The Agile Quality Culture
A survey on agile culture and software quality

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Abstract

Despite the importance of the agile methods and the acknowledgement that they do contribute to the software quality and client satisfaction, little is known about what factors, habits or tools usage have high impact on the product quality. It has been observed that agile practitioners have a different posture towards the development process they use. This paper goal is to report an analysis of agile practitioner’s opinion and behavior on agile development methods and what’s the impact of those issues on the product quality. To construct the analysis an online survey was planned and executed with agile methods practitioners. The results shows that agile practitioners have a very good knowledge of the method they use, they know the benefits, and pledge to be committed to the development process. The subjects showed a great interest in test activities and quality assurance activities. It’s possible to grasp an insight on the commitment of agile practitioners with their development method. The relation between agile practice and software quality may lie on the agile culture. The agile methods make their participants more engaged to the development process.

Keywords: Agile Quality, Agile Culture, Quality Assurance, Agile Survey

I. INTRODUCTION

Agile methods are arousing interest both in academy and industry [1]. They have gained acceptance in the commercial area because they embrace non-stable requirements, focusing on collaboration between developers and customers [2]. The great variety of tools and methods, and its capability to adapt, change and meet the customer need doesn’t comply with the existing quality models. The agility imposed by the very same methods is a barrier between agile and enshrined quality models.

Agile practitioners have been claiming since the agile methods appearance that the use of its techniques greatly improves the quality of software products. However, a closer look into such claims reveals that there is a lack of a comprehensive technique to evaluate how agile processes meet software quality requirements [3].

This survey is part of a wider research about agile methods and software quality.

After planning and executing a case study to determine which activities agile teams run to do software quality assurance, the authors perceived a different posture from the developers towards quality assurance and control when compared with more developers who work with non-agile software development.

This factor motivated two new studies. The first one is a case study to compare how the developers on non-agile software companies and agile based software companies perceive quality. The second study is a survey where we try to identify why agile practitioners have the feeling of higher product quality as result of their work.

In this paper we report the results a survey on agile practices focused on quality assurance and test activities. We identify most often used practices and the perception of teams about product quality and customer relationship.

The body of this paper is organized into five sections. The second section describes the research method applied on the research, along with the questions used on the survey. Section 3 presents the related work. Section 4 presents the results of the survey itself and last section makes conclusion on the results and addresses suggestions for future work.

II. RELATED WORK

Reference [3] brought an innovative technique for evaluating agile methodologies in order to determine which factors of software quality they improve. The technique used a set of adapted software quality factors as defined by [4, 5]. The authors broke down two agile methods, XP and Lean
Development, into process activities. Then for each process activity of the agile method, an evaluation of what software quality factors are met was done [3].

They concluded that agility introduces a paradigm shift in project management in the sense that every part of the software development process is reviewed with the aim of reducing the activities and number of deliverables to the minimum needed in any given situation. The move is in fact from a command oriented management structure to a facilitator oriented management system. As seen from the way software quality factors are defined in agile processes, the central players in the development process are the customer and developer and not the manager [3].

Reference [6] presented a new Agile Quality Assurance Model (AQAM), with the purpose of being a flexible method to incorporate new changes in the software industry and provides detailed guidelines and templates for real world implementation and customization focused on medium and small companies. The researchers concludes that customizability and evolution of software processes and their models are acquiring a growing importance in the software process community [6].

Considering that traditional quality assurance techniques are reporting based and rely on heavy weight inspection methods whereas Agile Quality Assurance techniques are built-in daily activities by teams, on the paper [7] the author aims to study various challenges faced in terms of assuring quality in Agile, what are the key drivers or indicators of Quality in agile and proposing the framework to evaluate what aspects of Agile improve the quality of the product in terms of bug rates, development time and costs. The obtained conclusions are that agile methods require changes in way we do quality assurance. In waterfall development process, quality and stability are usually addressed in the later phases of the release, when changes are more costly to fix. However, in agile development, smaller builds that provide incremental functionality are presented to customers early and often in a fast-paced, iterative process. Therefore, quality assurance has to bring quality and stability to each of these iterations to be effective [7]. It is belief that the research will help in empirically proving that agile methods have build in quality management system and aims to provide software organizations deeper understanding about what factors are important to ensure quality in agile. When agile methods have good impact on quality they also has good impact on productivity and cost that in turn results in increased business value, could be a potential research finding.

Continuous integration is an agile practice for the continuous integration of new Source Code into the code base including the automated compile, build and running of tests. From traditional quality assurance we know software metrics as a very good approach to measure software quality.

Combining both there is a promising approach to control and ensure the internal software quality. The proposed approach adds continuous measurement and continuous improvement as subsequent activities to continuous integration and establishes metric-based quality-gates for an agile quality assurance [8]. The authors concluded that agile practices for continuous integration offer new opportunities for traditional software measurement. It provides a measurement infrastructure for the continuous measurement, which measures both traditional and agile metrics. It also shows the shift of metrics and quality attributes over time and leads to proper and also continuous improvement activities selected via the GQM-Approach. The improvement process does not only lead to selective improvements but to automated quality gates to preserve the improvements enduringly [8].

III. RESEARCH METHOD

A survey is a strategy or design for an empirical study to provide a quantitative or numeric description of some fraction of a population through the data collection process of asking questions of people [9, 10].

The strategy for this survey was the one described at [11]. It is an instantiation of a general process for conducting empirical studies in software engineering.

The survey was conducted according to the following steps:
1. Study Definition - Determine the goal of the study.
2. Study Design - Operationalize the study goals into a set of questions and select the subjects.
3. Implementation - Operationalize the design.
4. Execution - Collect and process data obtained from answered questionnaires.
5. Analysis - Interpret the data.
6. Packaging - Create and publish a report about the survey results.

In this section, we describe the questions used in our survey and the steps conducted in our research. They are presented in Sections A, B and C. The Analysis is presented in Section IV.

A. Definition

We have found several surveys that mentioned the importance of people commitment in agile methods, but most research had no background to confirm this statement. Four articles were found that do not address people behavior as it main objective, but consider it as an important factor to the success of agile methods utilization [1, 12, 13, 14].

This survey tries to identify why agile practitioners have a different posture towards software development process
and what’s the impact of this behavior on the product quality.

B. Design

The time of performance of the survey was set to one month by convenience. The questionnaire was sent to four previous known companies that work with agile development. Also the survey was published on agile communities in the social network LinkedIn\(^1\).

The questions for the survey were elaborated based on the objectives of the study. In order to adjust and improve the questionnaire, the survey was applied on two selected individuals. As result some survey questions had to be transformed into essay questions. The complexity of some topics cannot be assessed in multiple-choice questions.

The questionnaire was formulated in five parts. The first part is related to basic information and it’s only used for basic classification of the subjects. The second part is about the development process and tries to identify adaptations and how the person interacts with the process and people on agile development. The third and fourth part assesses quality assurance activities and tests respectively. The last part assess about agile methods and the perception of quality of the agile developer.

The questions created for the survey were, in it’s major-ity opened with an exploratory character with some partially structured items as described in [15, 11].

To represent a possible set of statements as a product of this work with quality and credibility, the possible threats to its validity are listed in this subsection as are the possible workarounds or mitigation actions to reduce the risk of each threat to occur.

- High levels of dropouts - To avoid incomplete fill of the questions on the questionnaire, the first questions assessed basic information on quality and tests, to make the subject more comfortable, giving him the context of what’s was next.
- Assure that subjects have skills agile methods - To assure that a significant part of the subjects have knowledge on the matter, we invited companies that are known to use agile practices, so answers would be significantly more trustable.
- Answers are shallow - To mitigate the risk of having shallow answers, the opened questions were arranged in some classifications and hints about the questions theme were given. When the answer was not clear, on not possible to arrange into the classification, it was not considered.
- The information sample given on a questionnaire is not trustworthy - If the information gathered does not represent an agile practice or, did not corresponded to what was asked, the answered questionnaire was not included.
- Survey procedures or questions are not clear - A pilot with two subjects was run to identify possible misunderstandings or misinterpretation of the questions.

C. Implementation and execution

The survey was taken online, in order to facilitate the process of gathering information, allowing that the subjects to answer the survey in their own time [11]. Based on the questions the environment for the web survey was created using the Google Forms \(^2\) and sent to the subjects.

Teams of four companies were invited to fill the questionnaire in. Also it was released on social networks focused on agile practices. Within a month the survey was closed, and the data exported to a spreadsheet file for processing the data.

Twenty-five people answered the questionnaire. The result of the data analysis is described on Section IV.

D. Packing

The survey report containing the questionnaire, spreadsheets and survey plan used to create and analyze the data on this survey is available at http://brunohen.com/agile_survey.

IV. RESULTS

Figure 1 shows that the most used agile method among the survey subjects was Scrum, followed by Extreme Programming and Lean Software Development. The Scrum approach focuses on the management of development process and therefore it’s one of the more flexible methods. Considering the process descriptions given on the questionnaires, the answers shows that most of the subjects knows the method they are using. More than 90% of the process descriptions had a high compliance to the agile methods descriptions on the literature.

Figure 1 also shows that most of the subjects do not work with a dedicated team for tests or quality assurance. Fourteen subjects stated that the quality of the final product is everyone’s responsibility and activities such as code review and testing, should be done by the whole team, with few exceptions. Five of the subjects also believe that testers are better developers, despite the confirmation bias that can be brought by this scenario. Confirmation bias is defined as the tendency of people to verify their hypotheses rather than refuting them and thus it has an effect on all software testing.

\(^1\)http://www.linkedin.com/

\(^2\)https://docs.google.com/templates?type=forms
It has been empirically proven that people have more tendencies to make positive tests rather than negative tests due to confirmation bias. However, it is highly probable that confirmation bias can be circumvented by factors like company culture [16].

An interesting information on this evaluation is regarding quality assurance activities, as show on Figure 2. More than 90% of the subjects claim that they do Code Review frequently, 64% claim that they do test activities and more than 50% participate on planning review. Further investigation is necessary to make any assumption, but this index seems elevated. Also some subjects claimed that they run these activities with an elevated frequency, this might be another issue to investigate.

Also for testing, subjects show a high level of usage on Unit Tools (such as phpUnit and JUnit). Most of the subjects use proprietary solutions or Selenium \(^3\) to execute front-end validation. To create the tests most subjects rely on the user history, which we can classify as functional.

\(^3\)http://docs.seleniumhq.org/

More than 20% of the subjects use Emma \(^4\) for assess the code coverage. Emma can show coverage for stronger test criteria than Unit tools can provide.

\(^4\)http://emma.sourceforge.net/
Analyzing the essay questions we could identify some convergence of opinions around the usage of agile methods.

About client satisfaction, the answers were divided into few or none contact with the client and excellent communication with the client. The low or none contact with the client came from agile projects that built SaaS, or shelf products. Instead of a client, they had a business analyst on the team. The analyst knows the business rules of the project, but he also knows technology and programming, which was pointed out as the main factor of success.

In the other hand, teams that had contact with the client have reported a good experience. In some cases the client was trained on agile methods in order to participate as much as possible on the project execution. Subjects also reported that once the client understood the agile method dynamic, they got more involved and participative, being this one of the most important keys to the project success. About 50% of the subjects that had contact with the client reported a communication improve or a desire to improve their communication with the client.

Few subjects had experience developing software with non-agile approaches. We asked about differences on non-agile and agile methods. The answers pointed out by those subjects addressed:

- Using agile methods makes easier to keep track of the project. They also reported they feel better knowing where the project is going and what are their part on it.
- Easier communication with client, being the fast feedback one of the most important contribution to the project.
- Focus on small features made the development process easier, helping to fix software bugs whenever they appeared.
- Client involvement helps to make the final scope closer to the one that was expected. Also, in the subject’s perception, the client understood the importance of some definitions better, and by the end of the project, they were more worried about defining rules earlier to facilitate the developer’s work.

Nine of the subjects reported that they do not imagine themselves in the future working with a development approach other than agile methods (even tough this was not a question of the survey).

On the project challenges, subjects reported that the agile method have a great impact on their posture towards the projects. More than 50% stated that they feel thrilled when facing project complications. The most pointed out reasons were:

- Perspective of the whole project make it more exciting and challenging.
- Dynamic work make developers more motivated.
- It facilitates the team work in a lot of aspects such as communication, performance and quality assurance.
- Motivates better communication.

V. CONCLUSIONS AND FUTURE RESEARCH

There’s a need on software development for developers to know more about quality and to be engaged on making better software. It’s important that development teams know how to assess the quality of a software product. From the results of the survey we can conclude that agile teams do have quality assurance activities. The frequency of these activities is high, considering that they occur during the short iterations.

Considering qualitative and quantitative data is possible to identify that agile developers knows the importance of quality assurance activities and testing. Despite the low usage of documentation, teams have structured a process for testing, evaluation, user test acceptance, and communication tools for propagating the project scope and it’s evolution.

What can be extracted from the essay questions is that agile practitioners are always trying to show the results of agile methods. They know the process and they believe it’s the best way to develop software. Results pointed on Section IV lead us to believe that the agile practices is a culture among the agile practitioners and this might be one of the most important reasons agile development shows good quality results, as already mentioned in the literature in [12,17,2].

This survey was used as part of an action research, as it’s limited by its sample size and distribution. The sample may not be significant for conclusion about the agile developers community, but it indicates that there is more to investigate on this matter. Some of the subjects worked on same company, affecting the results according to a company agile culture and method.

As future work we intend to re-run this survey to increase the number of subjects and separating questions by agile method so it’s possible to make a deeper analysis on the relation between development process and software quality. Some developers reported that the participation of the client a crucial factor for project’s success. We also intend to deepen the study on software team engagement and how can developers engage customers to the agile culture.

ACKNOWLEDGMENT

We thank all the participants who voluntarily performed the experiments, ICMC-USP for providing the infrastructure that allowed this project to be developed and CNPq for the financial support.
References


