Improvised Agile SCRUM Using Test-Asa-Service

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www.ijcseonline.org

Abstract— In today's era, service development demand is increasing day by day.Client's ever changing requirements made agile methodology to come into existence due to fasten production, flexibility and improved quality.Moreover, it can accommodate changes and provide instant feedbacks and transparent communication. Due to geographic distribution of team members and client, leading IT companies thought to strengthen the agile methodology by giving the user access to an environment that can be accessed worldwide i.e. CLOUD. This combination of agile and cloud has a positive impact on IT companies. For achieving Quality, we need to test all functionality so in our work we emphasis on testing assimilation using cloud services in agile environment. Cloud team members can perform testing easily using Test-as-a-Service without increasing the cost of the project and get the results faster. We can also use agile management tools to reduce the problem of communication and for all the updates in the product backlog as well as Sprint backlog lists.

Keywords- Software Testing, Agile testing, SCRUM, Testing as-a-service.

I. INTRODUCTION

The nowadays need of agile software development is growing rapidly as it allows for the changing requirements within the development cycle and provide quick delivery of software to the customer and the customer is a part of a team. Moreover, due to geographic distribution of team members of organization and between customer and team members made organizations to move to the cloud. The combination of agile and cloud provide a positive impact on society in terms of security, time, instant user feedback and reducing the overall cost of production by increasing the quality standard of the software. [23] [24] As testing is a very important part, without testing organization can't able to judge whether the software is properly working according to the requirements of customer and also help to find out the bugs in the coding. In Agile there are multiple releases so organizations use automation testing to cut the testing time and quick delivery of the project. Moreover, testing in cloud increases the speed by executing multiple tests simultaneously on virtualized machines which saves time to test the product.

A. SOFTWARE TESTING

Software testing is a technique to find the bugs in software and to check whether the product has been developed according to the requirements of customer or not. Software testing gives the company the confidence that their product is working properly and helps to achieve quality assurance of the product by getting the feedback of the behavior of the system. Testing Phase can be of any length and recursive in nature as the tester

test the application and if there are any errors they can send it to developer to correct the errors in the application[24][26].

B. SCRUM

SCRUM is a method to manage or develop a project using agile methodologies. It is an iterative process and delivers a small part of the software at the end of the iteration. The basic idea of SCRUM is to make the system flexible enough to adapt the changes in requirements, resources; technology etc. to achieve the desired results. SCRUM includes many activities to develop software or an application. It builds a Rapid prototype, as the initial requirements are gathered from the customer may be incomplete and can be changed during the development process. The team took the overview of the software application.
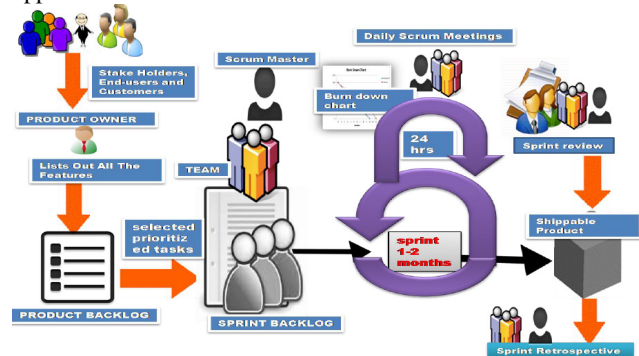

Fig. 1: SCRUM Process [18]

After a team has gathered the requirements, then planning phase starts and simple design is built for the software. Planning and designing is finalized in a short meeting. After planning and designing the whole project is divided into small iterations, known as Sprint and comes into the development phase. Each Sprint has a Sprint backlog, which contains the goals to be achieved during that Sprint and accordingly team members distribute their work among themselves and review it at the end .At the end of every Sprint there is a meeting in which team member discusses

what they have done and what needed to be done as shown in figure 2. At the end they integrate their work and sent to the customer for acceptance testing. Customer tests the part of the software and if there are any bugs/ errors, or they need any changes, will be added in the product backlog list and be implemented in the next Sprint.

C. AGILE TESTING

In agile, testers are the part of the team and directly interact with the developers and be present in every phase of the product development life cycle. Testing phase is present in every Sprint so the each and every small release be first tested by a tester and then passed to the client for acceptance testing [2].Agile testing, the client can perform pair testing with the developer or the tester .The client may help the tester to design test cases or create automated tests. In agile testing testers first write the test cases so that developers can do their work accordingly, this process is known as "Test Driven Development"[7]. In agile testing starts from the early stage right from the test driven development and ends with the automated acceptance testing on continuous integration testing for changes made in the code.

Role of Agile Tester
Testers are present in each and every phase of SCRUM [12].

i) *Tester In Planning Phase:*
   a. Helps to understand the rest of team members regarding the software.
   b. Interact with the client for better understanding of the software and make changes in user story if any requirement given by the client is not feasible.
   c. Interacts the developers so that every developer knows their tasks and has the same understanding.
   d. Think for testing dependencies required for software testing.

ii) *Tester In Developing Phase:*
   a. Make test cases.
   b. First test independent module and then moved to dependent ones
   c. Identify the bugs or errors and discuss it with the developer.
   d. Facilitates communication between tester and a client, or client and developer to resolve the issues arising during developing or testing phase.
   e. Perform automated testing.
   f. Perform some manual testing as some cases are difficult to automate.

iii) *Tester In Post Release Phase:*
   a. Find ways to improve next module.
   b. Estimate that there is enough time to test all the modules.
   c. Release the software to clients for feedback.
   d. Identify obstacles come during testing the module

D. AGILE AND CLOUD COMPUTING

i) *Combining Agile With Cloud Computing*

The cloud provides the environment for agile development. Combining agile with cloud helps to [3] build software faster and with better quality. There are certain advantages when we combine agile with cloud.

a. Infrastructure:
   Without cloud there is a lot of capital expenses which include software license, hardware, tools for monitoring or, security products etc. .With the help of cloud the need for infrastructure was removed and there is no need for purchasing software or hardware. Resources are allocated according to the demand and need of the application.

b. Frequent Communication:
   Organization are geographically dispersed and there is a lack of communication among team members which lead to the failure of an application, combining cloud with certain management tools we can overcome this problem.

c. Provision of Servers:
   You might have to wait till your department provides you the server or install the platforms like database software, etc., but in the cloud environment development team get the required server on their own.

d. Automated Testing:
   Testing in cloud increase the speed of developing the software as developers can test the software on different platforms using virtual images [1].

e. Prioritizing the task in the cloud: Continuous prioritizes the task needs proper monitoring and if the team is distributed so organizations need to install any Agile Project Management Tool in the cloud platform so that each and every member can access the data [1].

II. TESTING USING CLOUD

Cloud based software testing is being performed by using cloud environment and infrastructure. [4].
Testing in cloud combines cloud environment and simulate real world user traffic as a means of stress and load testing web sites.

A. CLOUD TESTING OBJECTIVES:
   a. To ensure the quality of applications deployed in the cloud including their functional services, system performance, scalability, business processes,
   b. To validate software as a service in cloud including performance, security, scalability based on predefined SLA's and certain economic scale.
   c. To check API of software as a service and their connections with each other**.**

B. IMPORTANCE OF TESTING WITH CLOUD
   a. Reduce Costs mean to use virtualized resources and shared infrastructure which eliminate the cost of purchasing hardware and software license.

b. On demand test services to perform effective large scale testing of web based applications.
c. Easy to test the system performance and scalability.
d. Automation testing and development of resource provisioning helps to reduce the cost of operating system and labor up to 30 to 50%.
e. Reduce the development and testing setup time [4].

C. TEST -AS -A- SERVICE[TAAS]

TaaS is used to provide the testing service to the client or the organization over cloud any time. Taas involves on demand execution of the test cases. Tests can be executed either on client or remotely from outsourced lab facilities.
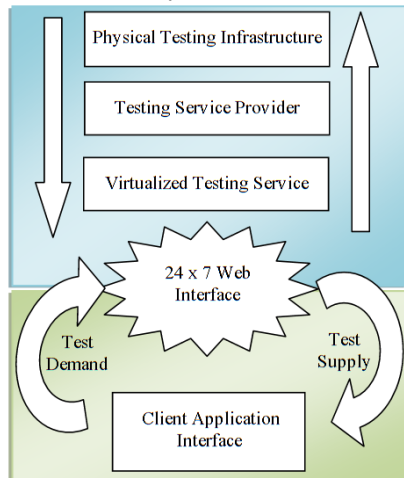

Fig. 3 TAAS Model

It is the most effective way to provide the testing service to the organization or client, as it accelerates the testing process by providing the third party with automated well equipped test labs which includes testing tools, perform Application Under Test (AUT), and monitoring of data. TAAS automate the testing process which reduces the testing time and the cost and helps the companies to be more efficient in delivering the applications to their customers or clients [4][15].

D. CHARACTERISTICS OF TAAS

a. Well Equipped Test Labs: TAAS provides with the test labs with full configuration, tools which helps the organization to deploy their test cases and complex web applications.
b. Security: Has a secure library and preventing unauthorized access.
c. Diagnosis and Tracking Service: It has automated rich application for diagnosis and tracking the errors in the test script or test cases.
d. On –Demand Test Service: It provides on-demand test service to the any team member as members are geographically dispersed so they could require the test servers at different time, so TAAS provides the service to members at any time.

e. On demand Test Environment: It creates on demand test environment and creates a virtual machine which has all required virtual computing resources and infrastructure and the testing tools [4].

E. SERVICES OF TAAS

There are different services provided by Test-as-a-Service which are listed below [15]:
a. *TAAS Management:* This includes all the details of account management, billing, pricing, access control.
b. *Test Environment Management:* This controls test tool deployment, environment configuration, resource allocation, test ware management.
c. *On Demand Testing:* This controls all the activities like test secluding, test running, test recording, bug reporting.
d. *Tracking and Monitoring Service:* Through this service tester can track and monitor the program behavior.

F. DIFFERENCE BETWEEN TRADITIONAL TESTING AND TAAS

TABLE I.   DIFFERENCE BETWEEN TRADITIONAL TESTING AND TAAS

TRADITIONAL TESTING	TAAS
Need labor which increases the cost	No need of extra labor , so reduction in cost
People Focus	Service focus
Rigid	Flexible and Scalable on demand
Input based pricing	Outcome based pricing.
Centralized, limited parallel and fault tolerance	Distributed and high fault tolerance and parallelism
Limited Sharing	Multi-tenancy architecture and has large scale resource sharing.

III. RESEARCH METHODOLOGY

A. ACCELERATION IN AGILE DEVELOPMENT & TESTING USING CLOUD COMPUTING

Provision of Templates:
Templates allow the team members to duplicate the environment. Virtualization helps the company to use virtual machines as the provisioning units for the developers or testers. While working with cloud developers can maintain a library of virtual machines which help them to combine the components or resources needed by them and template library should be updated with all the latest available resources [11].

Automated Development:
Without a cloud, first we have to establish the connections, defining firewall policies of connection at the start of every

project, which takes a lot of time. With a cloud platform, there is no need to perform this task, cloud provide companies distributed and easily accessible source code management without managing the infrastructure. With a single click copy of your development environment is created.It also helps the testers to create numerous copies of the code to be tested, so as to parallelize the testing effort [1].

Helps to Resolve the Issues Faster:
While developing the code, developers have to run from one place to another to resolve their queries and sometime the code only runs on one machine but this is not the case with cloud. Cloud helps the developers to work together with each other in the same environment in real time where all the bugs can be resolved and testers can test iteratively [11].

Customers Can Add new features and Validate Throughout Development/Testing:
Through the cloud, developers can create multiple copies of the small, functional bit and can share it with the customer, consultant, testers situated in any corner of the world for testing and fixing all the errors that arise during the testing phase. Once the user tested the functional bit and approved it , then virtual machine can be destroyed.

B. SCRUM OVER CLOUD.

SCRUM approach has been developed to manage the process for software development .It guides that how team members should work in order to achieve their goals in the environment where the needs of the customer changes very often.
 In this paper I have surveyed SCRUM over the cloud. Organization is geographically dispersed so cloud helps them to work together in a team. With the cloud platform, and the agile management tools client can communicate with thousands of the team members without managing IT infrastructure.
SCRUM is divided into 3 phases
   a.   Pre Iteration (planning ,designing) Phase
   b.   Developing Phase
   c.   Post Iteration Phase

a. **Pre iteration**: First user gives his requirements in the form of a story to the organization and stores it in a storage space using storage as a service, of organization's private cloud. After gathering the requirements, feasibility has been checked that weather requirements are practical and the organization has enough resources for execution. After checking the feasibility of the user story, it again stored in the storage space and now it is job of the planning team to plan the requirements and design the software and then product backlog has been created.

b. **Developing**: After product backlog has been made then it is given to Sprint Controller & Management, then the whole project is divided into small iterations known as Sprints. Each Sprint is managed by agile management tools like Cockpit, Mingle. Each Sprint has its Sprint

Backlog list which contains the tasks that has to be fulfilled. According to Sprint Backlog List planning is done and particular tasks will be allocated to different team members. Then developing phase starts in which developers will develop a bit of code will use pre-defined images and specify the resources needed through which a virtual machine is created to test the code according to test cases using Taas and then modify the code if needed as shown in figure 5.. Continuous integration of code is being done through automated development .Companies can also perform multi-platform testing with the help of virtual images and can run unit test parallel through cloud machines in spite of testing consecutive   tests on one machine.Daily SCRUM meetings are   managed by agile management tools like Cockpit, Mingle. At last after completion of the Sprint the module is delivered to user for acceptance testing.
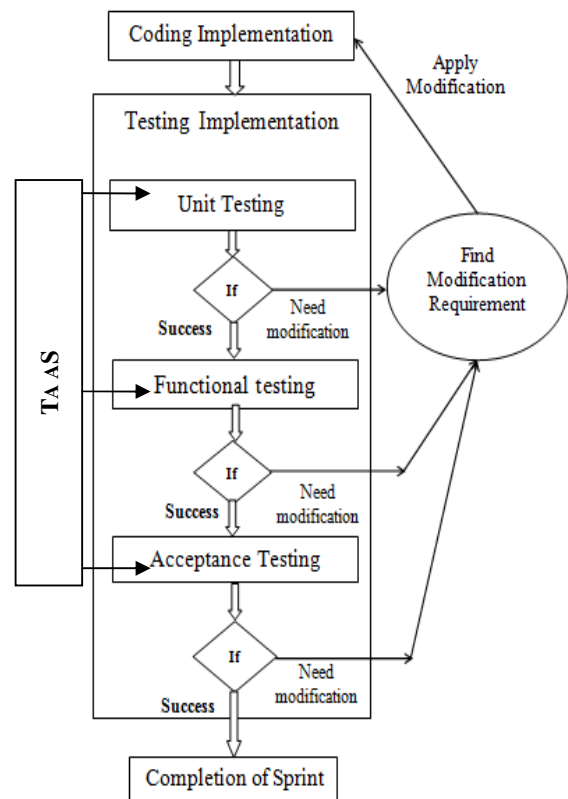

Fig. 4: Testing Process In SCRUM

c. **Post-Iteration**: After completion of all the Sprints, all the modules are integrated and then integration and system testing using Test-as-a-Service, then final product is sent to the customer for acceptance testing. In this way software is being made in the form of iterations and feedback   from the customer.

The figure 5 shows how SCRUM will be implemented over the cloud. In the first phase as pre iteration, the client gives

his requirements in the form of stories and stored in the storage space of the organization's private cloud and team manager identifies the requirements, whether they are feasible or not, then team prepare a high level design which is being tested by user.

A. *Sprint Controller &Management*

After verification by user Product Backlog list will be created, which contains a list of all the tasks which has to be performed. This list is being transferred to Sprint Controller & Management which has certain activities:
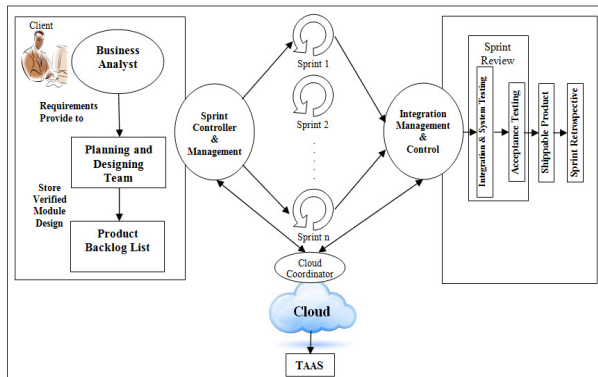

Fig. 5: Improvised Agile SCRUM process Over Cloud.

- Classification of Product Backlog data (Dependent and independent Modules)
- Find out the requirements needed for execution of modules.
- Assign the virtual machines as per need.
- Check daily progress of each Sprint.
- The developer can perform automated testing without incurring extra cost and time with the help of many virtual machines.
- Provide access to user for acceptance testing.

After classification is done by SCM, the process will be entered into the second phase of development where more than one independent Sprint will be executed simultaneously. At the time of developing the code, developer demanded for the virtual machine through SCM and perform unit testing and functional testing sequentially. At the time of these testings, the developer will ask for testing resources and environment to test the code using TAAS. After development of these independent modules as mentioned in Sprint backlog, system will deliver the independent modules to the client for acceptance testing and will ask for the acceptance testing environment from TAAS through SCM. After Sprint has been completed it is being transferred to Integration and Management Control

B. *Integration and Management Control* :

Integration and Management Control is to store the Sprint results and used to integrate the modules which are needed by dependent modules, perform integration testing of that particular module and then give back the integrated functional bit to the team member .The controller also helps

to deliver the results of Sprints to the user for acceptance testing. After all Sprints have been performed application is being developed. We can perform certain tests like Load Testing, Performance Testing, Migration Testing, User Acceptance Testing etc.

IV.   CONCLUSION

Time and cost benefits are the most motivating factors and measures for any business accessing tools and services via the cloud. The cloud provides a low-investment method to quickly increase capacity or add capabilities. Cloud provides platform for service based automated development / testing so as to reduce the cost and time and enhance the quality of product, with the help of TAAS implementation in our modified SCRUM process, We provide fast, effective on demand testing environment which have been created and accessed through cloud any time. This paper provides proposed modified SCRUM process which we are implementing in a simulated environment. This will give more accurate results for better review. As per our analysis, we found that our modification makes the process faster. We have also explained the testing sequence, including a recursive approach for improving the testing process which improves quality of results. For future aspects we may implement it in other agile environments and analyze the comparative implementation works.

V.   Acknowledgement

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