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A Review of Popular Agile Software Development Technologies

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Abstract

Over the past year, many software development technologies have been used. At first, Waterfall and V-models were used for software development, but these are heavy weight technologies. Now agile technologies are used. Agile is a group of software development technologies, which is based on iterative development. Agile technology is best to meet the rapidly changing customer's requirement. In this technology, the project is divided into self-organized teams. Scrum and Kanban are subsets of agile technology. In Scrum, backlogs are maintained that are "stories" of customer's requirements. In Kanban technology, Work is organized with a Kanban board. Kanban introduces change through incremental models and can be applied to any running process. This paper gives an analytical review of agile technologies, covering all the principles, advantages and disadvantages of using scrum with help of available literature.

Keywords: Software development; A-Dynamic systems; B-Adaptive software

Introduction: Section I

With the passage of time, many technologies have been introduced for software development. All of these have different principles, benefits and flaws. A software development technology is chosen according to system and customer's need. As for as the history of software development technology is discussed; Waterfall technology was widely used in the past. This technology is used when the requirements are clearly understood because it has no chance of modification. It is a non-iterative and high weight technology. If the errors are found at earlier stage then it costs less else modifications becomes very costly and even impossible. In this technology, the work is divided into phases and sub-phases. A phase must be completed to begin next phase. The advantage of using waterfall technology is that it is easy to use and understand. All the processes, phases and work in this technology is organized, scheduled and managed. But the huge drawback is that it is highly risky and uncertain to use.

Another widely used technology in the past is "Vee" model. Similar to Waterfall model as each Process must be completed before starting next stage. One difference is that verification and validation is performed at each stage. With the development of each phase, its testing is performed in parallel. Because testing is performed at each level so it contains less risks as compared to Waterfall model. But it is very rigid and inflexible [1,2].

Both of these technologies are non-iterative and non-flexible. The flaws of these technologies is filled by iterative technologies also known as agile technologies. Agile technology is widely used now a days. Agile technology is highly compatible with customer's rapidly changing requirements because customer is involved at each stage. Because requirements change rapidly so SRS is ignored in agile. There are many technologies which are iterative and are considered as agile technologies [3-5].

This paper is divided into four sections. Section II explains most widely used agile technologies. Section III briefly explains scrum technology. Last section IV gives conclusion and future work [6].

Specific Agile Software Methods: Section II

(A B M Moniruzzaman gives many reasons behind the agile method adoption and also give the percentage of many techniques used in agile methods (Figure 1). Conclude that reason behind the adoption of agile method is that success rate of project is very high there for majority of software developers like to follow the agile methodologies. The results shows in Figure 1 70% of participants indicates that they work in organizations that succeeded by using agile methods where as 15% of them asked they try to adopt agile method but cannot achieved the success point.

A. Dynamic systems development method (DSDM)

DSDM was primarily used as a software development method for solving complex problems. The principles and working of DSDM is similar to agile technology and it was released in 1994. DSDM technology is simple, straight-forward and extendable but it does not claims to solve all the problems. DSDM has nine building blocks as follows:

Focuses on customer and market needs.

- Change is incorporated according to customer needs.

- Change is reversible.

Figure 1: Success rate of different software models by Scott ambler.
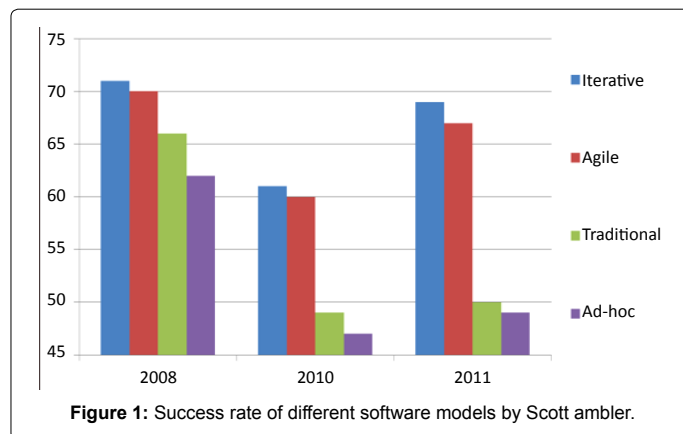
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- Involvement of end user is compulsory.

- Updates and increments.

- Authoritative and encouraged team.

- Focuses on quick, on-time and within the budget delivery.

- Quality is never compromised.

- Continuous communication and delivery.

Adaptive Software Development (ASD)

It was developed by Jim Highsmith and Sam Bayer and is a perfect replacement to traditional waterfall model. ASD is divided into four phases as describes below:

i) Communication and planning: In this stage, all the system stockholders are communicated and requirements are discovered. A complete documentation of system's process and needs is planned at this stage.

ii) Analysis: After customer approves the proposal, analysts analyses the documentation and system development begins.

iii) Design and development: ASD uses prototype approach for design and development. After the approval of porotype, development of actual system begins.

iv) Testing and deployment: In this stage test cases are prepared. First unit testing is performed and then all the units are integrated to perform integration testing.

Extreme programming (XP)

It was originally developed by Kent during his work at C3 payroll project. As it is agile technology, so the product is developed in frequent releases throughout the development cycle. Extreme programing has five rules:

i) Planning: At this stage customer needs are discovered and complete planning about system development is done. All stockholders are actively involved at this stage.

ii) Managing: After the entire requirement is discovered and primary documentation and planning is done; meetings are organized. At this stage, resources needed to develop the project are organized and teams are managed. Work and time is assigned to teams.

iii) Designing: At this stage system development begins. Spike solutions are developed to solve complex problems that may arise during development. CRC cards are used for designing sessions.

iv) Coding: All the units are coded at this stage. All the production coding is pair programed and the customer is always involved and available.

v) Testing: At this stage all tests are performed. First unit testing is performed. All the units must pass unit test before integration. After that units are integrated to perform integration testing.

Scrum: Section III

The term scrum was first introduced by Jeff Sutherland and Ken Schwaber in the early 90s. Scrum is an iterative agile technology. Scrum team works as a unit to achieve system's objectives and product is developed in continuous iterations. Before system development starts, Product backlogs are developed. Backlogs are discovery and description of customer's requirements. Product is developed in continuous sprints. Sprint is the amount of time given to the team to complete a specific task. Team members select a piece of task from product backlog and decide time in which this task will be completed. Sprint completion time is usually between one week and one month. When one sprint is completed, it is tested and is added to product backlog and next sprint is planned until the completion of whole system.

Scrum roles

There are three important roles of scrum technology. There can also be other roles involved in scrum technology but these three are most important and can be found in every scrum project.

These main roles are describes below.

The scrum team

Scrum team is group of individuals working together to achieve system's tasks. All scrum group members must communicate and corporate effectively to achieve system's objectives. As we know that Scrum project is achieved in continuous sprints; scrum team plans sprints to accomplish a specific task from backlogs. A scrum team works as a single unit and is well organized. Size of scrum team is small usually between seven and nine.

Product owner

The product owner is responsible for delivering working product which is according to customer's expectations. Product owner's role is like a leader because it maintains product backlogs and prioritizes the processes.

Scrum master

Scrum master does not have any management authority but it severs as a bridge between product owner and scrum team. Scrum master makes sure that the product and its processes work well and smoothly. It help product owner to maintain backlogs and prioritizing tasks and helps the scrum team to plan sprints.

Benefits of using Scrum

Advantages of using scrum are as follows

- The first and foremost benefit of using scrum is that it gives quick and effective response to market needs and demands.

- As the work is done in continuous increments and iteration so it is easy to incorporate rapid changes.

- It is cost saving and changes are reversible.

- Quality is main important factor in scrum. Scrum makes sure to provide as high quality as possible.

- Customer is involved at every stage of Scrum so usually the products developed using scrum are customer satisfied.

According to many author's surveys, Scrum and XP are popular among the many developers due to easy to manage software projects [7-9]. Scrum is helpful for managing agile methodologies and XP focus more on project level activities. In Figure 2 clearly describe the ranking of methodologies adopt by developers [10].

Disadvantages of using scrum

- Team management is very difficult task in scrum because everyone has different point of views. A product may fail or may lead to failure if team members are do not corporative and committed.
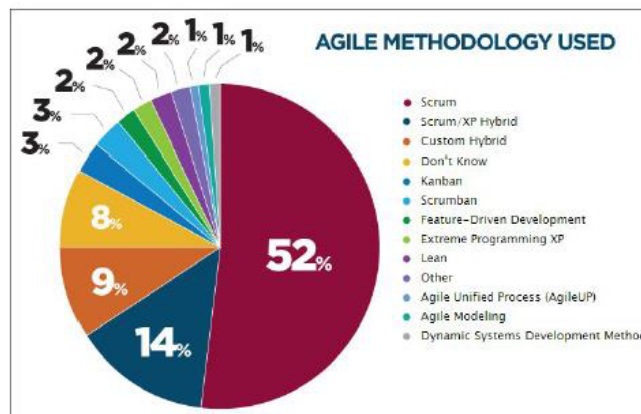
Figure 2: Ranking of Agile Methodologies used by various developers [10].
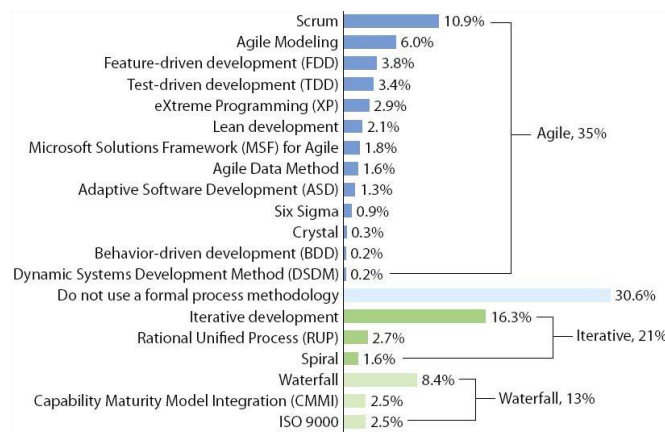

Figure 3: Agile adoption rates by Forrester Research in 2009 [12].

- Continuous meetings may be time consuming and frustrating.

- If a team member leaves during project development, it may cause trouble.

According to West and Grant, it is observed that agile adoption level graph is not only rapidly increased most of the developers main of the stream follow the agile methods standards [11]. Most popular companies including HP, IBM, Oracle, and Microsoft use Agile methodologies, moreover smaller organizations try to adopt Agile each year. West and Grant, conducted by Forrester Research in 2009, agile software development processes were in use in 35% of organizations, and another 16% of organizations used an iterative development approach, while only 13% of organization use a Waterfall approach. However, nearly 31% did not use a formal development methodology (Figure 3) [11].

Conclusion and Future Work: Section IV

As customer needs change unexpectedly so it is not fair to use waterfall model or Vee model. Because these technologies are unable to incorporate new changes. However, agile technologies may be useful in this context. Agile is a group of software development technologies. In this paper most popular agile technologies have been discussed. As in agile technologies, product is developed in iterations and continuous releases so end product satisfies customer's requirements. Selection of a particular agile technology is a complex decision and must be done

wisely. DSDM provides easy access from developer to end user but is not easy to understand. On the other hand ASD is user friendly. Extreme programing and scrum involves customer at each level but regular meeting can be frustrating. Simply speaking, all of agile technologies have advantages and disadvantages. A technology must be selected according to system's need which is developer's decision.

A future research can be done on which agile technology is better among all of them. A detailed comparison must be done between these technologies to identify results. This research will be very helpful for developers to decide a particular technology for their system development.

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