Strategic View on Various Sub-paradigms of Agile Methodology and Sig Sigma Approach

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Abstract

There are numerous software and software development methodologies revolving in the market. AGILE is one such methodology, famous for its incremental and iterative approach for delivering high-quality software and is tailored for adapting change and well co-ordination in movement. This paper elaborates importance of agile in day to day life for example in a software company or in an automobile industry or in retail department or in healthcare sector or in security software etc. Earlier methodologies used were expensive, time consuming, unchangeable and gave birth to various economic problems, lost welfare. On the other hand Six Sigma, a Motorola product adds on a ground breaking way of detecting and diminishing defects of agile product to bring out its best being a more appropriate, well organized data correcting measure. Together Six Sigma and Agile will link organization strategy and business requirements via data driven mapping of processes and product and will one day take over the world in each and every field. It is believed in this paper that reader has a bit prior knowledge of both six sigma and agile.

Keywords: Agile Software Development; Six sigma; Scrum; VOC (voice of customer).

1. Introduction

This paper follows following structure, section 1 includes all about agile methodology, its plus points and some of its pain points as well. In section 2, discussion on six sigma including its advantages and on its various ways of reducing defects is there. Last but not the least, consideration of having both six sigma and agile methodology in the same sheath is the main motive of the paper.

A software development process can be summarized as the set of activities, rules, iterations, requirements, methods, input-output to discover and confirm desired software or software related products. Hence the whole process should be well equipped. Maintained and organized in order to acquire a good, fast and cost-effective solution. From decades such techniques, processes, models are there to fit in suitable environment. Many of such practices are tagged as AGILE software development method. Agile as the word speaks of itself is a watchful, responsive, quick,and synchronized in movement and is creating a buzz in the industry. Here we will study why agile should be adopted, how it is beneficial, its grey areas and problem in its adoption.

Talking about how Six Sigma makes inroads in software development organizations. It helps in reducing software defects thereby improves quality. It is considered that six sigma's main objective is to find cause of the problem by applying numerous techniques, and getting a solution to the problem and at last implementing it. For Six Sigma to work effectively, the operands have to repeat their operations that too identically. Six Sigma is often used during the operations phase of a project and not during the development phase of the product.

In an industry quality of work performed depends mainly on following two attributes, the ability of the persons performing the task and the effectiveness of the processes that are to be followed to perform the task. Both of these factors can be achieved by having agile and Six Sigma together. Although it seems a bit fictitious but it is feasible too, as main objective of both the techniques is to reduce waste.

2. Agile Software Development Methodologies

Key to various principles of agile software development is AGILE MANIFESTO, proves to be a great platform for the beginners for understanding agile. In 2001, it was stated by the practitioners those were involved in proposal of various agile methods.

Agile Manifesto (Agile Alliance, 2001) of which the core beliefs are:

Individuals and working software over comprehensive documentation [7], [8],

Interactions over processes and tools [7], [8],

Customer collaboration over contract negotiation [7], [8],

Responding to change over following a plan [7], [8].

Agility is defined to bring lightness in the traditional software-development methodologies by peeling off the heaviness, promoting quick response to change and speeding up the project deadlines with the help of customer collaboration. There are

different types of agile methodologies based on various agile principles like Extreme Programming (XP), Unified Process, Scrum, Crystal, etc.

2.1 Principles of Agile Methodology
There are mainly twelve principles of agile derived from the above four core values [6]
1. Customer needs are always considered at the earliest by delivering high quality software.
2. Major point is to adapt change i.e. environmental change, requirement change, etc whenever necessary in the process.
3. Time management should be highly remarkable by delivering working software frequently.
4. Advisory way of communication between various co-functional teams is the face-to-face communication.
5. Working software is set as primary agenda.
6. Throughout the project, customer firms and development team must work together to achieve better results.
7. Motivation and trust should be the major support for the individuals to get the job done.
8. All the three sponsors, developers and users should maintain sustainable development throughout the development phase.
9. At regular interval, teams reflect what all work is done and what all is to be done.
10. Design, development process, technical work require continuous attention.
11. Amount of work not done should be measureable.
12. Self-organized, co-functional teams bring up best architectures, requirements, and designs.

2.2 Why Agile should be adopted
1. Fast deliveries of product as people are fed up with 18 months delivery cycle that quite often deliver the wrong product. Idea of two week delivery cycles and quarterly release cadences is pretty appealing.
2. Feedback of customers, as all the time they are involved in the process of making for which they are paying off. This also avoids the building of wrong product.
3. As agile focuses on architectural risk in early sprints and also continuously iterates it results in building defect free product.
4. Agile fixes time, cost, and quality and also gives us the tools to vary the business and technical scope of the solution.
5. Some people want to adopt agile because the culture in their organization is not lively whereas agile holds the promise of creating teams of empowered individuals and it creates really fun place to work.

6. Proper analysis of backlogs, defined end result, gathered requirements (called as user-stories) from users and a developer brings up high level of planning and aims at high business value.
7. Each iteration (sprint) usually begins after a prioritization of components with the stakeholders, where developers and scrum master can later sit and ship user stories in/out the backlog in the sprint planning board. Usually it is better to add more user stories - from the backlog to the planning board - than the team is capable to finish.

Below table describes the strength of companies using agile, non-agile and no any software development process.

Table 1: Industry *Scenario [1]*

Industry	Agile	Non-Agile	No SDM
Consulting	11	1	1
Education	2	0	1
Government	2	1	1
IT	23	0	9
Financial	9	1	4
Manufacturing	2	0	1
Retail	2	0	1
Telecommunications	1	1	3
Transportation	1	0	0
Utility	0	0	1
Other	11	1	3
No Answer	7	1	10
Total	71	6	35

2.3 Limitations of Agile

There are a few limitations with agile development methodology; first one is as agile support quick and early development of workable code where due to less documentation it may result in memory loss of code. The second limitation is that agile mainly depends upon user involvement because of which project entirely depends upon cooperation and collaboration of individuals and it may be very demanding on the user representative's time and require a big commitment for the duration of the project. The other is that there is much less predictability, not only at the starting phase of the project but also in intermediate phases, about what the project would actually be delivered as change in requirements is throughout the process. There is an additional cost to the project to adopt continuous testing throughout. Hence limitations based on a study of principles and assumptions could be easily detected.

3. Six Sigma: Quality Function Tool

The term *Six Sigma* originated from terminology associated with manufacturing, specifically terms associated with statistical modeling of manufacturing processes [7]. Achieving perfection in terms of time, quality, and efficiency are the main objective of six sigma, which is used by large companies to improve their process and making it defect free. It was developed by Motorola in 1994 to improve their overall performance. It is a measure of efficiency that is near to perfection due to its data driven, organized and defects eliminating strategy.

3.1 Why six sigma is used?

There are various key points on which six sigma methodology work, they are as follows:

1. It not only detects but also explores the field where work can be done.
2. Emphasize over customer wants and believes in delivering what they want by differentiating what they sees and feels.
3. It reduces cost by ensuring continuous vigilance or by making use of predict table for tasks and also as it is designed to meet process capability.
4. It also increases the quality level along with increasing the speed.

There are few basic principles of six sigma, some of them are listed below:

Table 2: Strategies, Tools, Techniques and Principles [2]

Strategies and Principles	Tools and Techniques
Project management	Statistical process control
Data-based decision making	Process capability analysis
Knowledge discovery	Measurement system analysis
Process control planning	Design of experiments
Data collection tools and techniques	Robust design
Variability reduction	Quality function deployment
Belt system	Failure mode and effects analysis
DMAIC process	Regression analysis
Change management tools	Analysis of means and variances Hypothesis testing Root cause analysis Process mapping

3.2 DMAIC process

DMAIC is the Six Sigma methodology which is used as the standard routine for planning and implementation of project.

Table 3: DMAIC PROCESS [2]

Steps	Key processes
Define	Define the requirements and expectations of the customer Define the project boundaries Define the process by mapping the business flow
Measure	Measure the process to satisfy customer's needs Develop a data collection plan Collect and compare data to determine issues and shortfalls
Analyze	Analyze the causes of defects and sources of variation Determine the variations in the process Prioritize opportunities for future improvement
Improve	Improve the process to eliminate variations Develop creative alternatives and implement enhanced plan
Control	Control process variations to meet customer requirements Develop a strategy to monitor and control the improved process Implement the improvements of systems and structures

4. Agile and Six Sigma in the same Sheath

Both agile methodology and six sigma are considered as best practices for achieving process excellence. Where agile methodology deals with iterative, incremental and is concerned with adapting change in accordance with requirements throughout the project. While Six Sigma aims at generating a defect free quality product. It seems a bit unreasonable that two can work together as one handles projects of manufacturing world and other goes on with empirical projects.

Except all the above beliefs both can be integrated together due to following reasons:

1. A dying requirement of software project i.e. defect free end product is offered by Six Sigma.
2. Next phase considering Agile software methodologies with six sigma tools is very clear as in every change adaptive framework it is mandatory to use a process enhancement tool which could also minimize defects.
3. Requirements play a major role in project performance and cost of requirements error is to be fixed, in this case both lend a helping hand to the developers where, agile deals them using an iterative and incremental approach where as in six sigma VOC (voice of customer) is used.

In agile we can make use of VOC before sprint cycles which will prove as a great asset. We need to follow certain steps for it as shown in the table 4.

Table 4 [9]

Steps for Collecting VOC Prior to Scrum Sprint Review			
Step	**What Needs to Be Done**	**Who does it**	**When**
1	Identify all direct and indirect customers affected by the upcoming sprint	Product owner	A week before sprint review
2	Prepare targeted questionnaires for each customer group	Product owner, Scrum master	A week before sprint review
3	Collect answers for the questions through direct conversation, email, etc.	Product owner	Two to three days before sprint review
4	Review any existing forms, issue log, etc. to identify customer pain points	Product owner, Scrum master	Two to three days before sprint review
5	Prepare for the sprint review meeting with additional knowledge of all customer needs	Product owner	One day before sprint review

1. By applying above steps we can also have a measurable view of what's going on and how more sparks can be added by using CTQ tree (as shown in figure 1) during Scrum sprint meeting which takes all generalized terms from customers according to their requirements.
2. Both are considered light weight as emphasize on reducing waste or say reducing extra efforts like documentation, etc.
3. Six sigma tool can also analyze the failure modes of various modules of agile projects by detecting loop holes.
4. By implementing six sigma with agile we can also reduce the waiting time and can come up with improved overall outcome.
5. Six sigma can be used in agile software development if we think software development as a process.
6. In today's world multi-disciplined teams are required which both six sigma and agile can support.
7. Few generalized steps should be kept in mind while considering both like, define the process, measure it and at last use measurement to form hypotheses about cause of problem, implementation, and improvement by ensuring that all is in control.
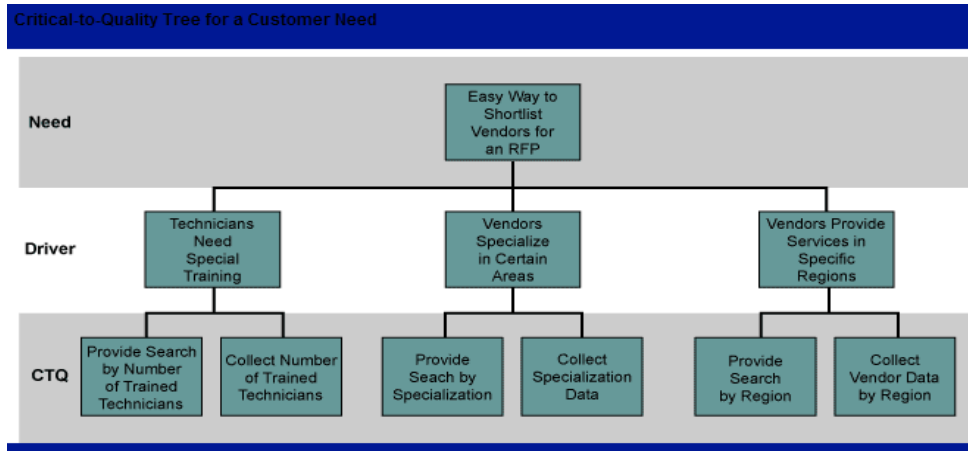
Figure 1: CTQ Tree.

5. Conclusions

After studying we may conclude that each method in agile methodology is described in terms of **Process** which includes weekly releases with the help of rapid cycles**, Responsibilities** as both customer and developer cooperate each other by remaining constantly in touch, **Cost effective practices** as a step by step top down approach brings up individual requirements and helps in adapting change without exceeding cost.

On the other hand six sigma is a generalized way to improve quality, capacity of performance by reducing waste, inventory stages, time space and thus contributing in satisfactory business proposals and releases.

This paper also concludes that yes agile and six sigma both can prevail together under one shelter as both aim to achieve customer satisfactory product with minimum wastage.

In future by magnifying agile approach with six sigma is an interesting but a bit challenging way to adopt for all small, medium and large projects. It will increase demand of more defect free change adaptive projects. More theoretical research base on the two in various sectors like health care, security services, education sector, manufacturing, inventory, etc. as both ensure that right project is done right and can also analyze the opportunities coming on the way. Some say project based on these is feasible only on paper but it isn't true as one day together they will take over the world.

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