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Agile Software Development: Characteristics and Impact on Software Product Quality

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Abstract: *Agile Software Development is software development method that emphasizes on adaptability. Due to which it satisfies customer - centered development that supports quick and flexible response to changes. Quality plays a major role for the software users. It is the confirmation of all the requirements according to customer satisfaction. So, it's important to define a proper software development process that leads to a quality software product. Agile being one of the quickest method's for software development, which allows the quality product to be delivered to the customer side. The objective of this paper is to discuss the effect of Agile Software Development Process on quality of software product. By defining the correlation between agile software development process and various software product's quality attributes as well as significance of agile way of software development.*

Keywords: Agile Software Development (ASD), Software Product, Quality Attribute, Iterative

I. INTRODUCTION

Agile software development follows incremental and iterative approach. As customer waiting time is reduced in this approach, it is becoming more popular now days. Agile process starts by writing user stories. User stories are short and simple statements formed through customer requirements. These are generally written on cards or sticky notes and generally hand written. These are pinned on walls or tables and used during planning and discussion.

All user stories are prioritized first and then distributed among developers for implementation. [1] The definition of quality, when applying to IT software products the context is slightly different. The Pressman states software quality as "conformance to explicitly stated functional requirements, performance requirements standards and characteristics that are implicitly expected by all the professionally develop ed software's".[2]

Meyer defines quality according to different quality factors given by McCall on the basis of 3 main representations: product revision, product transition and product operations. Another definition of quality from the perspective of management given by Summerville stating software with less defects and conforming to required standards of reliability, portability and so on is quality software. In general, software quality measures how well the software is designed, how well it is working without faults and conforming to that design. [2]To ensure a better success ratio for the projects, software development methodology plays a major role. The reason behind the enhanced qualities i.e. better accuracy, cost effective development and fast delivery of project, is the result of highly designed and systematic process which make use of formal techniques to improve the quality of software product and reduces the efforts of software development process. The competitive environment opens the door for adopting new and better methods of project development to deliver better quality in minimum time. [3]

Software industry is fast paced and has daily changing demands. Many organizations are facing difficulties to cope up with these emerging demands and they are looking for change in software development. Many companies are now interested in global business and as they expand, they face challenges with offshore operations; especially large scale industries face many difficulties. There is need of finding feasible solution for such large-scale off shower project management. There is a requirement of improving and revising previous as well as current software development process for the modern software development projects. If we study software development process since it was first

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introduced to the advanced software development process, then we can claim that the software development process has changed in the last decade mainly because of focusing more on user centred designs and automation. [3]

Software development process now follows the continuous improvement model with changes continuously. Within last some years, software industry has grown rapidly and adoption of agile software development has caught attention of software engineers, researchers and software development organizations globally, to improve the quality of software product over a certain level. Highly managed and effective process needs to be implemented to ensure the successful adoption of agile development approach. The traditional water fall model has various shortcomings such as lack of interaction among phases, no mechanism for error correction, extensively document-oriented, advance planning of process, difficult to accommodate change requests & does not support delivery of systems in pieces.[3] Agile methods respects our modern rapidly changing world and it assumes requirements are never ending story and thus the software development cycle has to adapt to this fact and software development teams have to build and deliver quality product to the end users i n less time without the concern of time taking planning as well as documentation.

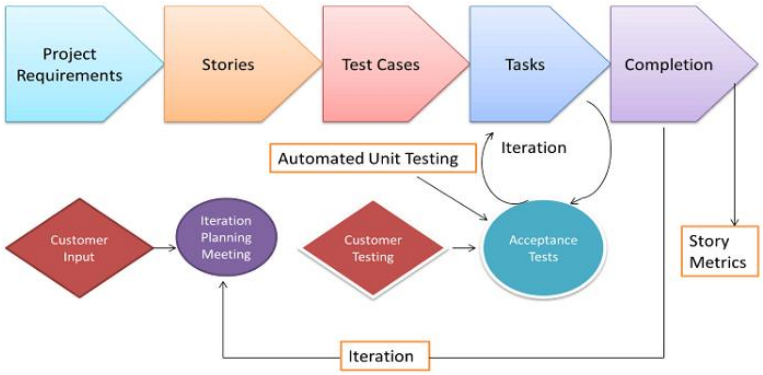
II. Background And Related Work

In [6], a simple algorithmic estimation method for agile software development model is proposed and compares the results given by proposed method to check the feasibility of algorithmic method in real time. The proposed method of [7] research mainly relates to the work of Baker. Code reviews are scheduled automatically.

Compared to this is done concurrently after the SCM commit and not only once a week. Further, in only one reviewer was responsible to review the work of 3-6 developers. In contrast to that, the proposed method uses a very flexible assignment of authors and reviewers e.g. to support developer peer reviews in the form {<author, reviewer, filter>,*}. This [8] presents an approach to support agile software development and especially the refactoring by the use of software measurements. The selection of the metric is important for the outcome of the refactoring process. Future implementations may include different types of metrics, e.g. a resource utilization metric, to improve the stability and speed of the programs. This [3] represents the software quality attributes using agile methods and processes, the 90% ratio of customer are satisfied with the software quality. The survey conducted identifies that the defect ratio of software.

An approach to support agile software development and especially the refactoring by the use of software measurement is proposed in [8]. It has been proposed a simple algorithmic estimation method for agile software development and compared the results given by proposed method to have a check on the feasibility of algorithmic method in real time. The result shows that the duration and cost of the project increases if effort increases but if resources are added with increased effort then duration and cost almost remain same. And, cost increases when resources are located onsite but with factors like Communication within team in different time zones speaking different languages, Familiarity within Teams improves resulting quality output. [6]

III. Process Of Agile Software Development



Extreme Programming (XP)

Figure 1: Agile methodology and model

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The traditional software development process follows a strict phase concept in which every phase gets executed in a sequential organized manner, restricting on to the original requirements and the design developed at the beginning of the software project.

The customers provide their requirements in requirement analysis phase and then based on the received requirements overall design gets created and then development starts. The project manager is the one who tracks every movement of the software project till the product gets delivered to the customer. In general, if no changes are required and the customer accept the deployable product with the whole satisfaction then the traditional process leads to produce the software product on time and on budget release.

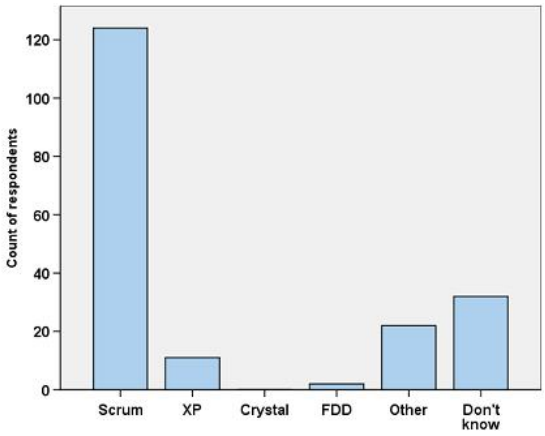

Figure 2: Different ASD methodologies [9]

To get the advantages of applying agile methodologies in the development, there is a set of assumptions that are assumed to be true. To mention few are: cooperation and face to face relation between the customers and the development team; also evolving and changing requirements of the project; developers having good individual skills and experience; in addition to many more [9].

IV. ASDP AND SOFTWARE QUALITY

This represents the use of agile practices and issue faced by companies while implementation of the agile development methodology, the survey identifies that the main issues are software project management as well as lack of requirements and this section represents the satisfaction level of organizations in term of their team productivity and software quality. [3]

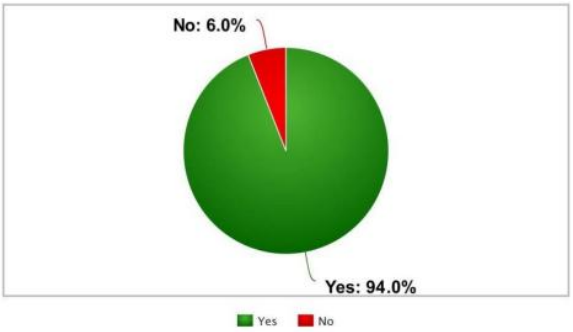

Figure 3: Customer satisfaction about quality [3]

The software development life cycle consists of mainly five development phases: software requirement, software design, software implementation and software testing, and software maintenance which have been used in various development models. Each phase individually plays a vital role and impact software product quality. An agile software development process differentiates with traditional development process in a way of engineering software. [2] Both the development process consists of five phases but executed in very much different manner.

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Characteristics	Agile Attributes	Quality Attributes
Requirement Gathering	Total no. of user stories, Functional Completeness, Functional Correctness, Consistency	Functionality, Reliability, Maintainability, Scalability
Software Design	Release Date, Total no. of Sprints, User story planned, Story points planned	Functionality, Efficiency, Reusability, Reliability, Maintainability, Portability, Flexibility.
Software Implementation	Sprint Stretch Factor, Productivity	Reliability, Maintainability
Software Testing	User Story Accepted, Defect Density, Review effectiveness, Pre-delivery defects	Functionality, Reliability, Maintainability, Portability, Performance
Software Maintenance	Post-delivery defects, Defect removal Efficiency	Efficiency, Reliability, Maintainability

Table 1: Correlation between ASDP and Software Quality Attributes [2]

V. CONCLUSION

Software quality plays a vital role while doing a software project. Various quality factors have to be satisfied onto some level to have a quality software product. The development of software consist of five phases that must catch up with the quality standards while development. Agile being a flexible approach for software development, which allows quality product to be delivered to the customer side.

Agile Methods offer a reasonable approach for the high degree of uncertainty as well as change in modern's Software development processes and since software engineering is emerging field the day-by-day evolving features create interest for the researchers to go for different models and methodologies and help to provide quicker and quality product in software industry. Through various studies it has been shown that every quality attribute is important in the perspective to have a quality product. And to incorporate each quality factor in the development of software, the quality attributes must be mapped with the agile software development process attributes and vice versa.

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