# Quality Assurance in Agile –A study towards achieving excellence

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*Abstract*— **Agile Methods are known to have built-in quality management system, however there are still challenges seen in the real life scenarios within the software organizations that are transitioning from traditional method to Agile development methods. 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. Research proposal here 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. Through this study we aim to provide some suggestions to help organizations overcome obstacles expected in adopting the agile method as software development tool and ensuring quality.**

*Keywords-agile software development; scrum; quality assurance (QA)*

## I.    INTRODUCTION

Agility has now become important with growing dynamics in business everywhere in order to respond rapidly to the changing needs of their customers while producing good quality software at a faster rate. Agile software development represents a major transition from traditional, plan-based approaches of software engineering to more value and customer driven approaches. There has been lot published on adoption of agile [1] and perceived impact of agile on overall success of the project [2, 3, 4]. However, not much research has been done on agile software quality assurance area. Some survey results that are available [2,3] though, indicates that there has been positive impact perceived on quality by the agile development, but at the same time organizations have still not been able to derive the quantifiable benefit to prove it by large.

Many organizations today are facing the challenges that how do we ensure quality in Agile in the facets that most of the heavy traditional Quality Assurance practices [5] that have,  in past proven to be efficient are no longer fitting completely within Agile environment. For instance, traditional quality assurance placed emphasis on review of deliverables at each phase of SDLC including more formal and detailed technical reviews such as Design review, Code reviews etc that ensured that bugs/problems get caught at early phases and improves the product quality. But, this formal review process has been now replaced with informal

peer reviews as team members are co-located and are more effective with face-to-face communication then documented procedures etc. It is therefore, up to the teams to decide and own the quality of each deliverable. In agile environment Quality Assurance activities have to be therefore integrated within the team daily activities so that it will flow seamlessly and brings needed benefits in improving product quality. The challenge for a large enterprise often becomes balancing the flexibility, transparency and collaboration needed for Agile while ensuring quality of product and not compromising on needed QA practices. With these evolving challenges in this area, organizations are struggling to find the answers about the acceptability and maturity of agile quality assurance [6, 7].Through, our research we therefore aim to focus our study to address the following questions:

- How we can manage the quality of software in Agile?
- Which practices of Agile will ensure the software quality?
- What are the key drivers of quality in Agile?

## II.    BACKGROUND AND RELATED WORK

The focus of literature and debates of agile methodologies has been on the development activities while quality assurance practices have received less attention and an overall picture is somehow missing. Few authors [11,7] have studied the quality assurance practices of different agile methodologies and  reported that Quality Assurance practices are built into an XP process like they are addressed by a Spiral model [12, 13]. Study by Noura, et al [9] supports that quality in agile projects is key contributor to project success. Results suggests that project success improves as quality, frequency of measuring customer satisfaction, organization experience in agile development, retrospective impact, the team participation in retrospective and the team contribution to retrospective, increases. Another study by Ahmed et al [10] also reports various key attributes such as active stakeholder participation, self organizing teams, team size etc. have impact both on productivity and quality of the finished product.

It is usually perceived that agile methodology is mainly applicable to development teams, however in reality it actually requires the entire organization to adjust. And similar holds good for also Quality Assurance (QA) organizations where they need to go beyond their traditional techniques and tailor their processes in order to adapt to the

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requirements of an agile methodology. Early involvement and the flexibility to adjust to frequent changes are the keys to successful quality assurance (QA) in an agile development environment [8]. Therefore, quality assurance is important to the quality of the software product regardless of the development process we choose. Organizations are still looking to find a convincing answer to the question " Do agile methods have enough rigor like traditional methods to ensure and manage quality of software produced and how do we achieve improved quality in Agile environment ?"

## III. RESEARCH OBJECTIVE

Thus, the need to expand the current quantitative scientifically valid research regarding various aspects of agile methods and their impact on quality is evident. The following are objectives of this research: a) To identify key drivers of quality in Agile and how we can manage the quality of Agile software b) Study how product quality impacts further cost reduction and business value in agile environment c) Propose Agile quality framework that can guide organization to establish effective quality assurance practices using Agile development methodologies.

## IV. RESEARCH METHODOLOGY

The proposed research methodology is questionnaire based survey [17, 18] to collect the primary data. Interpretive structural modeling (ISM) methodology [21] will be further explored to develop contextual relationship among the control variables identified to influence quality. An Analytical Hierarchy Process (AHP) [20] can then be used to quantify relationships and weigh the significance of different factors identified to impact quality. Data will be put to statistical analysis using Structural equation modeling (SEM) which is a statistical technique for testing and estimating causal relationship among variables using a combination of tools. Based on literature review and from practitioners experience using open ended interview questions and face to face discussions, we thus derive the framework or model to evaluate the evolution of quality during the agile development and factors to be considered to ensure quality in agile and achieve overall business value. (Fig. 1). We also referred extreme programming evaluation framework (XP-EF) [19] that is composed of three parts: context factors, adherence metrics and outcome measures.

Agile influence on quality will be studied measuring the following impacted parameters i.e. Defect Reduction, Early defects Detection, Cycle Time Improvement, Code Quality. In addition we have also identified here the control variables that are believed to also impact the quality and would have potential benefits in improving the quality of product. For e.g. effectiveness and level of scrum practices like daily scrum, retrospection meetings etc would influence the outcome and software quality. Hence, it is essential to study relationship between these control variables and derive the analysis to identify the key agile success factors impacting quality.
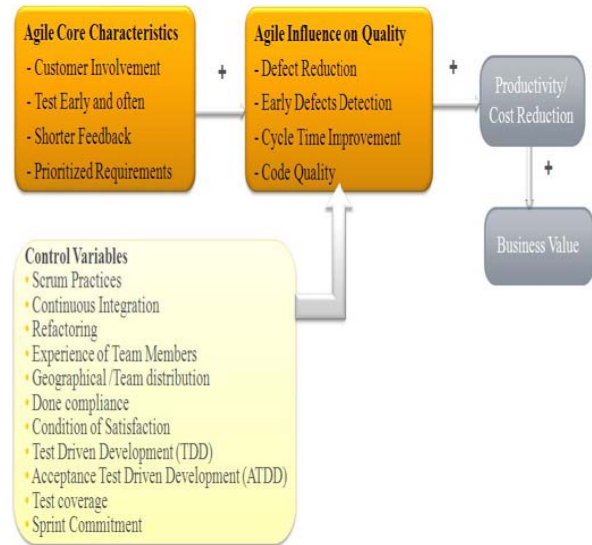


Fig 1: Research Framework

### A. Research Hypothesis

The following hypotheses are derived based on the literature review [2, 6, 10, 12,16 ] and experience from agile projects within organization and will be validated with the data collected on various Quality Drivers identified. (Fig 2)

- HO1: Agile supported by good engineering practices improves the Code Quality
- HO2: Agile facilitates reduction of Technical Debt (through Basic Engineering Practices like Code Refactoring)
- HO3: Agile produces high quality code and faults captured at early stage that results in reduction of open defect level (controls building quality debt)
- HO4: Agile supports Continuous Integration that enables stable build quality
- HO5: Agile facilitates the possibility to deliver Features at a faster rate to the Customer
- HO6: Agile improves defect containment effectiveness so fewer customers reported issues.
- HO7: Agile reduces outages/failures at customer (Iterative development/early Customer involvement)
- HO8: Agile induces positive customer satisfaction index due to shorter feedback & increased involvement.

Data collection is currently in progress and will be gathered using the sample sets of survey questionnaire (web based) to obtain the feedback on the perceived impact of identified control variables on quality. Based on the survey results the detailed statistical analysis including the hypothesis testing will be used. This involves the relationship study among the various control variables chosen and their influence on the quality of product.
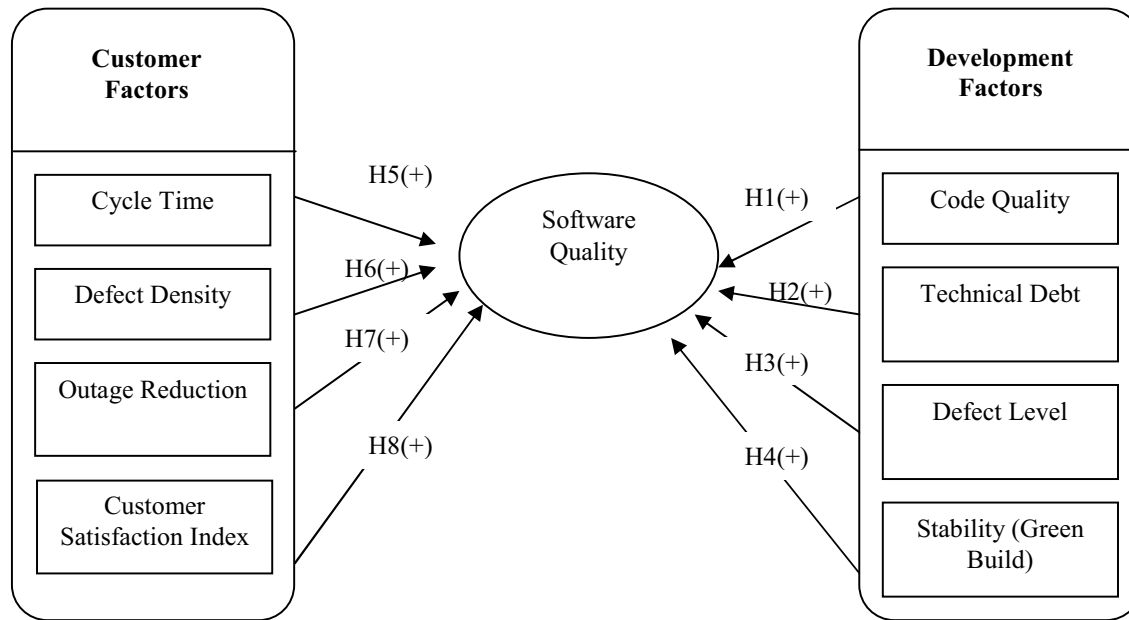
Fig 2: Hypothesized Quality Drivers in Agile

## V.  RESEARCH SIGNIFICANCE AND CONCLUSION

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. This 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. Further, by evaluating critical links between various success factors in Agile development and their impact on achieving high quality software we aim to propose quality assurance framework in Agile that will help organizations to drive towards achieving excellence with improved software quality.

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