Towards Developing Software Testing As a Service (Staas) Model in Cloud Computing: A Case of Collaborative Knowledge Management System

RUSLI ABDULLAH
Information System Department, Faculty of Computer Science & IT,
University Putra Malaysia, 43400 UPM, Serdang, Selangor,
MALAYSIA
rusli@fsktm.upm.edu.my

Abstract: Software testing (ST) is the process of identifying and delivering the software as a product based on the specification that has been given and required by the users. In order to ensure the product is working properly based on the user specification, there are many people who are working together and provide their services for a community of practice (CoP) purposes. The CoP in ST of cloud computing environment are including the software designer, programmer, and system tester as well as the software users by themselves. Based on this scenario of working together or working collaboratively in order to avoid a lot of mistakes or errors and causes the software failure, which may be found during the ST as a service (STaaS) process, so that there is a need for CoP to have a tool called Collaborative Knowledge Management System (CKMS) in managing the ST knowledge of best practice and lesson learnt. The paper will discuss a model on how the ST of CoP is offering its service of processes called STaaS through knowledge life cycle which starting from knowledge acquisition, knowledge storing, knowledge dissemination, and knowledge application in order to overcome any shortcoming faulty or failure especially during the software development and it implementation in a cloud computing environment. Therefore, by utilizing the CKMS model in managing knowledge of STaaS, the CoP can maximize the STaaS knowledge in the CKMS and furthermore to overcome the mistakes or errors, so that they can also delivered a good product as part of well services besides in enhancing the quality of software of the particular users.

Key-words: Software Testing as a Service (STaaS), Collaboration Environment, Knowledge Management, Collaborative Knowledge Management System (CKMS), Software Quality, Cloud Computing

1 Introduction

Software testing (ST) is the process of identifying and delivering the quality of software as a product based on the specification that has been required by the users [1]. In order to ensure that the product is meeting the user specification, there are many people who are working together for that purposes as a community of practice (CoP). These are including the system designer, programmer, and system tester as well as the user by himself. Based on this scenario in order to avoid a lot of mistake or errors and causes the software failure, which may be found during the processes of ST as a service (STaaS) process, so that there is a need of tool CoP called collaborative knowledge management system (CKMS) in managing the ST knowledge of best practice and lesson learnt [2,3,4]. According to Awad and Ghazari (2004), Collaborative Knowledge Management (CKM) is the process of capturing making use the organization's expertise anywhere, anyplace, and anytime in the business in explicit and implicit knowledge [2]. The paper will discuss the model on how the CKMS is offering of its processes for ST as a service (STaaS) in cloud computing (CC) environment through knowledge life cycle which is consists of knowledge acquisition, storing, dissemination, and application [3]. Therefore, by using the model of ST as a service (STaaS) in managing knowledge of, the CoP can utilize the CKMS , and then it will reduces errors, so that they

can delivered in a good or quality product to the organization.

2 Literature Review

According to Kaner [9,10], software testing (ST) is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. So that, by handling the ST process, the product that will be delivered to the stakeholders as main users significantly will become in a good quality of condition which according with their requirement. Fig. 1 is showing on CoP such as Software tester, Developer, and the User are working collaboratively in ST as a service (STaaS) and shared their knowledge as much as possible into a specific enterprise business system.

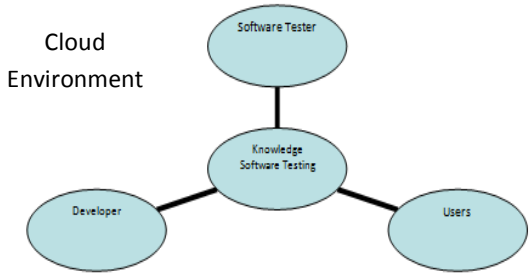

Fig. 1: CoP in STaaS Environment

ST process normally involved black box and white box of testing [12]. Black Box Testing is a testing process that will test the functionality of the product as an external structure or working of the product, while the white box testing is the testing process involved as an internal structure in term of coding of the product starting from input goes to the appropriate output. Both of these testing processes can be applied at the unit, integration and system levels of the software testing process and it normally will be conducting based on the inventory testing process [5]. This inventory will be starting by requirements which are describing the functional, non-functional requirement, and followed by any other type of testing such as user acceptance test (UAT) and regression test.

Meanwhile, CKMS is a tool for managing knowledge which is involved knowledge acquisition, knowledge storage, knowledge dissemination, and knowledge application [4]. The knowledge of the CoP can be divided into two types of knowledge called tacit and explicit knowledge [3,9,11]. Fig. 2 is showing the KM life cycle process. In this context, CKMS can also be used in different knowledge environment such as Software Engineering [4,5], Software Testing [3,6], Software Maintenance Knowledge [7,8] and many others.

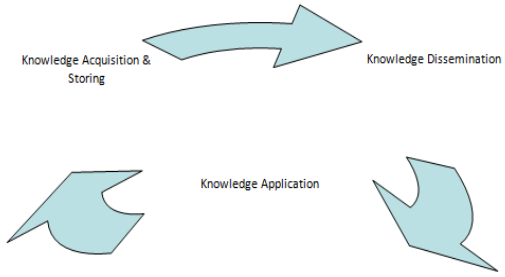

Fig. 2: KM Life Cycle Process

In the context of managing knowledge of ST which is consists of knowledge of testing activities of processes, it will be managed or categorized according to the knowledge structure of software testing process based on Black Box and White Box testing environment. Fig. 3 is showing the black box and white box testing by indicating the internal and external structure of the software as a product as well as UAT.

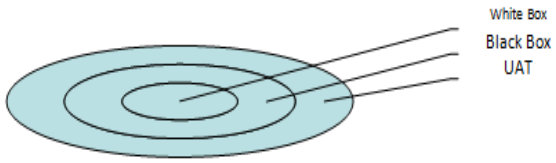

Fig. 3: Types of normal ST Environment

Besides that, in order to ensure the CoP will be informing about the latest knowledge about the ST that was deposited and used by certain members of the CoP in the KMS, there are two kinds of technologies can be implemented for this environment. These are included push and pull technology mechanisms in term of soft and hard information about the utilization of a specific relevant knowledge of CoP in STaaS in cloud computing (CC) environment [4,7].

ISBN: 978-1-61804-070-1

3 Methodology

In order to formulate the ST as a service (STaaS) model of CKMS in managing knowledge of ST process environment, there are few steps that has been conducted as shown in Fig. 4.

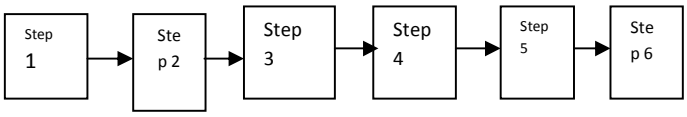

Fig. 4: Steps in KMS of STaaS model formulation

Step 1: Perform by reviewing of the literature. This is involving the process of reviewing the CKM, STaaS process, and how the CKM as a tool that can be used to manage of STaaS knowledge in a CoP in order to achieve their mission statement.

Step 2: Conduct the preliminary survey. This is the process of conducting the preliminary survey for getting input for the model of ST as a service (STaaS) in CKMS environment. For this purposes, the survey has been done by using a questionnaire to those who are involved in the ST project such as software testers, developers, and users. So that, they can verify the proposed input such as ST content management, usability, maintainability, and security that supported from the literature as well as may have additional requirement of any missing variability or functions of CKM as a tool in providing the knowledge of ST process to the CoP.

Step 3: Formulate the model. This is the process involving the composition of the attributes and elements based on the previous steps into a specific format or manner. *Step 4:* Translate the form of model into system components. This is also involving the architectural design the STaaS as a model into its component-based system.

Step 5: Evaluation. This is the process of evaluation that involved another round of questionnaire called post-survey in order not only to verify and validate the model but also a part as well as in enhancing of a comprehensive system model specification.

Step 6: Conclusion. This is the process of summarizing the finding of preliminary survey in preparing the post survey that going to done on in producing the StaaS model for managing knowledge of STaaS using CKMS in a CC environment.

4 A Model of Software Testing as a Service in KMS environment

The overall model of CKMS in managing knowledge of STaaS knowledge a CoP in CC environment, it can be proposed as shown as in Fig. 5.

Besides that, the model KMS can be divided into three main components or layers. These are including the tester CoP layer, CKMS Functionality in Software Testing layer, and CKMS architecture layer. These layers will be interacting to each other in order to ensure it will perform based on the particular purpose of cloud testers in CoP.

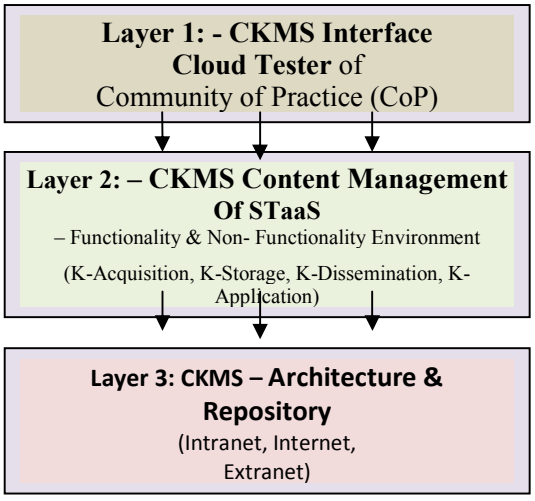

Fig. 5: A StaaS Model with CKMS in a CC Environment

ISBN: 978-1-61804-070-1

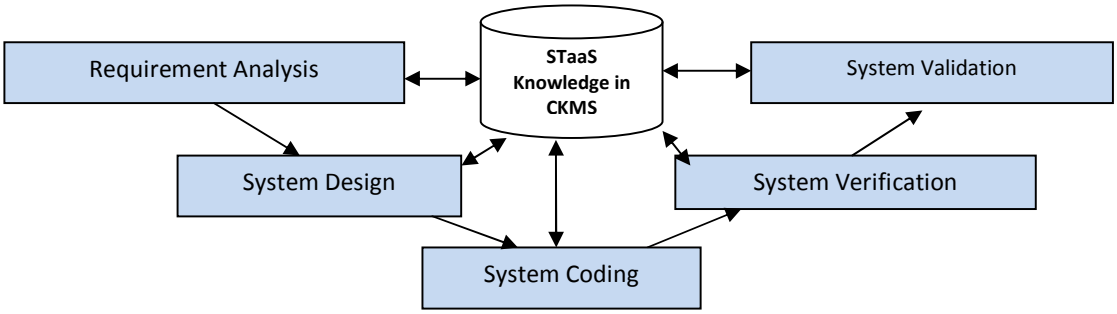

Fig. 6: Knowledge Structure of STaaS in CKMS Repository

Fig. 6 show also STaaS process in terms of knowledge structure in software development in a CC environment that is starting from the requirement analysis in producing system specification and followed by other system development activities, which are consists of system design and system coding and then up to system verification and validation of a product and delivered to the specified to the users.

5 Result And Discussion

The STaaS model of development in the context of CKMS has been gone through the steps as mentioned in the methodology section. Based on this, there is a significant result shown that the STaaS model should accommodated the following features or components of CKMS, in order to become more relevant in serving the CoP in a CC environment.

5.1 CKMS of Software Testing Capabilities in CC Environment

CKM system Capabilities of its Environment that can be implemented based on the following aspects such as Conceptual modeling, CKM system Functionality and Its Architecture, CKM system Operational that having the similarity agreement. Fig. 7 shows the level of agreement on particular knowledge of ST community about the knowledge as indicated in the previous section that need to be included in the CKMS for future purposes. While, Fig. 8 show the level of important of Knowledge Type that the explicit knowledge is more concern than tacit knowledge of STaaSa in CKMS of a CC Environment.

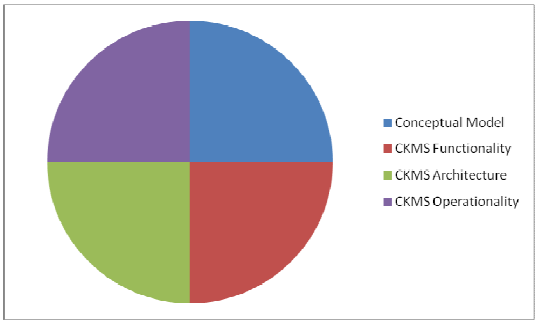

Fig. 7: CKMS Capabilities in serving CoP for STaaS in a CC Environment

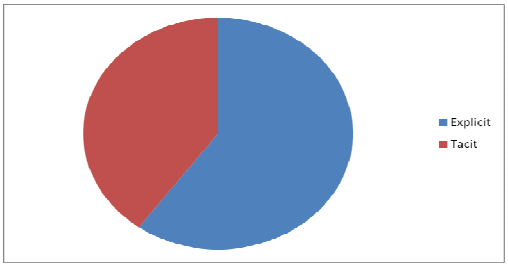

Fig. 8: The Important of Knowledge Type of STaaS in a CKMS Environment

5.2 Knowledge Structure of Software Testing

Based on the Knowledge Structure of STaaS in terms of importance of Reliability and Availability, most of respondents are agreed that the average of Knowledge Structure of StaaS in managing the knowledge, where reliability should be more concentration by the CoP that

ISBN: 978-1-61804-070-1

has agreed about the Reliability – 100%, and Availability – 80%. This is shown as Fig. 9 that reliability is more concern in the ST environment.

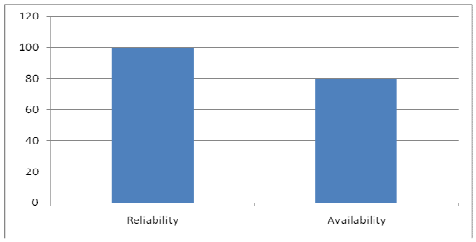

Fig. 9: The Aggreement of Important for STaaS Knowledge Structure of CKMS

6 Conclusion and Future Work

As a conclusion, the paper has shown that the knowledge of software testing as a service (STaaS) model is very important feature for the CKMS in order to provide the CoP in serving them in a CC environment. The CKMS can be implemented by using two components which are involved CKMS functionality and its related architecture through network computer capabilities weather it was connected directly or remotely. The finding of the research is also shown that the CoP can getting a collection of STaaS knowledge processes that has been contributed with a significant effected to them in acquiring, storing, disseminating and applying the knowledge of ST for the future purposes. Besides that, in order to ensure CKMS in ST that can be done smoothly, the CKMS administrator should be considered the most related issues like performance, learn ability, reliability, availability and security in a good manners so, that CoP can access and use of the particular knowledge at anywhere and at anytime.

For future work, it is good to be considered on how KMS can be accessed and used by CoP in STaaS together service level agreement (SLA) that may be using any devices especially through mobile computing since this project is only considered for accessing in a CKMS as common devices (client server based environment through desktop technology) only.

References:

[1] Y. L. Ji Wu, and X. L. Guochang Gu, Investigation of Knowledge Management Methods in Software Testing Process, *International Conference on Information Technology and Computer Science,* IEEE

[2] E. Awad, and H. Ghazari, *Knowledge Management*, Prentice Hall, Upper Saddle River, NJ

[3] A. Desai and S. Shah, Knowledge Management and Software Testing. *Proceedings of the International Conference and Workshop on Emerging Trends in Technology*, Mumbai, India.

[4] R. Abdullah, M. H. Selamat, S. Sahibudin, R. A. Alias, A Framework For Knowledge Management System Implementation In Collaborative Environment For Higher Learning Institution, www.tlainc.com/articl83.htm. Access date (4 November 2011)

[5] A. Aurum, M. Handzic, C. Wohlin, and R. Jeffery, Managing Software Engineering Knowledge: Springer, 2003.

[6] T. E. Lee, "Applying Knowledge Management Approach for Software Testing" *https://umdrive.memphis.edu/g-mis/www/-memphis/step/documents/papers/LeeT.step-07.pdf.* Access date (9 October 2011).

[7] A. M. Talib and R. Abdullah, "Utilizing Usability Model with Multi-agent Technology to Facilitate Knowledge Sharing of Software Maintenance Process Knowledge Environment," *Computer and Information Science*, vol. 3, p. P101

[8] A. M. Talib, R. Abdullah, R. Atan, and M. A. A. Murad, "MASK-SM: Multi-Agent System Based Knowledge Management System to Support Knowledge Sharing of Software Maintenance Knowledge Environment," *Computer and Information Science,* vol. 3, p. P52

[9] R. Abdullah, "Knowledge *Management System in a Collaborative Environment*". UPM Press, Malaysia.

[10] C. Kaner. "Exploratory Testing, Quality Assurance", *Institute Worldwide Annual Software Testing Conference*, Florida Institute of Technology, Orlando, USA.

[11] I. Nonaka, and H. Takeuchi, *The knowledge-Creating Company.* Oxford University Press, New York.

[12] G.J. Myers, and C. Sandler, *The Art of Software Testing.* John Wiley & Sons