2, updated January 9, 2009
- [16] A. Ieshin, M. Gerenko, and V. Dmitriev, "Test Automation- *Flexible Way*", IEEE, 978-1-4244-5665-9, 2009