IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 4, Issue 2, April - May, 2016
ISSN: 2320 – 8791 (Impact Factor: 2.317)
www.ijreat.org.

A Study Of Agile Methodology From Various Perspectives And Evaluation Using Different Assessment Frameworks

Fiona Mathews, Princy Victor, Kangan Arora, Manjula R

School of Computing Science and Engineering, VIT University, Vellore, Tamil Nadu, India

Abstract- Agile is a process or methodology that continuously promotes iteration of phases like development and testing in software development life cycle (SDLC) of a project. This methodology mainly focuses on unpredictable or rapidly changing environments. Several Agile methodologies have been evolved over time like eXtreme Programming, Scrum, AUP, DSDM etc. How "Agile" are these methods is a point of great deliberation among Software Developers. Many tools, models and frameworks have been developed over time to measure the agility of these methods. The main objective of this paper is to review the existing frameworks for agile assessment. Also a study of agile evaluation from various perspectives is also undertaken.

Keywords-Agile software development, Agile assessment, Agileassessmentmodels

I.INTRODUCTION

The world around us is dynamic, so is the field of software development. There is a rapid change in the software requirements and customer expectations. Even though there exists different models for this, Agile model helps in fulfilling most of the customer needs since it prefer development of software rather than documentation. Software development is done through short iterations in which updations are continuously made according to the customer needs. Agile methodologies are quite flexible as compared to traditional models.

Software engineering is gravely hampered today by immature practices which is a hallmark of traditional methods. Specific problems include:

• The typical practices followed are not in consensus with the techniques of engineering discipline.

• The lack of well-established and widely acknowledged theoretical basis.

• The tremendous number of strategies and technique variations whose differences are not properly understood

• The lack of credible evaluation with solid experimental aid.

• The disparity between industrial practice and academic research.

The frustrations around these seemingly unproductive software development

activities led to the advent of Agile methods. Every organization chooses a method "tailored-fit" to its needs. But how good it is in achieving this objective has to be measured. This is where the need for assessment arises. We need to approach this from different perspectives to make sure the chosen methodology fulfills various requirements effectively.

This paper undertakes anassessment of theseagile methodologies from the viewpoint of various frameworks and from different perspectives like adequacy, capability, effectiveness etc.

i.Adequacy - Sufficiency of the method with respect to meeting its stated objectives[1].

ii.Capability – Ability of an organization to provide an environment supporting the implementation of its adopted method[1].

iii.Effectiveness – Producing the intended or expected results[1].

II section traces related works in brief. III section presents the overview of agile methods. IV section describes the evaluation and assessment methodology perspective and V presents the methodologies for assessing agile practices.

II. RELATED WORKS

Agile Software Development presents an organised discipline in the field of Software Engineering. It is being promoted by many skilled software experts. Agile software principles are proceeded and supported from developed traditional software development principles with numerous experiences related to achievements and failures in agile projects.

Though Agile Practices emerged as software development methodology initiated from year 2000 ; these practices are derived from the analysis of various factors, ideas, proposed methodologies and processes that followed from object-oriented programming community [2]. In mid-2001, a group of independent specialists with a strong network in software industry associated with research groups from universities and colleges opted to unite forces and establish what was later called the agile evolution. For making these ideas more specific, professionals from software industry met in February in the peaks of Utah, USA; to consider all techniques in the agile platform [2].Agile Development should focus on four core values as stated by the principle: [3]

1. Over processes and tools, individuals and interactions were given importance.

2. Instead of in depth documentation, delivery of working softwares is taken into consideration.

3. Satisfaction of client and working together as a team is given utmost priority.

4. Acting in response to change instead of going through a particular plan.

Several software professionals and institutional researchershave conducted

several studies and experiment backed research on risks and benefits of agile methods. The main contributor amongst them is Stefan Cronholm who has compared advantages in classical and agile methodology and has shown a critical approach so as to open up prospects and risks along with the particular benefits in agile methods. [4]He has tried to locate the solutions for some benefits of Agile Methodology which are not practically implementable and also identified which benefits are sustained while switching to agile methods. Certain advantages of examining and getting into analysis of current agile processes and practices, interpreting the pros and cons of agile processes and various other issues in order to meet the goals and objectives for which they have used both qualitative and quantitative research methodologies has been discussed[5].

[6] Agile presents a group of agile methodologies which guarantee to convey expanded profitability, quality and achievement rate in programming and also rate the project success overall in software development. Such techniques are SCRUM (Schwaber&Beedle, Agile Software Development with Scrum, 2001), XP (Beck & Andres, Extreme Programming Explained: Embrace Change, 2004) and the less-known Crystal (Cockburn, 2001) [6]. Using agile principles these techniques are implemented. Other popular Agile Processes include DSDM (Dynamic System Development Method), AUP(Agile Unified Process) etc.

Advancement of these numerous development techniques has prompted to compare analysis so as to distinguish between the preferences and inconveniences and appraisal of these strategies to discover which strategy is suitable for particular situation. An outline of such studies is being presented. [7] It recognizes and structures the principle theoretical contributions to the field of Agile Methodologies research by displaying Agile Methodologies ,analysing the fundamental papers on social implications of utilizing Agile, exhibiting the primary studies on usage of Agile and by combining the incorporated research ideas as to give correspondence in Agile projects.

The research paper proposed an answer and abridges how the quality is accomplished or guaranteed in agile software development utilizing numerous variables subsequently such as examining the quality parameter in agile procedure. Agile software programming procedures, for example: extreme programming (XP), Scrum and so forth depend on best practices that are considered to enhance programming development. The assessment criteria for programming quality assurance utilizing agile systems for comparing the impacts of changed parameters is discussed[8].Competency is provided by software product released by agile strategies before time to the running programming surroundings, improving participation and getting higher the client satisfactions[8]. In Agile, there is a consistent correspondence with the client, so as per the customer communication; according to the

requirements specified by customer, the new features are added to satisfying the customer requirement thereby reducing time and cost which auxiliary help in modeling the quality assurance of software[8].

Some principles and values of agile processes which are becoming more effective in software development industry has been explained by [9] Harleen K. Flora, Swati V. Chande. They analysed that [9] agile strategies which have been using are not always beneficial; also they have their own advantages and disadvantages. Some of the familiar existing agile software development techniques with their objectives[9]. Agile techniques like Extreme Programming (XP), SCRUM, Adaptive Software Development (ASD),Feature Driven Development (FDD),Dynamic System Development Method (DSDM)share common fundamental principles but are different in practices[9].

[10]This paper portrays the review of three agile approaches including Extreme Programming, Agile Modelling, and SCRUM; specifying the differences between them and also suggests when to use them. [10] To do software development, agile methodology came into existence after the need for lighter way so as to accommodate changing technology requirements. [10]The main purpose of agile methodology is to come across what is required and when it is necessary.

Three significant indices such as communication load(which gives extend of communication), project priority and criticality have been presented by Alistair Cockburn [11] in order to characterize projects and recognize that different project attributes require different approach. [11]He evaluated Extreme Programming (XP) as being advisable for projects with people who are having a necessity so as to avoid having defects which cause loss of life.

Barry Boehm and Richard Turner [12] have used five dimensions affecting method selection i.e. personnel, dynamism, culture, size, and criticality by dividing the dimension space into two; agile and plan-driven techniques; by the analysis of these dimensions they came up with the idea that a hybrid approach exists at the boundary using which adapting XP to develop complexbroad-scale applications by suggesting components of plan-driven mode is explained.To present required big picture intelligence using design patterns and architectural key solving solutions these elements include high-level architectural plans instead of providing an elementary design to manage a foreseeable change [12].

In this,the known agile assessment methods were evaluated and each method was located with their advantages and disadvantages by Mina ZiaeiNafchi et al. [13]. Five Agile Assessment Models Sidky- agile measurement index (SAMI), 4-D Framework , OOP Framework, Comparative agility, Thoughtworks assessment model were reviewed and so the actual position of these methods was highlighted in calculating agility degree of organizations that are

planning of moving on to agile methodology.

Sidky agile measurement index (SAMI) is proposed by Sidky et al [14] taking into consideration four levels including agile levels, agile standards, agile practices, ideas and indicators. They managed all practices in few levels in such way that related practices; one's that can make considerable changes in process of agile acceptance efficiently.

A four dimensional framework is proposed by Qumer et al. [15] based on the features of flexibility, speed, leanness, learning and responsiveness to determine the agility of agile methods. A particular meaning of agile method is being introduced based on the four dimensions- scope, features, agile values and process.

Comparative agility (CA) proposed by Williams et al. [16] is a tool to analyse the agility level of people or organizations with opponents. Reasoning behind this tool is that it may not be regularly important to know the agility degree of a product organization, but also it should know about the position of the organization in comparison with other opponents.

A framework to acknowledge the goodness of agile methods Soundararajan et al. [1] is described under the name of OOP (objectives principles and practices). It assesses an agile processes based on its adequacy, the capability of the organization to apply this technique and the effectiveness of the processes in terms of meeting the expected outcomes.

III.OVERVIEW OF AGILE METHODS

There are number of agile methods(agile techniques) existing today. Different agile methods focus on different approaches such as project management, software implementation, collaboration practice etc. Some commonly used agile methods are:

i. Extreme Programming(XP)
ii. Scrum
iii. Feature Driven Development(FDD)
iv. Dynamic Systems Development Method(DSDM)
v. Agile Unified Process(AUP)

i. EXTREME PROGRAMMING(XP)

XP is a method which almost overcomes all the disadvantages of Scrum method. It is keener in the daily software development activities which improve the model in 4 perspectives such as simplicity, feedback, communication, and courage. Communication between Customers and developers are done here so that knowledge transfer between them will help in developing a successful model.

ii. SCRUM

Scrum is an experimental approach which enhances the flexibility, productivity and adaptability of software development model. In this, variables like requirements, resources and technology varies according to the customer needs on system

development phases which make the process complex and uncertain. This method can be implemented at any phase of the project, either at the beginning, or in the middle. This is commonly used for teams of less number of members. If more members are available, more teams are formed.

iii. FEATURE DRIVEN DEVELOPMENT(FDD)

FDD is a highly adaptive and a short iterative process that emphasizes performance at all stages. This will divides the problem domain into sub problems which can be solved in a small duration of time. Communication process may be reduced if these problems are independent to each other. It offers progress tracking, predictability and reporting capabilities if the customer requirements are stable. Scalability is more compared to other methods.

iv. DYNAMICSYSTEMS DEVELOPMENT METHOD(DSDM)

This method is best model for implementing business solutions for high level projects of big budget in a small period of time. It comprises of different phases in which each has a specific purpose and certain quality criteria that helps in technical and management issues. It is better to integrate other methods like Extreme Programming and Rational Unified Process with this method, because of the restrictiveness and complexity of work compared to other methods.

v. AGILE UNIFIED PROCESS(AUP)

It is a simple method that helps to develop softwares with more efficiency for business applications of small size, but adding more features to the system makes it complex. Tool independence is one of the main advantages of AUP such that any tool can be used according to the job.

IV. EVALUATION AND ASSESSMENT METHODOLOGY PERSPECTIVES

i) Capability

HosseinMehrfard et al. talk about how agile processes, specifically XP, do not have the necessary components to fulfill the FDA prerequisites for human factors necessities. A complete set of FDA requirements are discussed as a Mapping process between XP and FDA by extending the current method inorder to determine the capability of XP method to meet the regulations of FDA and found out that XP does not support this aspect[17].

ii) Adequacy

Joris van Geetassess the adequacy of tests in the form of documentation urged by the Agile process and eXtreme Programming (XP).Two criteria such as (1) level of test coverage and (2) test work environment (isolation factor) are used for this.eXtreme Programming (XP) have a tendency to minimize function, favoring working code over documentation. They do, nonetheless,

advocate the utilization of tests as a type of "living documentation". This exploration tries to make a starting appraisal of whether these unit tests can in fact serve as a type of undeniable documentation. With respect to the test scope we saw a strategy test scope of around 65%, which is a very good level, yet can be enhanced for documentation purposes[18].

iii) Effectiveness

Lisana assesses the effectiveness of Agile Unified Process by developing software for a private organization[19]. This was done by dividing the system into tiny iterations that carries out continuous tracking in different phases. A case study on a gold jewelry was conducted. The result showed that Agile Unified Process (AUP) methodology was effective in developing software whichinitial requirements were vague and incomplete[19].

Agile approach is used by a Small-to-Medium Enterprise (SME) programming engineers is analysed by Peter Clutterbuck [20].This study integrates the experiences of these supervisors, developers and clients to create a general assessment of the handiness of Web application conveyance by means of agile methods. They found out that every agile approach needs to be modified inorder to fulfill the engineer's product process.Effectiveness of Scrum and XP methods within a SME software developer is also done to find out the risks and advantages of it[20].

iv)People perspective

VikashLalsing et al.[21] investigates an Agile project management methodology, that compares with daily life projects and goes for recognizing the general population variables to be considered for an Agile group to be viable. This study aims at some degree of couple of mental variables that can influence group cooperation, for example, working memory, ideal experience and suggested group size in view of social practices. To accomplish this, threeAgile groups of various size will be utilized and made do with the same Agile standards. This study has been made solely in light of the Agile Methodology and inside of an association that is making utilization of Scrum.The exploration was made with a little gathering of comparable activities that contrasted by size and group estimate as it were. This work gives profitable knowledge to group pioneers to choose the fitting number and sort of individuals on every task[21].

V.METHODOLOGIES FOR ASSESSING AGILE PRACTICES

i. OPP Framework

Soundararajan et al.[1] proposes an Objectives, Principles and Practices framework is used for assessing the 'Goodness' of Agile methods such as FDD,XP and Method A based on three perspectives- Adequacy, Capability and Efficiency . Top-Down (Adequacy) and Bottom-Up (Capability and Effectiveness)

approaches are taken into consideration for this assessment process in an organization. It has been found out that XP is more adequate compared to the other two methods.[1]On the basis of Agile Manifesto Soundararajan et al. binded 27 Agile practices they have identified, to the agile values and nine Agile principles.

Parameter	Adequacy	Capability	Effectiveness
Approach	Objectives, Principles, Practices and Linkages are identified.	Process, People and Project properties are used.	Product and Process properties are used
Assessment	Top-Down	Bottom-Up	Bottom-Up

ii. CMMI

Mark Paulk assesses XP from a CMM point of view and infers that XP incorporates great designing practices, despite the fact that alert must be practiced in light of the fact that some of them might be questionable or even conflicting. By assessing XP from a CMM point of view, he communicates how both thoughts can be joined in a sufficient and synergic path with other administrative thoughts and rehearses. While XP gives a framework programming point of view, CMM gives a hierarchical procedure change viewpoint. The thought is that organizations can exploit each of them by adjusting and receiving their practices.

iii. Agility Assessment Model

TaghiJavdaniGandomani proposes an Agility model to find the Agility level of programming organizations. The model exhibited is anything but difficult to utilize and perfect to Agile standards and qualities. Concentrating on Agile practices, this study recognized the significance of Agile practices in being Agile. The underpinnings of the proposed model are Agile practices and their significance in accomplishing Agile qualities. Their main focus is on all practices rather than any particular Agile methods[22].

VI.RESULTS AND DISCUSSIONS

Measuring the agility degree of software companies and determining how agile is an Agile Software Development Method really is still a challenging task despite the availability of so many tools and techniques.

The practices indicated by Agile methods for achieving their specific objectives is called Agile Practices. So every Agile method has its own set of practices. As an example, regular meetings and retrospective, along with sprint review are some of the characteristics of Scrum methodology whereas pair programming, unit testing of the modules andrefactoring belong to XP practices [13].The number of agile practices taken into consideration for the assessment of agility varies from ten to hundreds. So to establish a certain tool or model is superior to some other is really difficult.

From an organisation perspective it is still a very good practice to identify the agility degree of a software company using some tool or technique best fit to the organisation's culture and to understand its relative position with respect to its competitors.

VII.CONCLUSION

From the study conducted, it could be concluded that Agile Practice works to the fullest when it is tailored fit to an organization's needs. The best approach is to adapt a hybrid model that is suitable to the organisation's goals and objectives. Methodologies and tools listed can be made use to determine how agile a chosen Agile Methodology is. Review conducted on Agile Methodology from various perspectives show us that the capability adequacy and effectiveness depends on that specific project or organisation and a general inference cannot be drawn.

REFERENCES

[1] Soundararajan, Shvetha, James D. Arthur, and Osman Balci. "A methodology for assessing agile software development methods." *Agile Conference (AGILE), 2012*. IEEE, 2012

[2] Melo, Claudia de O., et al. "The evolution of agile software development in Brazil." *Journal of the Brazilian Computer Society* 19.4 (2013): 523-552

[3] Larman, Craig, and Victor R. Basili. "Iterative and incremental development: A brief history." *Computer* 6 (2003): 47-56.

[4] Cronholm, Stefan. "Using Agile Methods?–Expected Effects." *Information Systems Development*. Springer US, 2009. 913-921.

[5] Rao, KudaNageswara, G. Kavita Naidu, and PraneethChakka. "A study of the Agile software development methods, applicability and implications in industry." *International Journal of Software Engineering and its applications*5.2 (2011): 35-45

[6] Maria Sagheer, TehreemZafar, MehreenSirshar. "A Framework For Software Quality Assurance Using Agile Methodology"

[7] Ionel, Năftănăilă. "Agile software development methodologies: An overview of the current state of research." *Annals of the University of Oradea, Economic Science Series* 18.4 (2009): 381-385

[8] Agile Manifesto, http://agilemanifesto.org/

[9] Flora, Harleen K., and Swati V. Chande. "A Systematic Study on Agile Software Development Methodologies and Practices." *International Journal of Computer Science and Information Technologies* 5.3 (2014): 3626-3637

[10] Nagwani, Naresh Kumar, and Pradeep Singh. "An Agile

Methodology Based Model for Change-Oriented Software Engineering." *International Journal of Recent Trends in Engineering* 1.1 (2009): 128-132

[11] Alistair Cockburn, "Agile Software Development." *Agile Software Development 2 nded (additions*)

[12] Boehm, Barry, and Richard Turner. *Balancing Agility and Discipline: A Guide for the Perplexed, Portable Documents*. Addison-Wesley Professional, 2003.

[13] Nafchi, Mina Ziaei, HazuraZulzalil, and TaghiJavdaniGandomani. "On the current agile assessment methods and approaches." *Software Engineering Conference (MySEC), 2014 8th Malaysian*. IEEE, 2014.

[14] Sidky, Ahmed, James Arthur, and Shawn Bohner. "A disciplined approach to adopting agile practices: the agile adoption framework." *Innovations in systems and software engineering* 3.3 (2007): 203-216.

[15] Qumer, Asif, and Brian Henderson-Sellers. "An evaluation of the degree of agility in six agile methods and its applicability for method engineering."*Information and software technology* 50.4 (2008): 280-295

[16] Williams, Laurie, Kenny Rubin, and Mike Cohn. "Driving process improvement via comparative agility assessment." *Agile Conference (AGILE), 2010*. IEEE, 2010

[17] Mehrfard, Hossein, HeidarPirzadeh, and AbdelwahabHamou-Lhadj. "Investigating the capability of agile processes to support life-science regulations: the case of XP and FDA regulations with a focus on human factor requirements." *Software Engineering Research, Management and Applications 2010*. Springer Berlin Heidelberg, 2010. 241-255

[18] Van Geet, Joris, et al. "A lightweight approach to determining the adequacy of tests as documentation." *Proceedings of the International Workshop on Program Comprehension through Dynamic Analysis*. 2006

[19] Lisana. "Review On The Effectiveness Of Agile Unified Process In Software Development With Vague System Requirements". ARPN Journal of Engineering and Applied Sciences. VOL. 9, NO. 10, OCTOBER 2014

[20] Clutterbuck, Peter, Owen Seamons, and T. Rowlands. "A case study of SME web application development effectiveness via Agile methods." *The Electronic Journal Information Systems Evaluation* 12.1 (2009): 13-26

[21] Lalsing, Vikash, SomveerKishnah, and SameerchandPudaruth. "People factors in agile software development and project management."*International Journal of Software Engineering & Applications* 3.1 (2012): 117

[22] Gandomani, TaghiJavdani, and Mina ZiaeiNafchi. "Agility assessment model to measure agility degree of agile software companies." *Indian Journal of Science and Technology* 7.7 (2014): 955-959