

Comparison of Test Management Tools and Challenges in Migration of Test Management Services to Cloud

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Abstract: The primary purpose of this study is to effectively conduct the evaluation of test management tools that would replace quality center. The evaluation is done based on comparing the features of the leading test management tool quality center 10.0 with other tools. This study would help business decision-makers to identify the test management tool which will replace quality center. Currently, HP Quality Center is used as a test management tool used across all of the software development process. Since, the cost of the tool is high and lack of some features, the analysis would help in adopting new types of test management tool. Further, the challenges that are involved in moving test management services to cloud are discussed in this study.

Key words: Quality assurance, testing as a service, test management tool, development process, evaluation

INTRODUCTION

A test management tool that includes everything needed to manage the test process and can save testers from the hassle of installing separate applications that are necessary for the testing process. They can be implemented with minimal programming ability, allowing for easy installation and monitoring of the test process across multiple project groups. Once installed, teams have instant access to a user interface and can immediately start running and recording test cases. These types of applications are designed to simplify the test management process with high levels of automation and tracking built in yet don't require advanced programming skills or knowledge to implement. They are useful for teams who manage a variety of test cases and for larger teams who need an all-inclusive application for project management. There has been very little research on analysis of test management tool. This study focuses on comparing and contrasting the industry leader for test management 'Quality Center' with other low cost test management tools. The related researches on this area is given. The proposed system is available from the test requirements, test planning, test execution to defect the tracking management of the entire testing process and test related tasks management.

This evaluation includes different stages: the initial stage is listing out the test management tools available in

the market. The second stage is evaluating the features of the tools with quality center features. Third stage is setting priority and short listing the tool from the selected list of tools. Fourth stage is downloading and installing the tool and exploring it in detail (Serrano and Ciordia, 2005; De Gea *et al.*, 2012). For commercial tools this was done using the trial period of the tool. Fifth stage is preparing the report and finalizing the tool. Test management tool considered for evaluation in the initial stage is:

- SpiraTeam
- Bugzilla Testopia
- XStudio
- Software planner
- QADirector
- Test Link
- RTH
- QATraq
- ApTest
- QAManager
- Bromine
- Testitool

The generic modules of the test management tool are:

- Admin module
- Customization module
- Requirements module

Table 1: Comparison of admin module features for the selected tools

Tool area	Features/Tools	Bugzilla				Test					Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	link	QAManager	SpiraTeam	planner	QADirector	RTH	ApTest
Admin	Configuration the parameters	Yes	No	No	FE	No	No	No	No	No	FE	FE	FE	FE
	Monitoring the license	Yes	No	No	FE	No	No	No	No	Yes	No	FE	No	FE
	Communicating to the users	Yes	No	No	FE	No	No	No	No	No	No	FE	No	FE
	Creating new domain	Yes	No	No	FE	No	No	No	No	No	No	No	No	No
	Creating new project	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Creating new users	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Assigning project to the users	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Creating specific roles	Yes	FE	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	FE	Yes
	Configuration of parameters	Yes	No	No	FE	No	No	No	No	No	No	No	No	No
	Customizing the work flow	Yes	FE	Yes	No	No	No	Yes	No	Yes	No	Yes	FE	No
	Adding new fields	Yes	FE	Yes	No	No	No	Yes	No	Yes	Yes	Yes	FE	Yes
	Assigning modules according to the role	Yes	FE	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	FE	No
	Multiple domain	Yes	No	No		No	No	No	No	No	No	No	No	No
	Multi project	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Audit log	Yes	FE	Yes	No	Yes	Yes	Yes	FE	Yes	Yes	Yes	FE	Yes
	Upgrading existing QC projects	Yes	FE	No	FE	No	FE	FE	FE	Yes	FE	FE	No	No
	Impact to space/storage requirements	Yes	FE	-	FE	-	FE	FE	FE	-	FE	FE	FE	FE
	Creating specific roles	Yes	FE	Yes	Yes	No	No	No	No	Yes	Yes	Yes	No	FE
	Assigning modules according to the role	Yes	FE	No	Yes	No	No	No	Yes	Yes	Yes	Yes	FE	FE
	Project information- like phase, start date, end data, etc.	Yes	FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	FE
Generate document	Yes	FE	No	No	Yes	No	Yes	No	Yes	No	No	No	FE	

- Test plane module
- Test execution module
- Reporting module
- Automation module
- Version control

LITERATURE REVIEW

There have been very little research on analysis of test management tool (Yuan, 2011). A test management tool that includes everything needed to manage the test process and can save testers from the hassle of installing separate applications that are necessary for the testing process. They can be implemented with minimal programming ability, allowing for easy installation and monitoring of the test process across multiple project groups. Once installed, teams have instant access to a user interface and can immediately start running and recording test cases. These types of applications are designed to simplify the test management process with high levels of automation and tracking built in yet don't require advanced programming skills or knowledge to implement. They are useful for teams who manage a variety of test cases and for larger teams who need an all-inclusive application for project management. Test management tools and software's have always been desktop based and in the recent past many of them have been deployed as a client server application on the web to address the needs of software testing processes.

Many test management tools both licensed and open source have been adopted by many testing systems (Safana and Ibrahim, 2010). HP's Quality Center continues

to be the industry leader in providing test management related solutions in terms of complete application lifecycle management. The other leader in test management solutions is Spira Team.

ADMIN MODULE

Challenges on moving to cloud from admin module perspective: Admin module of most of the test management tools deal with software project management, project fields' definition and in managing user and user groups. Hence, these features are taken as given in Table 1. Workflow customization and projects scalability has to be analyzed to ensure that the test management tool is scalable based on new project requirements. Researchers have few of the test management tool in which the vendors provide an option to the business users to install the tool in the cloud, so that the users can disown the installation and server maintenance. However, as the major project related data are maintained outside a specific organization, the provider has to ensure that data is secure and data does not gets locked in with a specific vendor as the data will be required for metrics even after the project gets completed.

REQUIREMENTS AND TEST PLAN MODULE

Requirements and test plan module in test management tool deals with the management of different types of requirements in a software development life cycle and in the management of automation and functional test cases as given in Table 2 and 3.

Table 2: Comparison of requirement module features for selected tools

Tool area	Features/Tools	Bugzilla										Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	Test link	QAManager	SpiraTeam	planner	QADirector	RTH	ApTest	
Test plan	Preparing test scenarios and test case	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	Can import the test case														
	Adding test script	Yes	FE	Yes	No	Yes	No	FE	No	Yes	FE	No	Yes	No	
	Test planning	Yes	FE	Yes	Yes	Yes	Yes	Yes	No	Yes	FE	FE	Yes	No	
	Test plan execution	Yes	FE	Yes	Yes	Yes	FE	No	No	Yes	FE	Yes	Yes	No	
	Risk-based quality management	Yes	FE	No	No	Yes	No	No	No	No	FE	Yes	No	No	
	Copying across projects	Yes	FE	No	No	No	No	No	No	Yes	No	No	No	No	
	Cross project sharing	Yes	FE	No	No	No	No	No	No	Yes	No	No	No	No	
	Creating assets similar to BPT	Yes	No	No	No	No	No	No	No	No	FE	No	No	No	
	Maintaining assets similar to BPT	Yes	No	No	No	No	No	No	No	No	FE	No	No	No	
	Sharing assets similar to BPT	Yes	No	No	No	No	No	No	No	No	FE	No	No	No	

Table 3: Comparison of test plan module features for selected tools

Tool area	Features/Tools	Bromine					Test				Software			
		QC	Testopia	Bugzilla	QATraq	XStudio	Testitool	Test link	QAManager	SpiraTeam	planner	QADirector	RTH	ApTest
Requirements	Adding requirements	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
	End to end requirement traceability	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
	Requirements management	Yes	FE	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No

Table 4: Comparison of test execution module features for selected tools

Tool area	Features/Tools	Bugzilla					Test				Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	Test link	QAManager	SpiraTeam	planner	QADirector	RTH	ApTest
Test execution	Executing test case for the mapped release cycle	Yes	FE	Yes	Yes	No	Yes	Yes	No	Yes	FE	No	Yes	Yes
	Executing automation test script for the mapped release cycle	Yes	FE	Yes	No	No	No	FE	No	Yes	FE	No	FE	Yes
	Execute test script by scheduling test runs	Yes	FE	No	No	Yes	No	FE	No	No	FE	No	No	No
	Attach the Screen shot and other reference document in all the entities	Yes	FE	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	Executing BPT assets	Yes	FE	No	No	No	No	No	No	No	FE	No	No	No

Table 5: Comparison of Reporting module features for selected tools

Tool area	Features/Tools	Bugzilla					Test				Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	Test link	QAManager	SpiraTeam	planner	QADirector	RTH	ApTest
Reporting	Generating report for all entity (Text and graphical report)	Yes	FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Ad-hoc reporting features and packaged reports	Yes	FE	No	FE	Yes	No	No	No	No	Yes	FE	No	No
	Quality center dashboards-rolebased reporting	Yes	FE	No	No	No	Yes	No	No	Yes	Yes	Yes	No	No

Challenges on moving to cloud from requirements and test plan perspective: In today's world requirement management aspect in test management tool needs to dynamic which means most of the software development environment and software configuration management tool have the requirements stated there, instead of having the requirements in documents to avoid the hassle of maintaining the requirements at different places, consistency can be ensured if the requirement management can interact with the software configuration and development tools on a periodic basis and update itself automatically. Further, the test cases should have the capability of running the automated test cases which would have been developed by a different tool. The required adapters and logins should be available for this integration.

TEST EXECUTION AND DEFECT MANAGEMENT MODULE

Challenges on moving to cloud from test execution perspective: Test design can be either automated test

cases or would be the functional and non-functional testcases created by various test design mechanisms. The feature of test execution service is listed in Table 4. Test execution service will have to be integrated with the required test automation tools. Further, as various metrics would be derived from test execution the need for maintaining the history of test execution and test re run would be essential.

Challenges on moving to cloud from defect management perspective: The main important module of any test management tool is defect management and reporting. The features of them are listed in Table 5 and 6, respectively. This should ensure that the various stake holders have the proper access privileges to strengthen the defect life cycle. Also, defect scoping can change from one project to another project. If a project creation has happened in a particular tool moving the data from one tool to another should ensure that the migration of data is successful without any inconsistency.

Table 6: Comparison of defect mgmt. module features for selected tools

Tool area	Features/Tools	Bugzilla							Test link	QAManager	SpiraTeam	Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	planner				QADirector	RTH	ApTest	
Defect Mgmt.	Adding defects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
	Export defects to excel	Yes	FE	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
	Liking defects to the Test case & Requirements	Yes	FE	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	
	Defect management-defect sharing across projects	Yes	FE	No	No	No	No	No	No	No	No	No	No	No	
	Import and export of defects from other systems	Yes	FE	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	

Table 7: Comparison of customization module features for selected tools

Tool area	Features/Tools	Bugzilla							Test link	QAManager	SpiraTeam	Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	planner				QADirector	RTH	ApTest	
Customization	Other tool integration	Yes	Yes	Yes	No	Yes	FE	FE	FE	Yes	Yes	No	Yes	Yes	
	Add ins	Yes	Yes	Yes	No	Yes	No	No	No	Yes	No	No	No	No	
	Organization of projects	Yes	FE	No	No	No	No	No	No	Yes	FE	No	No	No	
	Cross project customization	Yes	FE	No	No	No	No	No	No	Yes	No	No	No	No	
	Process enablement (shared customization)	Yes	FE	No	No	No	No	No	No	No	No	FE	No	No	
	Integration and APIs	Yes	Yes	Yes	Yes	Yes	No	FE	No	Yes	FE	No	No	Yes	
	Cross project libraries	Yes	FE	No	No	No	No	No	No	Yes	No	No	No	No	
	Workflow	Yes	FE	Yes	No	No	No	No	No	Yes	No	Yes	No	NO	
	Test resources	Yes	FE	No	No	No	No	No	No	No	No	No	No	No	
	Dependencies	Yes	FE	No	No	No	No	No	No	No	Yes	Yes	No	No	

Table 8: Comparison of release mgmt module features for selected tools

Tool area	Features/Tools	Bugzilla							Test link	QAManager	SpiraTeam	Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	planner				QADirector	RTH	ApTest	
Release Mgmt.	Adding releases	Yes	FE	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	
	Release management	Yes	FE	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	
	Library	Yes	FE	No	No	Yes	No	No	No	Yes	No	No	No	No	

Table 9: Comparison of miscellaneous release mgmt. module features for selected tools

Tool area	Features/Tools	Bugzilla							Test link	QAManager	SpiraTeam	Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	planner				QADirector	RTH	ApTest	
Misc	Resource skill sets required	FE	FE	Yes	FE	Yes	FE	FE	FE	Yes	FE	FE	FE	FE	
	Support-documentation, 1-800 support, etc.	Yes	FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	Follow up and alert in all entity	Yes	FE	No	No	No	No	No	No	No	No	FE	No	No	
	Mail (Auto mailing/manual mailing)	Yes	FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	
	Secure forms-based web authentication	Yes	FE	Yes	Yes	No	No	No	No	No	No	Yes	No	No	
	Discussion, task	No	FE	No	FE	Yes	No	No	No	No	Yes	No	Yes	No	
	Import and export of the test data in requirements, test plans, etc.	Yes	FE	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	

Table 10: Comparison of version control module features for selected tools

Tool area	Features/Tools	Bugzilla							Test link	QAManager	SpiraTeam	Software			
		QC	Bromine	Testopia	QATraq	XStudio	Testitool	planner				QADirector	RTH	ApTest	
Version control	Base lining	Yes	FE	Yes	No	Yes	No	No	No	Yes	No	No	No	No	
	Version control	Yes	FE	No	No	Yes	No	No	No	Yes	No	No	Yes	No	

PROJECT CUSTOMIZATION AND RELEASE MANAGEMENT MODULE

Challenges on moving to cloud from project customization and release management perspective: Project customization deals with customizing or designing a project based on the software development life cycle. The features of project customization and release management are listed in Table 7 and 8. Further, the releases and cycles that are in scope of a particular project have to be created and should be compatible with the rest of the test management tools. This activity if not done properly may result in incompatibility issues if each project in an organization uses different test management tools on the cloud as data import and export will have challenges.

VERSION CONTROL AND OTHER OPERATIONS

Challenges on moving to cloud from version control and other operations perspective: The other major operation that are miscellaneous in nature and version control related feature are listed in Table 9 and 10. Tool migration or upgrade will have issues if the other tools integrated are not compatible with the new upgraded version of the tool. Further, if the cloud server in which the application is installed undergoes a migration or upgrade, the tool should not have any incompatibility issues. Further, the data in the tool can go to a freeze model during production deployment of the projects that are accommodated in the tool. This will lead to vendor lock in where in the tool might not be used but the projects would require just the data for deriving various metrics.

Table 11: Final comparison and analysis

Test management tool	Commercial/Open source	Yes	No	FE
QC	Commercial	73	1	0
Spira Team	Commercial	52	22	0
Bugzilla testopia	Open source	34	40	0
XStudio	Open source	35	39	0
Software planner	Commercial	31	24	19
QADirector	Commercial	31	32	11
Test link	Open source	28	35	11
RTH	Open source	26	35	13
QATraq	Commercial	23	39	11
ApTest	Commercial	17	49	8
QAManager	Open source	14	56	4
Bromine	Open source	11	9	54
Testitool	Open source	19	48	8

CONCLUSION

As testing has evolved to be a key process in the software development life cycle, testing related metrics and management has evolved to be a key parameter in ensuring quality systems delivered. As all types of services are moving into cloud, this study would provide a ground work in moving test management services and standardizations to the cloud. The summary as

given in Table 11 was derived after the final analysis and this can be used for enabling test management as a service option in future.

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