The Impact of Agile Methodology in Modern Software Development

Santosh Kumar Vududala

Sanqa19@gmail.com
Independent Researcher

Abstract

In today's world software development is a complex process which requires requirements gathering, analysis, development, testing, delivery and maintenance. Over the last few years, there are different Software development methodologies in the IT industry like Waterfall, Incremental, Prototype, V-Model, Agile etc. In this competition world, companies do not need aSDLC model which consumes a lot of time and effort to develop a software. More time taken to develop the software will lead increased cost, competition and delayed time to market.Most of the projects have failed because they arenot able to respond to the changing user needs. This has encouraged the software engineers to propose flexible and effective techniques that help to develop quality software. The methodology impacts software development because it results in quality products. To mitigate these problems Agile methodology is a modern approach in software development. Agile methodology aims to meet the customer requirements with the deployment changes in the rapidly developing environments. Agile principles and innovative setup rules and protocols helps developers to overcome the challenges faced in the traditional waterfall model.The benefits of Agile include flexibility to change the requirements, enhanced product quality, cost effective, customer interaction, and continuous testing.This paper explains various ways in which agile methodology impacts software development. Italso describes benefits and limitations of agile methodology. This paper helpssoftware development companies to adopt thismethodology in order to develop software that meet their changing needs.

Keywords: Agile, Waterfall, Scrum, Frameworks, Sprint, Continuous Delivery, Continuous Improvement

Introduction:

Software development companies have constraint to reduce the cost of the project but the software delivery should be efficient. The continuous changes in the requirements, priorities of the customers and demands for convenience product delivery has forced to migrate into web-based services. But it required more resources to develop successful product. However, most of the projects have not been successful due to over budget and heavy costs incurred. The companies need a methodologywhich will allow the software development teams to resolve the challenges caused by the changing user demands with lesser cost.

The software engineering and design science communities have proposed a variety of flexible techniques, such as agile methodology in order to fix the challenges.Agile methodology is a modern approach which widely used in the software development. Agile methodology breaks a project related tasks into stages/sprints. It is an iterative and incremental approach in software development which has flexibility, early feedback, easy collaboration with customer throughout the process. There are many agile development

frameworks for different types of projects. Some popular frameworks within Agile includes Scrum, Kanban, Scaled Agile Framework (SAFe), Lean Software Development, Dynamic Systems Development Method (DSDM) and Extreme Programming (XP). While each approach has its own specific practices and guidelines, they all share the core principles of Agile and aim to deliver high-quality software efficiently and adaptively.

Literature Review:

This literature review on Agile methodology examines the key features, process, popular frameworks, advantages, approach to managing complex projects and how it is more popular methodology than traditional development models. The key differences between Agile and traditional waterfall model. Few real time examples who implemented agile and delivered the successful projects with low cost. This literature illustrates that Agile methodology significantly impacts modern software development by improving collaboration, adaptability, product quality and software outcomes. However, challenges in adoption and scalability suggest that organizations must carefully tailor Agile practices to their unique environments.

Key Benefits of Agile Methodology:

Flexibility: Agile designed to accommodate changesin the requirements even at later phases of the project. This will allow customer to change the prioritiesbased on the needs and market conditions.The frequent changes in requirements increase flexibility of the teams, which enable them to respond effectively. Flexibility to different changes enables them to develop high quality software in accordance to customer requirements.

Customer Satisfaction: Customer feedback is gathered on regular basis throughout the process which allowsproject team to find the defects early phases of the project before it become more sever. This has a significant impact on software development because itresults in high quality project that increases customer satisfaction. Customer will involve and provides the continuous refinement of requirements and features. This continuous feedback helps to meet user expectations and satisfaction.

Improved Team Collaboration: In Agile Process, Daily Scrum Calls (DSU's) will help the team members to communicate with each other. This will improve the transparency between teams and helps clients to get higher quality deliverables.The coordination activities in the team will increase positive emotions among the members and motivating them to fulfil the requirements of a project.The positive emotion of the agile methodology increases the team members to be more innovative and creative in solving different tasks of the project.

Risk Mitigation: Agile methodology helps to detect faulty pieces of code in good time because it allows the developers to test the system in each iteration.Iterative sprints allow early identification of the defects.These defects will be addressed promptly early in the development process to reduce the risk and costly rework later in the process. Testing will be performed after every code enhancement or bug-fix.

Continuous Delivery: It is important for the companies to conduct training programs in order to improve the decision-making process, which will lead to continuous improvements within the organization.Agile teams will deliver the working software incrementally and frequently at the end of each sprint which will be

twice in a month usually. The sprint demo willallowcustomer to see progress and provide feedback early in the process, reducing the risk at later stages and ensuring that the software meets user requirements.

How Agile is different than other methodologies:

There are various software development methodologiesin the market, but the most common used models are Agile and Waterfall. Each one has its own strengths and weaknesses.
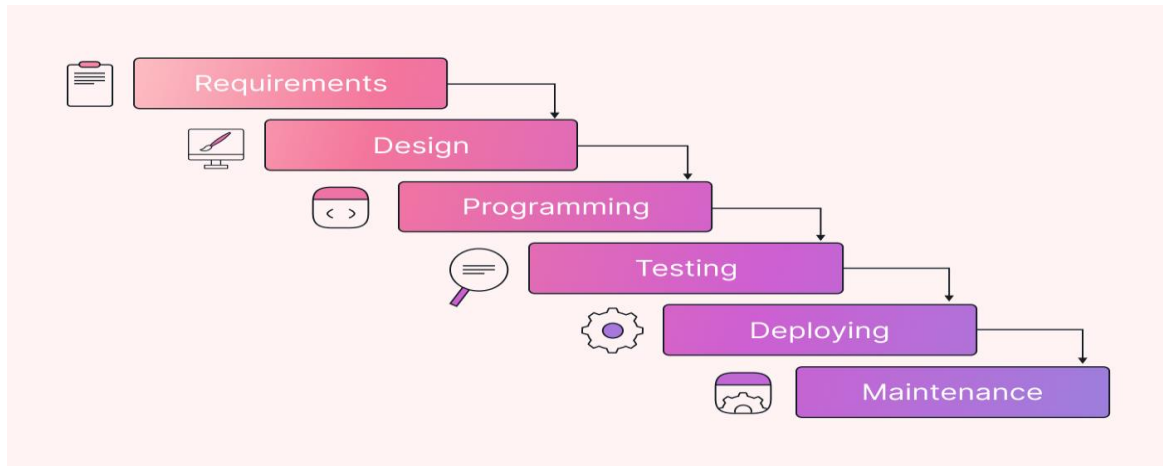
The waterfall is a sequential software development methodology whichis widely used project development and management. Waterfall has different phases like requirements gathering, analysis, development, testing, delivery and maintenance. Each phase must be completed before moving to the next phase. Waterfall has several drawbacks like minimal customer involvement, long delivery time, lack of flexibility to change the requirements, detailed documentation, late testing.

Agile is an iterative and incremental approach that prioritizes flexibility, collaboration, and customer feedback. Agile divides the project into manageable cycles called sprints. Agile will allow the teams to adapt to changes in the requirements and deliver functional components incrementally. This will reduce the risk of delivering a product misaligned with client expectations.
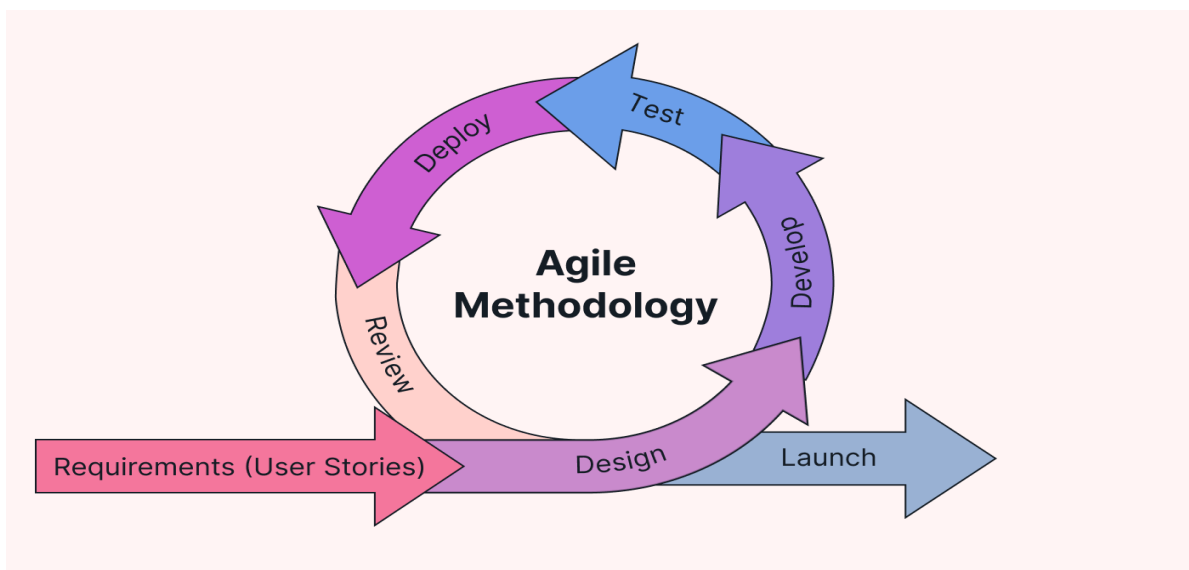
Below are the key differences between Agile and Waterfall models.

1. Flexibility:

Agile allows for continuous changes throughout the project lifecycle. Development teams can quickly respond to new requirements, feedback, or changes in business priorities. The agile methodology is flexible. even at a later point of the project it will allowto adjust possible changes, integrating knowledge and changing customer requirements. Waterfall follows a sequential approach where all requirements are fixed and changing them in the later stages will lead the delays the project. In waterfall each phase must be completedbefore proceeding to the next phase. This model is less adaptable than agile. This is suitable for the companies which hasclear requirements of what they are aiming from beginning to end of the project development because the project is planned out well in advance.

2. Interaction with Customer:

Agile will allowinteraction with customers and stakeholders continuously to ensure their needs are correctly met. Customer involvement, rapid iteration during development, finding and fixing the issues in the early stages,informal suggestions and communication helps projectsto be succeeded. Waterfall model starts with extensive planning and analysis with high interaction of the customer where his involvement is limited to requirement gathering phase only. Development phase will start once requirements are documented, and during this phase customer interaction is minimal. The defects may found at the end of the product as customer is not involved in the earlier stages of the process. Hence it will increase the cost and may lead customer dissatisfaction.

3. Continuous Improvement and Continuous Delivery:

In Agile, at the end of each sprint team will conduct retrospective meeting to discuss on what went well and what can be improved, promoting ongoing learning and process refinement.The project team may find genuine benefit by conducting frequent retrospectives to pinpoint opportunities for improvement. But Waterfall has limited opportunities for process improvement during the project as phases are fixed.Agile delivers functional product increments at regular intervals. This will allow stakeholders to see progress and provide the feedback early in the development process. In waterfallmodel product will be delivered at the end of the project. This can lead customer dissatisfaction due to poor/unexpected quality of the product.

5. Identifying Risk:

Agile will Identify and address risks early in the development process due to its iterative approach. Continuous testing will help to identify the issues and resolved quickly. In Waterfallrisks may identifiedat the beginning of the project or later stages in the project. Also risk response time will be very slow because all the phases are sequential and one will depends on another. This will potentially lead to rework and increases the cost.

6. Team Interaction:

Agileencourages frequent, iterative, cross-functional and daily communication in a collaborative work environment. Project teams will work in short sprints or iterations with regular daily stand-up meetings (DSU's) to discuss progress, roadblocks, and next steps. This collaboration is continuous across all the roles, including developers, testers, product owners and business stakeholders. Walter fall will follow linear, sequential process with different phases. During this process, interaction between the teams will be more

formal and completion of each phase. Teams often work independently and focus on completing their specific phase to move to the next.

Examples of Real-Time Implementations:

CISCO is one of the Global IT leading company in network is adopted to Agile methodology in their Subscription Billing Platform (SBP). It improved their efficiency in the product development and reduced the defects by 40% compared to waterfall model. Also increased defect removal efficiency by 14%.

Sony Group of Corporation which is a multi-industrial company is adopted to Agile and noticed that their project planning time reduced by 28% which made company to save $30M in a year.

Conclusion:

In Software Development Life Cycle (SDLC) Agile is better than all other development models where it provides flexibility, early feedback, continuous improvement and continuous delivery etc. However, waterfall might still be advantageous for projects with clear, fixed requirements and less emphasis on frequent changes. The choice depends on the project's nature, goals and constraints.

Reference:

[1] Williams, L. (2007). A Survey of Agile Development Methodologies. Retrieved from http://agile.csc.ncsu.edu/SEMaterials/AgileMethods.pdf

[2] Fergis, K. (2012). The Impact of an Agile Methodology on Software Development Costs from http://repository.upenn.edu/cgi/viewcontent.cgi?article=2017&context=cis_reports

[3] Amber, S. W. (2014). Communication on Agile Software Teams. Retrieved from http://www.agilemodeling.com/essays/communication.htm

[4] Global Knowledge. (2011). 12 Advantages of Agile Software Development from http://cs.anu.edu.au/courses/COMP3120/public_docs/WP_PM_AdvantagesofAgile.pdf

[5] Mark, L. C. (2014). Ten Benefits of Agile Project Management. Retrieved from http://www.dummies.com/how-to/content/ten-benefits-of-agile-project-management.html

[6] Waters, K. (2014). Agile Methodologies. Retrieved from http://www.allaboutagile.com/agile-methodologies

[7] Yoong, P., & Sidney, L. H. (2007). Managing IT Professionals in the Internet Age, Hershey; PA: Idea Group Inc. Zolyak, A. (2013). 8 Benefits of Agile Software Development. Retrieved November 20, 2013, from http://www.seguetech.com/blog/2013/04/12/8-benefits-of-agile-software-development

[8] Cao, L., Balasubramaniam, R., Kannan, M., & Xu, P. (2009). A framework for adapting agile development methodologies. European Journal of Information Systems, 18, 332-343. http://dx.doi.org/10.1057/ejis.2009.26

[9] Siau, K., Roger, C., & Bill, H. C. (2010). Systems Analysis and Design, Armonk; NY: M. E. Sharpe.

[10] Serena. (2007). An introduction to agile software development. Retrieved from http://www.serena.com/docs/repository/solutions/intro-to-agile-devel.pdf