

Agile technique: Review and Assessment

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Abstract— in today's era, the most important thing is to identify the critical determinant factors for the software development projects. As many of the projects cannot be completed on time and within cost, this lead to finding out the new methodologies so that projects can be completed on time and within budget. In recent years, the most dominant successful methodology with regards to software development is agile methodology. In this paper, we have tried to present the critical factors of agile methodology which is necessary for the success of software projects. In this paper, a lot of reasons have been mentioned for the failure of traditional methodologies in the software development.

Keywords— *Success factors, Agile software development, Agile adoption*

I. INTRODUCTION

Software has been part of modern society for more than a decade. It was started as a "code and fix" i.e. for a given problem, the software was written without much planning and design. This type of methodology was good for small systems which were not very critical but as systems grew and become critical, it became very difficult for developers to cope with this and became difficult task to add new features at later stages and to fix bugs in system. This type of methodology will lead to project failure. To reduce or minimize the number of project failures, an alternate methodology was introduced. Methodologies enforce a disciplined and non-phased process for software development which aims to provide reliable and efficient software's to users. Traditional methodologies followed a set of rules for development (i.e. strategy driven). The first phase was gathering and elicitation of requirements which was followed by software low level design and high level design and which was further followed by development. As this methodology followed phase structured development but in today's era, the customer does changes at later stages which make very difficult for heavy weight methodologies to cope up which resulted in project failures. To avoid project failures, the developers were implementing their own methodologies and respond to the expected change they were experiencing. These methodologies and practices were not phase-restricted and were based on iterative refining. This was a method which was introduced in 1975 and now known as agile light weight methodology. The name "agile" came to existence in 2001. There were seventeen software developers in a summit and discussing future trends in software development so that project failures will be less. They noticed that many approaches had many features in common so they decided to the name these

methods as agile methodology. Agile signifies light quick and sufficient development. The agile methods highly focused on welcome changes at any stage, people, working software, customer commitment & collaboration, rather than on plans, tools, processes and contracts. Agile methodologies are gaining importance in software development houses as there was decrease in number of failure projects, though they compromise a combination of accepted and disputed code of engineering practices. Agile methodologies are proving better than traditional methodologies day by day.

II. DIFFERENCE BETWEEN HEAVY WEIGHT METHODOLOGIES & LIGHT WEIGHT METHODOLOGIES

There are lot of differences between heavy weight methodology and light weight methodologies (Kukreja, V., & Singh, A., 2015). These are mentioned as:-

- 1) Agile methodologies follow principles rather than strict rules.
- 2) Heavy weight methodologies gave importance to people rather than process.
- 3) Testing is done through the project whereas in traditional methodologies it is done at end of the project.
- 4) Agile methodologies gave more preference to high communication & low documentation whereas traditional methodologies were just opposite to it.
- 5) When requirements are changing at any stage then agile methodologies are most suitable.
- 6) Working software given at end in traditional methodologies whereas in agile methodologies, the working software is given in few months.
- 7) Traditional methodologies are like Waterfall model, Spiral model etc. And various agile methodologies are Scrum, extreme programming etc.

III. LITERATURE REVIEW

The authors (Abrahamsson et al., 2002) stated about various agile software development methods and approaches. Here the author has also analyzed about various agile software development methods in detail on the basis of some defined criteria. In this paper, various agile methods are differentiated. Based on the prediction, future research needs are identified and discussed.

The authors (Williams, L., & Cockburn, A., 2003) mentioned the primary emphasis of this study was to mix agile processes with the heavy weight processes in software development so that chances of software failure are less. Agile software development puts a lot of stress on changing the working habits. The software companies which are not

using light weight methodologies, the change is to figure out the most suitable agile methodology for their work but the companies which are using light weight methodologies, the change is to adapt and improve the use or functionalities of light weight methodologies over times. Agile software development believes in division of decision making i.e. a person in a team can take the decision for the welfare of the project. The authors discussed various articles for better understanding of XP and plan driven approaches.

The authors (Cohen et al., 2004) stated in this study about different agile methods to the readers. This made the readers to understand and judge whether these different agile methods were useful in the modern software development. This study also mentioned about the agile manifesto. This study discusses and differentiates some of the reputed agile methods and also helps in telling when agile approach is useful and applicable. In this study, the authors conclude with an analysis from various reports and empirical studies of reputed agile methods.

The authors (Mann, C., & Maurer, F., 2005) proposed this study as quantitative study. This is two years case study in an industry. The study has been performed on a small team in Calgary and it is Scrum based study. This study helps to know the agile methods long term effects rather than short term.

Results:-

- 1) The analysis shown that after the introduction of Scrum light weight methodology, there were less number of overtime worked rather than before introducing Scrum. For this analysis F test was used.
- 2) The results shown that after introduction of light weight methodology like Scrum, there was more customer satisfaction.

Customer Opinions/Satisfaction:-

- More transparency and communication after introduction & implementation of Scrum lightweight process.
- Much involved in the process
- Liked daily sprint planning meetings which keep them up-to-date
- Liked sprint reviews and retrospectives
- Time taken is more for meetings

Developers Opinions:-

- Scrum process had improved communication at all levels and significantly improved customer involvement.
- Liked sprint meetings, sprint reviews and retrospectives meetings.
- Time taken is more for meetings

Limitations:-

- 1) After implementation of Scrum process, the results are significantly different as the same developers were not used as before introduction of Scrum.

- 2) The results are different because there were different pressures to deliver the software.

The authors (Misra et al., 2006) tracked the factors on the basis of anecdotal and practical past experiences that helps in success of projects while using agile software development. The factors are:-

- 1) Organizational Factors
 - a) Customer commitment/collaboration
 - b) Team distribution
 - c) Corporate culture
 - d) Planning & Control
 - e) Dynamism and Uncertainty
- 2) People Factors
 - a) Personal attributes
 - b) Learning & Training
 - c) Technical Knowledge
 - d) Communication and Negotiation
 - e) Culture
- 3) Technical Factors
 - a) Gathering of requirements
 - b) Development of these requirements
 - c) Testing of the product

The author (Livermore, 2007) discussed the enablers that were stressing the implementation of agile software methodology. In this study, eight hypotheses were made. Out of these, the first five hypotheses were based on traditional methodology implementation which was drawn from Roberts study and the left hypotheses were drawn & made from the literature review. This study received 112 responses. According to the survey results, there were several enablers of management dimension that affect agile SDM and there are several enablers that did not affect agile SDM.

The authors (Dyba, T., & Dingsoyr, T., 2008) discussed a proper and systematic literature review of 1996 studies up to 2005 of ASD. Out of these studies, only 36 have been figured out as empirical studies. These 36 different studies were grouped into four themes.

Points:-

- 1) Only XP was studied in this paper.
- 2) The difficult thing was to make the customer present on-site for longer periods.

The author (Bavani, 2009) mentioned about critical factors of distributed environment in agile software development. These are:-

- 1) First is to make the base camp.
- 2) Second is to validate the various assumptions
- 3) Minimize or reduce the hurdles of communication loop.
- 4) Facilitate tool like web based for driven query resolution

- 5) Initiate various test drives to know the product progress and solve the various productivity issues of the process.
- 6) Proper measures should be taken to check on internal quality
- 7) Constructively take care of effort variance.
 - Take stock of user stories for status checks and review should be given at end of iteration.
- 8) For measuring the root cause, proper investment for implementation of technique should be performed
- 9) Compliment people to improve processes
 - Appreciations on time with email or words
 - Announce monthly or quarterly rewards
 - Motivate teams

The authors (Srinivasan, J., & Lundqvist, K., 2009) proposed the study which is focused on Game Dev. Co. After 5 years of development, the company adopted Scrum. Total 22 people were interviewed.

The factors for agile adoption are:-

- 1) Stakeholder Alignment
- 2) Employee empowerment
- 3) Individual, Group and organizational learning
- 4) Systems of governance

The author (Abbas, 2010) mentioned some points which should be taken care while applying agile software development are:-

- When organization calculates customer satisfaction, this lead to improve in quality of software.
- The success of the project is increased if there is increase in customer satisfaction, team participation & contribution, experience in agile methodologies, retrospective impact and quality.

In this study, the survey consisted of various sections. First section was about the respondents' basic information and the section was about respondents' current or most recent agile project and the third section consisted about questions related to agile governance.

The variables found in this study are:-

- 1) Organization variables
- 2) Project variables
- 3) Retrospective variables
- 4) Metrics variables

Results:-

- 1) Sample size is 106 responses
- 2) The survey was done on web and it was authenticated by Southampton Ethical University committee.
- 3) During analysis, the data which was mentioned as N/A responses were behaved as missing so that correlations which were found to become meaningful.

The authors (Stettina, C. J., & Heijstek,W., 2011) has discussed five different dimensions of agile teams. These are:-

- 1) Team members shared leadership
- 2) Orientation of team members

- 3) Enhancement in Learning skills
- 4) Redundancy
- 5) Autonomy

The questionnaire is given to practitioners and experts of Scrum methodology. The sample size consisted of 79 individual responses and 8 scrum teams from 13 different countries.

Results:-

- 1) The authors have not find a significant difference by analysis between means of redundancy and all other remaining factors.
- 2) Team orientation and learning have achieved the global maxima among all the factors.

Limitations:

- 1) The distribution of answers reveals an expected bias of participants towards positively perceived answers. This is called Socially Desirable Responding (RDS). For removing this, self-administration of the survey is done through computer and it can also be lowered by taking subjects personal details so that he feels fully involved in the questionnaire.
- 2) Psychometric questions can be used in future.

The authors (Melo et al., 2011) have done two case studies for a period of six months. Research questions asked in this paper were:-

- 1) What was the way of define productivity by agile teams?
- 2) Identify the main factors of productivity by team members of agile.
- 3) Identify the agile practices that impact the team productivity.

The researcher interviewed 13 team members. The interviews were arranged in a semi-structured way. To answer RQ1, mostly the members of the team were unclear about productivity definition. Some of the interviewee said that:-

- 1) Timeliness is a criteria for measuring productivity
- 2) Quantity is a criteria for measuring productivity
- 3) Customer satisfaction is a criteria for measuring productivity

After doing the analysis, all the above mentioned factors were not strongly associated with the productivity.

To answer RQ2, the main factors impacting on productivity are:-

- 1) Team
- 2) External factors
- 3) Staff

To answer RQ3, the agile practices which impact productivity are:

- 1) Pair programming
- 2) Collocation

Limitations:

- 1) This study was conducted in two companies.
- 2) Interview was the source to derive the results

The authors (Wan et al., 2011) study was based on KY company. KY company has been working in many business areas. Its main business area was in Hong Kong. The overall staff was greater than 600. This company was distributed in many countries like Hong Kong, Beijing and other places. Some factors related with agile process improvement are:-

- 1) Overtime culture should not be promoted in light weight methodology.
- 2) The culture of low level trust should be minimized.
- 3) There was lack of spirit of mutual cooperation.

Critical success factors for agile process improvement:-

- 1) Support from top leaders
- 2) Support from organization
- 3) Use of Tools & technology
- 4) Appropriate import
- 5) Training and Education

Results:-

- 1) Total sample size is 80 and valid sample size is 51.

The authors (de Souza Bermejo et al., 2014) stated success in software development associated with the following:-

- 1) Time delivery of overall product
- 2) Cost of the product
- 3) Scope
- 4) Quality (Functionality)
- 5) Customer Satisfaction

The success factors for ASD are:-

- 1) Team capacity
- 2) Culture
- 3) Communication with customers
- 4) Environment configurations
- 5) Relationship with external partners (This factor does not confirm as critical factor for software development)

Results:-

- 1) Sample size is 409.

IV. MOTIVATIONAL FACTORS FOR ADOPTING AGILE METHODOLOGY

1. According to the 10th state of Agile survey, 95% of the respondents told that their organizations are practicing agile, only 1% of the 3,880 respondents told that their agile implementation was unsuccessful. This survey also told that the top three measures of successful agile implementation has been product quality (48%), on-time delivery of projects (58%) and customer/user satisfaction (46%). The most important is that Scrum continues to dominant with 70% of respondents said they use Scrum or Scrum/XP hybrid. There are a number of reasons for agile adoption but the top two reasons

Were accelerating product delivery (62%) and enhancement abilities to manage the changing priorities (56%).

2. According to testing trends in 2016: A survey of software professionals, 88% of the respondents told that their organizations had adopted agile methodology. This number was 82% in the last year.

V. CONCLUSION

Within a short time, the agile methodology manifesto and principles have gained a huge acceptance by small, medium and large scale organizations. Basically, agile methodology is an umbrella term and under this umbrella various methodologies exist, some of these are scrum, extreme programming, DSDM etc. While through literature review, we can say that there exist a lot of problems for adoption of agile methodologies. Some of these are organizational resistance to change, people factors and technical factors. According to the version one survey, the top three factors which create a problem for agile success are company philosophy, lack of experience with agile methods and lack of management support. These factors are the concern for agile proponents. But, in the longer run, the claimed benefits of agile methodologies will be the key and it facilitates its wider use and dispersion. The claimed benefits of agile approaches are project cost and timeliness. In the nearer future, agile methodologies can be applied on various domains and the question arises how these can be used to stop building worthless software at first place. More surveys should be performed on finding out agile critical factors for various domains like textile manufacturing, automotive manufacturing, mobile applications and FDA regulated environment etc.

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