

Survey: The Lack of Usability in Software Quality Assurance Activities

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Abstract

The Software Quality Assurance activities (SQA) are implemented in order to create software, which adheres to quality specifications and meets the functional and non-functional requirements of customers. This paper investigates the implementation of usability as one of the non-functional requirement in SQA on Agile software methodology in Web development as well as in web application. A survey was conducted on MySIKAP an online system of Malaysian Road Transport Department. It is a new system for accomplishing road transport related transaction via online. The survey conducted reveals that, there is need to improve interface of the MySIKAP Web site which is not usable to the end users thus there is need to improve in implementing the SQA activities during the development process. Even though the Navigation and links, effectiveness and efficiency are usable to the users which the level of usability is above the mid percentage but there is proper needs to implement the SQA activities fully so as to produce qualitative software product.

Keywords: Agile, Software Quality Assurance, MySIKAP, Usability, Web Development.

INTRODUCTION

Recently there was an issue related to software quality in the mainstream. Many, especially the software quality professionals would have heard about the United State government's healthcare site, (HealthCare.gov) where many have hashed about its project management failures and its overall quality. There might be many lessons that we can learn from these kinds of failures, but it is very costly to learn from such mistakes all the time. Nevertheless, the popularity of web-based application is well known that it becomes part of our daily life. Ranging from simple to sophisticated, they generate millions in revenue. It is a challenging task to develop; test and quality assure these applications (Abdesselam, 2002).

Web development usually adopts the standard software development methodologies. Developing a web application with waterfall model is very restrictive. Iterative nature of developing web application cannot be achieved with the waterfall model. Thus, the spiral approach is often regarded as the favorite practice (Andrew and Ray, 2002). However, it is often debated for its lack of exact steps of every phase and metrics. An agile approach that applies the

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concept of agile modeling, adopts standard software architecture and is heavily based on frameworks, speeding up system analysis, design and implementation for web application development have been proposed (Altarawneh and El-Shiekh, 2008).

Agile methodology is based on the principles of So-YoungKim and Ho-Jin (2012) which are essential when implemented in the software development. The Individual Communication, which allows to establish a good relationship between the stakeholders and development team for successful development of software product. Also the stakeholders are more concern to see a working software prototype rather than documented or textual deliverables. This can be achieved through prototype or throw-away development process. Satisfying customer's requirement is necessary, therefore; customers need to be involved from the head to the tail end of the development life cycle for better requirement gathering. One of the most important features of agile methodology is change of requirements which can be done at any stage of the development, thus it responds to changes at any stage.

With this liberty provision by the principles above, there is rising interest in agile methodologies as more and more organizations strive to improve quality and product delivery and to cater the ever changing requirements of the customers. It also provides solutions for rigid delivery date, low customer input and budget constrains (Tonelli, 2013).

BACKGROUND

This paper discusses the SQA activities in Web Development using Agile methodology. For that purpose, we have selected a government website that handles road transportation. MySIKAP is an online system by Malaysian Road Transport Department also known locally as Jabatan Pengangkutan Jalan (JPJ) Malaysia. MySIKAP is a new system for accomplishing almost all JPJ's transaction via online. The usual transactions are: driving license renewal, checking summons, road tax (LKM) renewal and so on.

Literature Review

According to Tonelli (2013), SQA is one of the most significant parts of a software development cycle. SQA is software development milestone achieved through compliance and adherence to defined processes, standards, and procedures; Apart from quality insurance, management is equally important. Software quality management aims at defining processes for achieving quality while SQA reviews and ensures that the processes and standards are duly followed (Tonelli, 2013).

As in any other development methodologies, the Agile Software development needs continuous SQA implementation. In this paper, we have detailed out some of the quality activities done in order to achieve a high-quality product. In the scrum practice, which is one of the agile methodologies, scrum of scrum mechanism is proposed (Mundra, 2013), this eventually distributes a larger project into a few teams where quality and speed of each team can be monitored. In addition Agarwal (2014) pointed out that development phase and testing phase should be done in parallel to maintain a higher level of quality, such that when agile method goes through sprints and problem is discovered as bugs or errors, it is rectified as soon as they are discovered. Many researchers, including (Jiangping, et al., 2011) present a number of strategies that had been proposed to improve quality of agile software development derived from some case studies. One of it is to make the software quality activities a continuous process throughout every phase of the software development cycle and the team members should be able to perform

multiple roles and their competency should be improved continuously in the domain of technology as well as the processes. It is also suggested that process should be automated as much as possible and overly ambitious targets should be avoided.

As in measuring the quality activities to be able to make informed decisions, this paper is suggesting some metrics as well. These metrics such as the sprint wise open issues, escapes per sprint and impediment count per sprint can be tracked and measured in agile. Agile methodology helps to have a flexible change process in the software development. Agile methodology helps to build software in an incremental manner. Each iteration of incremental process is called a sprint. In 2001, some software developers created an agile manifesto, which provides twelve principles that governs the agile methodology. (Kumar and Bhatia, 2013).

Comparison between Agile and Traditional

The agile approach is said to be more people oriented and has lesser documentation and more code oriented. Their difference is tabulated as follows.

Table 1: Difference between Agile and Traditional methodologies.

Agile Methodology	Traditional methodology
Code-oriented	Document-centric
Adaptive to changes	Predictive in nature
People Oriented	Process Oriented
Reduced risk	Increased risk
Small scale projects	Large scale projects
Component Based Agile	Waterfall SpiralRational Unified Process

Agile Sprints In General

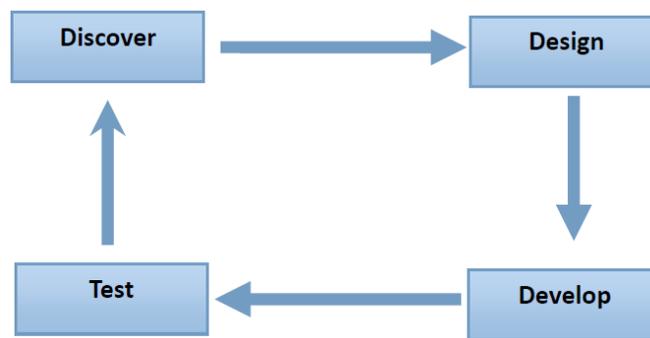


Figure 1: The agile sprint processes.

Figure 1 shows that the typical activities involved in each sprint. The process starts with a design and a workable solution is developed and then tested usually with the customers input, flaws and other enhancements pending are also realized. This in turn will go into another phase of design, develop test and discover cycle called the sprint (Kumar and Bhatia, 2013).

Benefits of Software Quality Assurance activities in web application development

Software development involves high financial cost due to resources and tools requirements in the development. The software companies often spend excessive budget to developed high quality software, hence, it is important to balance quality and costs involve in quality assurance (<http://istqbexamcertification.com> 2012).In quality concepts, the developers are concerned with

controlling the variation in the process, resources, budgetary and quality attributes of the developed software. Software Quality Assurance benefits clients through:

Customer Satisfaction

Software development is business transaction between client and Software Company. The client requires the service from the developer to develop the product. The customer satisfaction is achieved based on quality of design and quality of conformance. The high reliability product results greater client satisfaction. These also build trust and respect between them.

Reduce Time

Software Quality Assurance decreases the time spent working on making every part of the project from development to deployment. Reviewing these quality standards in the software development help identified bugs before they become very costly to fix. These quality standards can be reused in various projects, which improves the development time and lower costs of each project involved (Mohammed, 2013).

Reduce Cost

Implementations of Software Quality Assurance in the conformance of quality product gradually reduce the cost because software requires less modification. The defect detection and correction at an earlier stage of development result in the overall reduction of life cycle cost.

Lack of Software Quality Assurance activities in Web Application Development

Software Quality Assurance (SQA) is an activity that monitors the software engineering process to ensure quality software is met and complies with defined standard. SQA is process within software development life cycle (SDLC) such as design, coding, configuration, testing and deployment (Petersen and Claes, 2009).

Nowadays, many software projects are not without some problems in the process of development due to lack of quality. Not imply any quality assurance in software development, the project will not be without bizarre outlook, difficulties in the deployment and could lead to possible software failure. In quality standard, there is benchmark as a reference for maintaining and ensuring the quality of the project. It also helps developer understand and provide the guidelines in terms of quality. Absence or inadequate quality bench-marking hinders the right cross checking between quality standard and quality that has been implied. These inadequacies are consequence upon the followings:

Inability to determine termination of failure project

In any software development, it is the responsibility of project manager to monitor the progress and completion of a project. The project manager has capabilities to terminate project facing difficulties such as financial loss or other challenges that requires termination of project such as project delay and financial loss. Investing more resources and money to make project success rather than terminate the project result in creating product with less or lack of quality. This action is influenced by the factors such as insecurity in job position.

Lack in Vision

Within the time frame of the software development, the project vision sometimes changes when the decisions made to meet the requirement changes. The changes in the project vision should be notified within team members to increase and improve quality standard in developed software.

A lot of, software companies carried out with a minimum effort to implement the right quality standard in their development process to improve quality of the software. Team within project members to achieve quality in the developed software should monitor the software quality assurance activities and methodologies implementation closely.

RESEARCH METHODOLOGY

The main purpose of this segment is to measure the usability of MySIKAP Websites from users and developers' perspective on the application. International Standard Organization (ISO, 1998), ISO 9241-part 11 defines usability as the degree to which a product can be used by certain customers in given context in order to achieve their objectives in an efficient and satisfactory way. Questionnaire, Research model, are discussed as follows

Questionnaire

There are various questionnaires used to evaluate websites usability, among such include SUMI (Software Usability Measurement Inventory), QUIS (Questionnaire for User Interface Satisfaction), NIST Web Metrics (The National Institute of Standard and Technology Web Metrics), MUMMS (Measuring the Usability of Multi-Media) to access multi-media websites and WAMMI (Website Analysis and Measurement Inventory) to access website.(Marzanah et al., 2013)

This study adopted the questionnaire of (Thiam and Siti, 2003) as evaluation method. The questionnaire was divided into two parts, the first part focused on the user information such as name, gender, category, internet experience and most use browser. The second part includes the twenty-four questions that were used to evaluate the usability of the websites. The questions are divided into four, each consists of six questions:

- Content, organization and readability
- Navigation and links
- User interface design
- Performance and effectiveness

The questionnaire also addresses two open-ended questionnaires about the like and dislike features of the websites. This method was chosen because research studies have found that questionnaire data can be both reliable and valid for assessment of user satisfaction with websites or computer based application. The questionnaire was distributed to five hundred (500) users of MySIKAP to measure the usability of the web portal. The 500 users were randomly selected from those who volunteer to participate in the survey.

Questionnaires Distribution

Questionnaires were distributed to 500 users from different places of the country to evaluate the usability of MySIKAP regarding implementation of SQA activities during the development process hence; the effectiveness of the SQA based on the usability of the website was measured.

Reliability and Validity

Reliability and validity are two elements use in the instrumental measurements evaluation such as questionnaire. The value of alpha measure the internal consistency of a test and it is defined as number ranging from 0-9 (Cronbach, 1951). George and Mallery (2003) provide the following

rules of thumb: “> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor and < .5 – Unacceptable”. (George and Mallery, 2003)

Cronbach’s alpha, is the most widely used objective measure of reliability and it is used to measure the reliability of the questionnaire adopted for this study. The closer Cronbach’s alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. Reliability test was conducted on the data that was obtained from the pilot study.

Reliability Test of Pilot Study

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of items
0.798	0.798	24

Reliability Test of Final Study

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of items
0.823	0.823	24

The above two tables shows the Cronbach’s Alpha result of both pilot and actual study to be 0.789 and 0.823 respectively. This reveals that the instruments (questionnaire) used in this study has good reliability and appropriate for the study.

Research Model

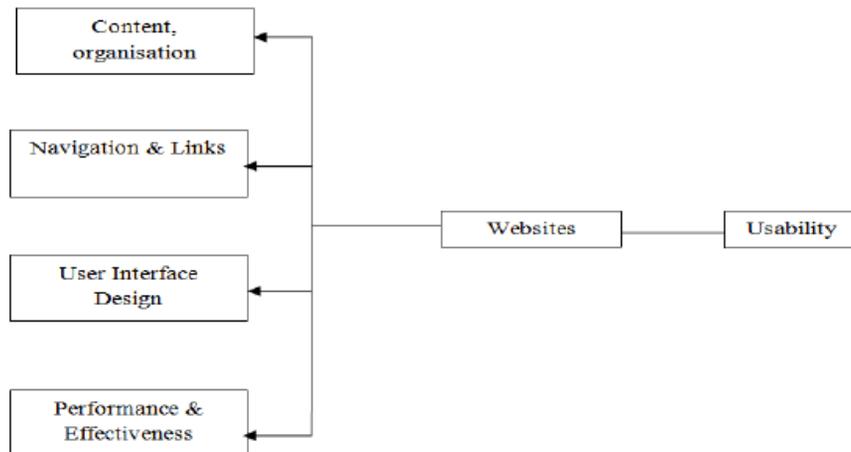


Figure 2: Research Model

The above figure shows the research model consisting of dependent variable (Usability) and independent variable (Websites). Content Organization and reliability, Navigation and Link, User Interface and Design, performance and Effectiveness are sub characteristic of usability.

Interviews

Data were collected from the Software development team members of the MySIKAP workers by interviewing them weather they applied the SQA activities during their software development life cycle. The team members are Data Migration specialist, System Analyst, Business Analyst, Software Developer, Software tester and Software Developer Manager.

RESULTS AND DISCUSSION

Our survey consists of two parts; an interview and a set of questionnaires survey given to the users. Based on the interview conducted we have observed that each role from the development team has specific function complementing the SQA activities during every stage in the project. Some respondents believed that, they do implement Quality methods in their routine activities even though some do not. Others are not even sure whether they do apply SQA activities or not. Most respondents understand the needs of SQA activities implementation towards producing a better and quality product. Nevertheless, our findings revealed that there are many challenges in implementing these SQA activities, one of such is lack of proper documentation from previous developers. Once a developer quits or move to another company, the knowledge has gone too. The Agile methodology requires a rapid back and forth development activities in its processes, hence, the need to have a proper guideline to ensure the quality measures are not neglected is evident. While maintaining the abrupt changes in Agile, the team members have to be equipped with knowledge of the SQA activities to make the development output a better and quality product.

Content, Organization and Readability

The first part of the questionnaire requires the users to evaluate the overall website content and readability. From Figure 4 below, it shows that more than half of the users were satisfied with the contents of MySIKAP Website thus the contents are organized and well arrange and can be read without any difficulties. Only 28 percent were not satisfied with the contents and readability of the website, thus the overall contents of MySIKAP is usable hence it was testimony that, SQA activities has been implemented in the development process.

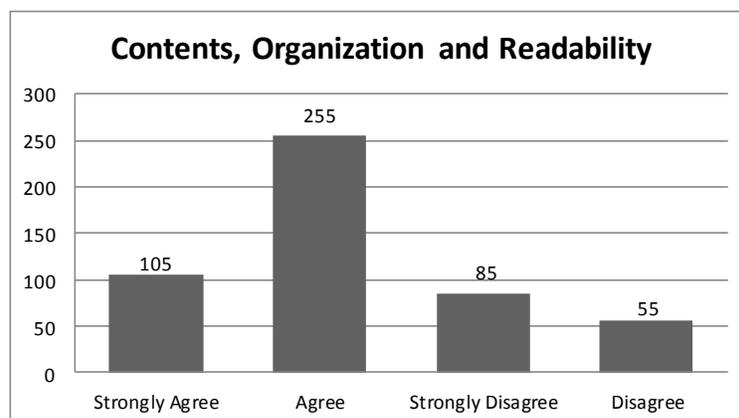


Figure 4: Percentage of Content, Organization and Readability

Navigation and Links

Figure 5 below shows that more than 50 percent of MySIKAP website users find the Navigation and Links of the sites to be usable to them even though the level of usability is within mid-level percentage as 44% of the response are not comfortable with the navigation and links occasioned by none functioning of some links; therefore there is need for enhancement of the navigation links to be more users friendly. To achieve that, the team members need to practice and implement SQA activities in all processes.

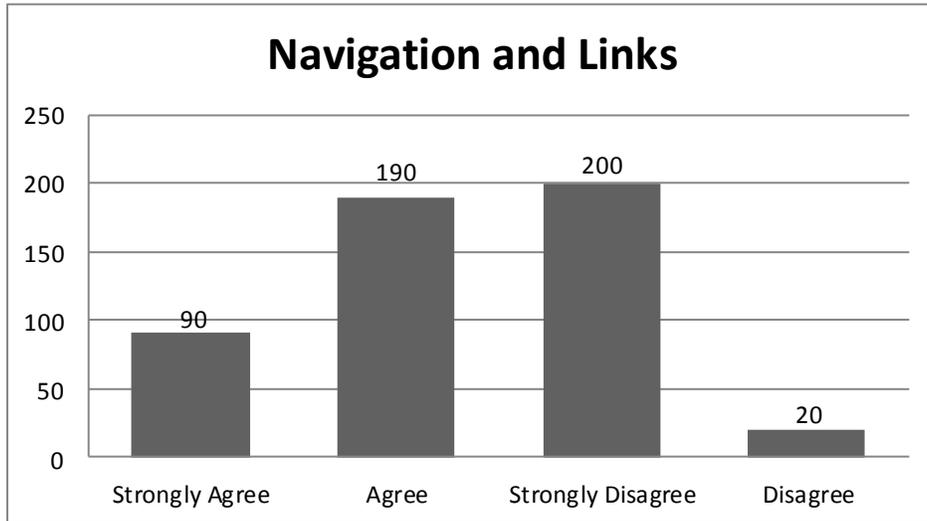


Figure 5: Percentage of Navigation and Links

User Interface Design

User interface is one of the most essential for satisfying the needs of the customers. From figure 6 below majority of the users are not satisfied with the MySIKAP interface as such the interface is not pleasant to them and the design is obsolete compared with the other websites design. The results shows that there is needs for the team to improve in the usability part of the design interface of the website and put in place all the necessary SQA activities for good and qualitative software product. 56% of the response indicated a poor design on the interface hence the usability of the website is diminished.

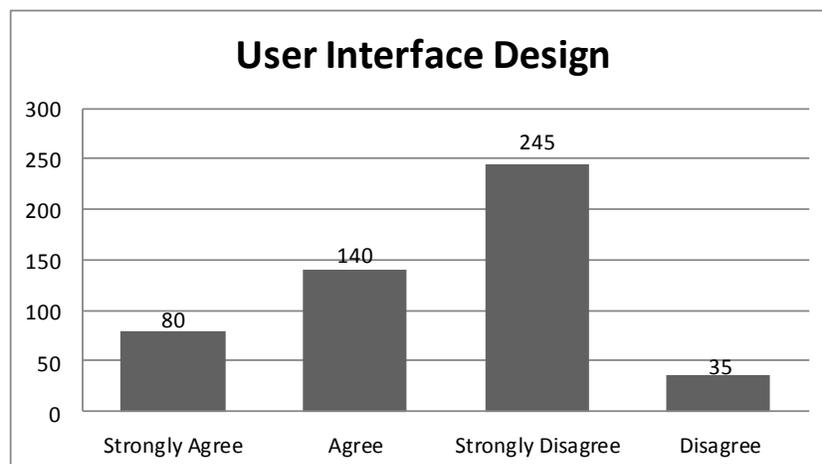


Figure 6: Percentage of User Interface and Design

Performance and Effectiveness

Website performance is of paramount importance to the users especially when the users request a service from or make payment to the websites. Too much time for the website to respond to users request is a major problem that affects performance and effectiveness of the entire website. Although 54% of users are comfortable with the performance, the result in figure 7 below shows that a little close to half of the users of MySIKAP suffered response time delay, which takes long time than expected to meet the needs of the users. Therefore the need to improve MySIKAP to make it more effective for the overall satisfaction of users is inevitable.

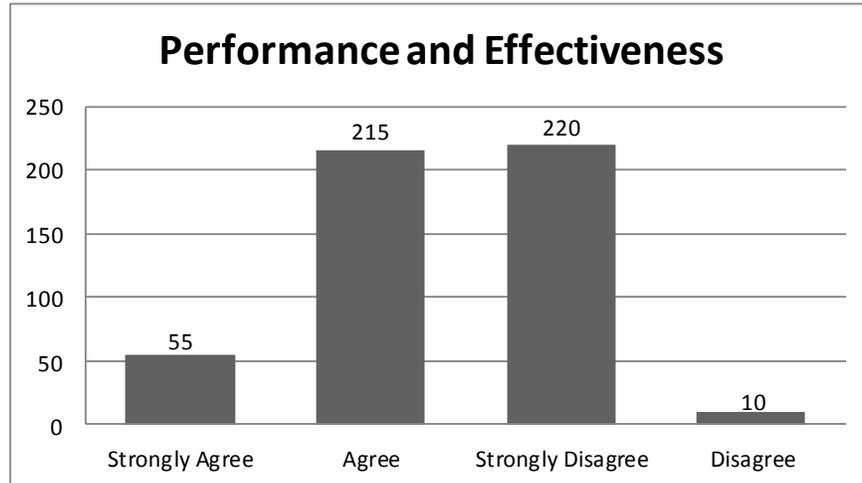


Figure 7: Percentage of Performance and Effectiveness

CONCLUSION

From the usability analysis, there were some indicators of usability issues observed, it could be seen that the MySIKAP web-based portal, is relatively usable. In terms of contents, organization and readability, a considerable number of users found the contents readable, useful and relevant to their needs, in addition, the structure is well organized to their liking. With regard to navigation and links, usability was relatively achieved with minimal percentage as users were roughly divided on the ease of use of navigations and link which again prompt more concerted effort for improvement. However, the user interface design of the portal is not usable to the end users as demonstrated in the result, therefore, there is need to improve the interface to make it more attractive and acceptable. In terms of performance and effectiveness, a considerable number of users were successful in accomplishing their goals with the webpage, however, there were varying level of disagreement from almost half of the users. But since the perceived satisfaction score for the portal was relatively higher, it implies that users were satisfied with the usability of MySIKAP.

In conclusion, the result shows that, contents, organization and readability contribute more to the usability of MySIKAP; however, the user design interface of the portal is not. Although the navigation and links; effectiveness and efficiency are usable to the users, but with the level of usability they are at mid percentage thus prompting more improvement. This demonstrates that by implementing the quality assurance activities in the software development could help build a quality and usability web application.

FUTURE WORK

Future works will examine the usability and the lack of SQA of MySIKAP portal on mobile devices and compare it with results obtained from web-based computer system context of use

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