Successful Adoption of Agile Project Management in Software Development Industry

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Abstract: **At present, Agile Project Management has done an evolutionary change in software industry. Agile Project Management is defined as a conceptual framework which responds quickly to changes, collaborates with the client frequently and covers minimum amount of document needs. Agile methods facilitate the software development by performing incrementally and iteratively and thereby minimizing the risk. This literature review paper covers the aspects of agile project management in the software industry.**

Keywords: **Agile Project Management, Extreme Programming, Scrum.**

I. INTRODUCTION

Software development plays a main role in the modern society. Holding the top 10th position in professions in UK [1], time to time different methodologies for the development of software are introduced. One of the successful and most suitable methods for software development is agile software development methodology. Since developing a software is a project which can be said as a "temporary endeavor undertaken to create a unique product, service or result" according to PMI's PMBOK Guide 5th edition, agile project management takes a prominent place among the software development methodologies. Including Scrum and Extreme Programming there are many agile project management methods which are used widely. Well-known companies like Fuji-Xerox, IBM, Oracle, Honda, Canon and Toyota practice scrum and they have achieved four times the productivity and twelve times the quality of competitors [2]. This proves that agile project management has lead these companies to a high level of success.

With the growth of the software industry, it is important to follow the best practices to achieve the success in order to be stable in the industry. Since agile project management has proven the success of many software companies, knowing the in and out of agile project management is valuable.

This literature review paper provides various aspects of agile project management and how it can be helpful for the success of software development.

II. CRITICAL EVALUATION OF LITERATURE

A. What is Agile Project Management:

Agile project management is an iterative way of planning and guiding a project. Figure 1 shows the life cycle of agile. At the beginning the stakeholders determine the features which are going to be developed in the project. Product owner who is a key stakeholder write epics (large user stories) which require to be broken in to smaller pieces of work. Once an epic is broken into user stories, the user stories are prioritized and stored in a backlog. With regard to software development, agile software development is where the software is developed in iterative cycles, where all the phases are connected together and each phase being a feedback to the other phases [3].
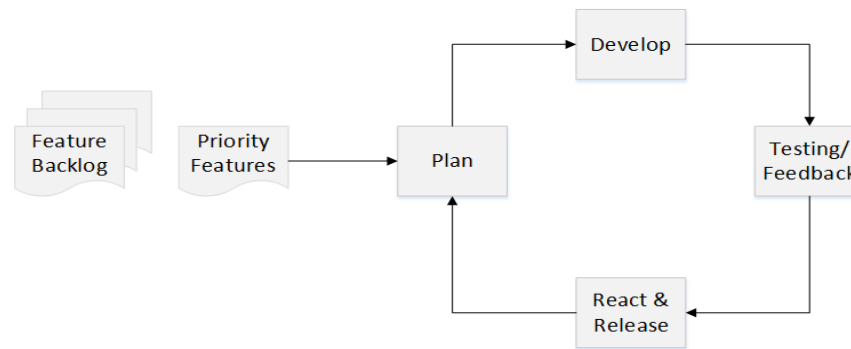
Fig. 1. Agile Life Cycle [3]

Agile methods are developed as a reaction to the traditional project management which is plan-driven. In case of software development, when following traditional project management due to the plans to be followed slows down the software development, Therefore agile methods have become prominent as a group of software development methodologies which are adaptive rather than predictive and are people-oriented rather than process-oriented [4].

Agile software development method is incremental, cooperative, straightforward and adaptive. Incremental is small software releases are done in rapid development cycles. Cooperative is the close relationship between the development team and the client. Straightforward refers that this method can be easily learnt and easy to modify. Adaptive implies the ability to respond to any changes produced at any moment [5]. An iteration may not add enough functionalities to release the deliverable to the market. Several iterations may require to release a complete product of a new feature [6].

B. Why Agile Project Management is suitable for Software Industry:

Due to agile project management's iteration and continuous feedback that provides to successively refine and deliver a product, continuous planning, continuous testing, continuous integration, light weighted than traditional project management approaches, inherently adaptable and since it collaborates people and make decisions quickly and effectively, agile project management is very much suitable for the software development in the software industry.

Agile project management methods decompose features in to smaller increments. These increments require only less amount of planning for a short term since an increment is time boxed to 1-4 weeks. The agile project management team is cross functional. Therefore each member works in every software development stage such as planning, requirement analysis, designing, developing, testing and implementing. At the end of each iteration a deliverable is presented to the client. Managing software in this manner makes the software adaptable and also mitigates the risk of failure [7].

C. How Agile Project Management is Beneficial for Stakeholders:

Organizations produce work to their best when the project management processes are simple. Using non-bureaucratic project management processes enables organizations to respond to client's requirements faster and flexibly. This allows the organizations to gain competitive advantage [8].

Agile project management practices daily, weekly updates. This allows the clients to adjust their requirements in order to achieve their desired needs accordingly. Since the client is also considered as a part of the agile team, this creates high transparency and allows greater input from clients throughout the software development life cycle. Due to the presence of iterations if any problems occur, the problems are fixed early and it reduces the possibility of reworking later in the process. If anything is missed, these can be found at the time to time demonstrations and then the project team can take corrective measures. This makes to save the cost of the project by identifying missing components or correcting faults earlier [9].

Due to the daily or weekly meetings with the stakeholders increase the relationship and it helps to focus developing the product together. And also since the agile team is cross functional it helps to solve issues quickly and interacts highly. Therefore the team becomes goal-oriented. This leads to make innovative and creative solutions [9]. Benefits are not limited to the collective team. Also the team members get benefited individually by being able to interact with other team members who are specialized in multiple fields.

Finally all these benefits lead to organizational benefits by increasing the productivity and producing high quality software products at the end.

D. Example: Developing a Software using Traditional Waterfall Method and Agile Method:

Scenario: A software which is to be handed over to the client in 10 months starting on 1st of January, 2018.

*1) In Waterfall Method:*
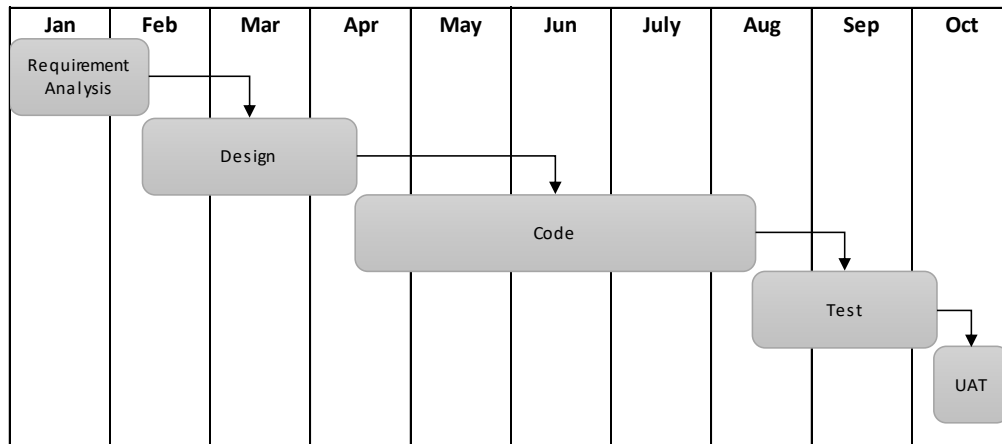
Fig. 2. Schedule for Software Development in Waterfall Method

According to the above:

1. 15% (1.5 months) for requirements analysis

2. 20% (2 months) for designing

3. 40% (4 months) for coding

4. 20% (2 months) for testing

5. 5% (0.5 months) for user acceptance testing

When the software is developed as above, the client is only able to see the product at the end of the project. If the client needs to do any changes it will be very costly and difficult.

2) In Agile Method:
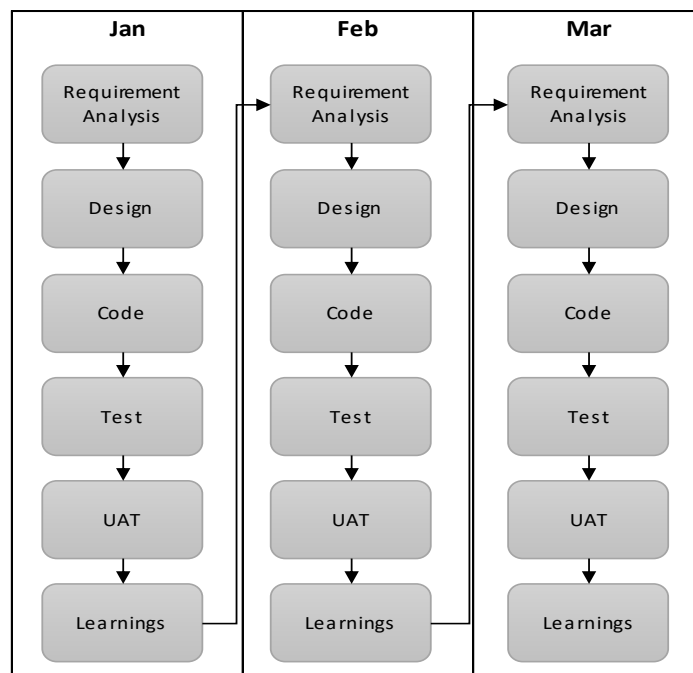
Fig. 3. Schedule for Software Development in Agile Method

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The above schedule continues until end of October, 2018. According to the above, the team is able to do changes easily with the use of feedback given at the end of each iteration and can take corrective actions in the next iteration to overcome the issue. At each iteration all the phases are covered which thereby the quality of the software product is enhanced.

E. Widely used Agile Methods:

At present many agile methods exist which follow the same concept. Most widely used agile methods are Scrum and Extreme Programming (XP). Apart from these two, lean software development, Crystal, Feature Driven Development(FDD), Dynamic Systems Development Method (DSDM) are also used.

1) Scrum Method:

Project risks minimizations and direct communication among stakeholders are the two most important concepts in agile project management. The risk is minimized due to the short iterations which focus on the clearly defined deliverables. communication among stakeholders helps the project team to adopt to the changing requirements. These two concepts can be realized through the Scrum method. "Scrum is an iterative, incremental framework for projects and product or application development" [10].

Scrum concerns mostly about team organization, planning of work and division of responsibilities. The scrum method was developed based on three main components. They are roles, events and artifacts [10]. A traditional project manager is not there in scrum. Instead of the project manager a Scrum Master is introduced. Following are the responsibilities of roles in Scrum.

1) The Product Owner handles setting project goals, handling the tradeoff of schedule versus scope, adapting to changing project requirements and setting priorities for product features.

2) The Scrum Master guides the team to prioritize their tasks.

3) The Team Members directly handle most of the task assignment, daily detail management, progress reporting and quality control for the product.
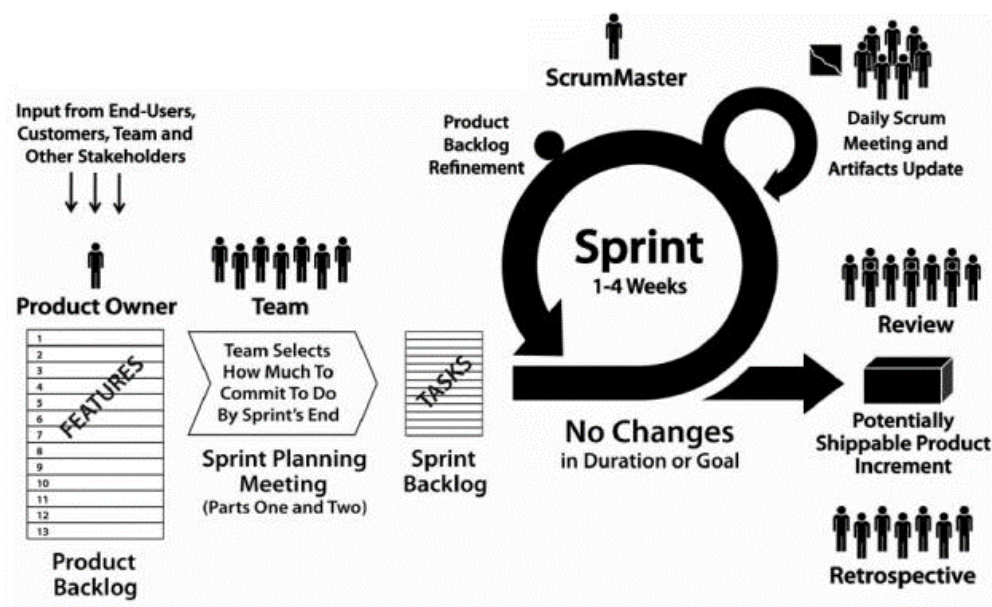

Fig. 4. Scrum Process [10]

Fig. 4 shows the summary of Scrum. In scrum, defining the product roadmap, releases and sprints, and project authorization are the initiation processes. So after initiation, during the first sprint (a duration of 1-4 weeks), structuring and planning the project occurs. However even at the first sprint a single feature of the product would be delivered. A Release Planning Meeting is followed in Scrum where a plan and a goal is set for the scrum team and for the rest of the organization. A sprint meeting is a meeting in which a sprint is planned and a goal is set for the respective sprint. In a daily scrum meeting, a day in a sprint is planned. So planning is carried throughout the project no matter traditional

aspects or agile aspects are followed. During each sprint, the tasks taken from the product backlog are executed. The deliverables in Scrum are always monitored and controlled with the help of daily scrum meetings and sprint retrospectives which are done at the end of each sprint. So each and every task is discussed within the group along with the entire progress. The overall closure of the project is closed finally. So during the very last retrospective the entire project's success is assed and closed.

2) Extreme Programming (XP):

Software development is done in XP with the support of its simplicity and feedback. In XP, requirements are represented as stories. Each story is a unit of work description. This describes how the system is executed. Using the story cards which are mapped into units of work are used by the XP team [11].

XP practices the software development in short releases. In XP, planning is done together with the client. The required effort to implement the stories is estimated by the software developers and the scope and release time are decided by the client. One of the specialties in XP is the client is available full time for providing feedback. Here the test-driven development is happened where the developers write the code for testing first.

3) Crystal Clear Method:

Alistair Cockburn originated the Crystal method. It's a family of methodologies (Clear, Yellow, Orange and Red). This method is based on the criticality of the project and the size of the project. The members in a Crystal team are about 1-6, 20, 40 or 100. The criticality of a project is determined in Crystal method is by the defects which causes loss of comfort, discretionary money and essential money. "As the team size grows, Crystal implementations change to add more formality to the structure and management if the project" [12].
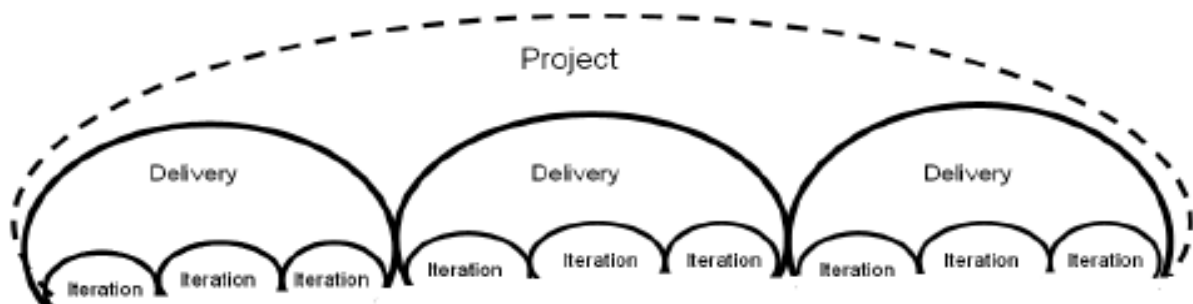
Figure 5: Iteration and Delivery Cycles within a Project in Crystal Clear Method [12]

Figure 5 shows the iterations and delivery cycles within a project in Crystal clear method. A delivery is happened once few iterations. An iteration in Crystal clear method is 1-2 weeks. Therefore once a month two releases happen. Therefore the client can give the feedback frequently. Because of the continuous feedback are received, the team improves the product to go to the right direction. The team can be co-located depending on the team size. But constant communication is available within the team. Since team members are free to raise their ideas the team can work comfortably. These lead the software development to a success.

F. Best Practices to be followed to adopt Agile Project Management:

When adopting agile project management in an organization, there may be objections and resistance. These can occur at three levels: management level, team level and customer level [13].

At management level the support given by senior management can be critical. Some of the managerial concerns have to be addressed prior to the adoption of agile project management. Traditional project managers like to work in predictable environments where it is easy for them to plan the project, estimate budget and allocate resources. But agile project management is focused on the value rather than getting framed to a process. Resource management also has a bit of a risk than a traditional project as changes are always accepted in agile project management.

Since the agile teams are cross functional, the team members should be able to have some kind of knowledge and skills in other areas than the area they are specialized in. So traditional teams may tend to refuse to work in agile because of the unwillingness to do all kind of work. This problem also has to be addressed in the team level.

The customer may also think agile project management is not successful and will think that it'll waste the customer's investment. So unwanted fears have to be sent away by making the customer well aware of the values of agile project management.

The traditional concept of a project manager's role has to be altered as a leader and a coach who shows the correct direction to the team in a very innovative and creative way.

In agile project management the resources may be distributed over different geographical locations and the team may be a virtual one. So the team members including the project manager should be able overcome the issues coming across and maintain the agile practices.

Once the misconceptions about agile project management are withdrawn, as the first step of adopting agile project, the employees in the organization especially the top level managers, project managers and key players in the organization have to get a well understanding of agile project management. For this they may take some education and understand all the in and out of agile project management.

Then the organization's readiness for agile project management has to be assessed. Importantly the degree to which the organization is willing to face the risks, accept the changes, value the deliverables than the procedures have to be assessed.

Then the project manager's readiness and team's readiness have to be assessed as they are the ones who are facing this new challenge. Then as the final step of preparation, the existing projects and the methods used to develop those methods have to analysed in such a way how the new approach is going to be deviated can be well understood.

When starting with agile project management, it is always encouraged to start with a small project rather than going for a complicated one. The reason is since this is the first time of applying the knowledge and first time of practicing, the risk of failing the project should be mitigated. In order to do that a simple small project which covers almost all the aspects of agility can be used. Thereby after obtaining the experience of how to work in an agile environment, with the time the organization will be able to practice agile very successfully.

III. CONCLUSION

The aim of this literature review article was to identify how successful a software development project can be by applying agile project management. Various studies have been found which justifies the fact that agile method is the most suitable method to develop a software.

Though there are many agile methods available only few are used widely. Scrum and Extreme Programming are widely practiced and proven results have been shown regarding the success of the projects and the organizations which practiced them.

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