Contemporary Study of Agile Methodology

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Abstract
In today's era, the most important thing is to find out the success 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 methodology from the point of view of success of software development project is agile methodology. In this paper, we present the literature review that shows the critical success factors of agile methodology for 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

Introduction

Software has been part of modern society for more than 50 years. Software development started off as a chaotic activity often mentioned as "code and fix". The software was written without much planning also design of the system was determined from many short term decisions. This worked well for small systems but as systems grew it became difficult for developers to add new features and to fix bugs in system. This style of development was used for many years until an alternative methodology was introduced. Methodologies enforce a disciplined process for software development which aims to provide reliable and efficient software's to users.

Traditional methodologies are strategy driven in which work originates with the elicitation and documentation contain complete list of requirements, followed by software architectural design and development. As a result, several professionals independently developed their methodologies and respond to the expected change they were experiencing. These methodologies and practices are based on iterative refining, a method that was introduced in 1975 and now known as agile methodology.

The name "agile" came to existence in 2001, when seventeen software developers held a summit to discuss future trends in software development. They noticed that their approaches had many features in common so they decided to name these methods as agile methodology. Agile signifies light and sufficient development. The agile methods highly focused on people, interaction, working software, customer collaboration, and change, rather than on processes, tools, contracts and plans. Agile methodologies are gaining importance in software development houses, though they compromise a combination of accepted and disputed code of engineering practices. Agile methodologies are proving better than traditional methodologies day by day.

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.

Literature Review

Abrahamsson, (2002) stated that this study has mentioned about various agile software development approaches. Here the author has analyzed various agile software development methods. These methods have been analyzed on the basis of some defined criteria. This study has mentioned agile methods differences and similarities. Based on the prediction, future research needs are identified and discussed.

Williams, (2003) mentioned the primary emphasis of this study was on determining how to blend agile methodologies with plan-driven approaches to software development. Agile software development carries with it the implication of changing work habits. The companies which are using not agile techniques, the change involves trying out and selecting the appropriate agile methodology but who are using agile techniques, the change involves the adjusting and improving their use over times. Agile software development can affect the power structure within an organization because it spreads out the decision making authority. The authors discussed various articles for better understanding of XP and plan driven approaches.

Cohen ,(2004) described the aim of this study is to introduce the reader to agile methods allowing him/her to judge whether or not agile methods could be useful in modern software development. This study discusses the history behind agile methods as well as the agile manifesto. It discusses the role of management, describes and compares some of the more popular agile methods, provides a guide for deciding where an agile approach is applicable, and lists common criticisms. It summarizes empirical studies, anecdotal reports, and lessons learned from applying agile methods and conclude with an analysis of various agile methods.

Mann ,(2005) proposed this study is quantitative study in small team industrial environment. This is two years industrial case study .The study is Scrum based and this study is done in Calgary. A longitudinal study is used to better understand the long term effects rather than short term effects of introducing agile methods.

Results

1) The F test shown that standard deviation before Scrum was introduced was greater than the standard deviation after Scrum was introduced indicating that there was more stability in terms of overtime worked after Scrum was introduced.

2) The T test shown that mean before Scrum was introduced was greater than the mean after Scrum was introduced indicating that team worked less overtime after Scrum was introduced.

3) The results shown that more customer satisfaction after Scrum was introduced.

Customer Opinions/Satisfaction:-

- Greater consistency, transparency and coordination since implementation of Scrum
- 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 fostered more customer involvement and communication.
- Liked sprint meetings, sprint reviews and retrospectives meetings.
- Time taken is more for meetings

Limitations :-

1) The results are different because software developers were not same software developers who worked after Scrum was introduced.

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

Misra ,(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) Competency
b) Personal characteristics
c) Communication and Negotiation
d) Societal culture
e) Training and Learning

3) Technical Factors
a) Requirements
b) Development
c) Testing

Livermore, (2007) described the factors that impact implementing agile software development methodology. In this study, eight hypotheses were made. The first five hypotheses were drawn from Roberts study on traditional methodology implementation and the remaining three hypotheses were made from the literature review. This study received 112 responses. According to the survey results, there were several factors under management's control that impact the implementation of an agile SDM and there are several factors that did not impact the implementation of an agile SDM.

Dybå , (2008) mentioned this study did a systematic review of empirical studies of agile software development up to and including 2005 was conducted. The search strategy identified 1996 studies, of which 36 were identified as empirical studies. The studies were grouped into four themes: introduction and adoption, human and social factors, perceptions on agile methods, and comparative studies.

Points :-

1) With rare exceptions only XP was studied.
2) The role of on-site customer seems to be unsustainable for long periods and that it is difficult to introduce agile methodologies.

Bavani, (2009) mentioned this paper stated critical success factors for distributed agile software development. These are:-

1) Setup The base camp
2) Ensure explicit delegation and validate assumptions
3) Cut communication loops
4) Facilitate tool driven query resolution
- Email is not appropriate for query resolution
- Chat is not appropriate for query resolution
- Web based tracking tool is appropriate for query resolution

5) Initiate test drives in understanding product progress and collaboration in resolving issues
6) Assess internal quality
7) Manage Effort Variance constructively
8) Take stock of user stories for status checks
- A core team is setup to take stock user stories and status reviews at end of iterations

9) Invest in root cause analysis
- Implement a technique for root cause analysis

10) Compliment people to improve processes
- Appreciations on time with email or words
- Announce monthly or quarterly rewards
- Motivate teams

Srinivasan, (2009) proposed the study 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

Abbas, (2010) tracked the main findings suggest that while applying Agile software development are :-

The quality of software improves as the organization measures customer satisfaction and the impact of retrospective increases.

The Project Success improves as quality, frequency of measuring customer satisfaction, organization experience in agile software development, retrospective impact, the team participation in retrospective and the team contribution in retrospective increases.

The survey consisted of three sections: gathering information about respondents, their current or most recent project and 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) We based survey was done. The survey was reviewed and approved by the university of Southampton Ethical committee.
3) While code the data N/A responses were treated as missing so that correlations are meaningful

Stettina, (2011) mentioned in this author has taken five dimensions of agile teamwork and related personal questions for the agile teams. These are:-
1) Shared Leadership
2) Team Orientation
3) Redundancy
4) Learning
5) Autonomy

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

Results:-
1) The author has not find a significant difference between means of redundancy and learning, team orientation and shared leadership
2) The global maxima are for learning and team orientation.

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.

Melo, (2011) The author has done two case studies for a period of six months.

Research questions asked in this paper were:-

1) How do agile teams define productivity?
2) What do agile team members identify as the main factors impacting on productivity?
3) Which agile practices are perceived to impact on a given team's productivity?

The researcher interviewed 13 team members. The interviews were semi-structured. To answer RQ1, the team member's definition for productivity was unclear. 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

Above 3 factors were not strongly associated with productivity from the results.

To answer RQ2, the agile team members identify 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) Study was limited to two companies and two projects
2) Interview was the source to derive the results

Wan, (2011) discussed this study is based on KY company. KY company is a multi-business company. Its main business is in Hong Kong. The overall staff is greater than 600. This company is distributed in Hong kong, Guangzhou, Beijing, Shanghai and other places.

Some factors related with agile process improvement are:-

1) The prevalence of overtime culture i.e. overtime work is not suggested in agile methodology.
2) The culture of low level trust i.e top leaders in the company always suspect the staff work capacity and professionalism for job done.
3) 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:-

Total sample size is 80 and valid sample size is 51.

De Souza Bermejo, (2014) stated success in software development associated with the following:-

1) Time
2) Cost
3) Scope
4) Quality
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.

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 accelerate product delivery (62%) and enhance ability to manage 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.

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 and success 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 were Company philosophy, lack of experience with agile methods and lack of management support. These factors are the concern for agile proponents. But, in the long run, the claimed benefits of agile methodologies will be the key and it facilitates its wider use and dispersion.

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