IT Project Management in Waterfall Model v/s Agile

ITEC 640 – Information Technology Project Management (Spring 2020)

Individual Assignment

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# **Abstract**

Project management as a whole requires a lot of skills, experience, competency level and time. Additionally, the project management of the information systems is even more complex than that in any other field. In the history of the information system development projects, there have been many methods and processes evolved which try to address the drawbacks of other previous methods. Two of the most popular methods are agile and waterfall models which differ by far from each other. Some experts argue that agile methods do not require a project manager, they have a scrum master and a product owner to do collective project management. Where some other analysts argue in support of traditional project management style which can be applied in the agile method. In this research paper, the differences between the two methods will be described from the project management perspective. Also, the shortcomings of the waterfall model will be elaborated in detail and how they are addressed in the agile method will be discussed.

**Introduction**

Day by day the IT projects have been more complex because of the technology advancements and increasing customer demands. It is critical that the projects need to be completed on time and budget. So highly qualified project managers are employed to manage these projects and they ensure the customer’s requirements are addressed on a timely basis.

Many new methods have evolved to support the development process. The most popular among them are Waterfall and Agile methods. From many perspectives, these two methods have big differences. The waterfall model follows many traditional processes, whereas the agile method has the objective to satisfy the customer's requirements. Where the waterfall model has fewer and bigger releases, the agile method has small and continuous releases to the production environment. Each of the projects demands a management style that is apt for the process. Therefore, the question arises whether the project management methods can be applied in the waterfall model be applied in agile?

Before getting to a conclusion about the above thesis question, the project management processes in IT should be discussed and analyzed thoroughly. This paper will dissect the project management as a whole, explore more about the specifics of the project management methods in IT, deduce the differences between SDLC methods in brief and finally analyze the differences. That will lead to the answer if the traditional project management method will be applicable for agile methods, like scrum, extreme programming, and test-driven development.

# **Project Management in Information Technology**

Typically, project management in IT or information systems is more complicated than that in any other industry. The information system projects are difficult to predict as it requires different people from different skill sets and functional areas. Besides, the IT projects require a lot of creativity using a programming language, and in addition to that, the developed program is expected to be bug-free and is expected to work seamlessly. During the project development, there are many chances that the project requirements are changed on the fly. That makes it even harder to estimate the project from a time and effort perspective. Also, there are so many uncertainties in the functionality of a piece of code as it has many dependencies on the platform and environment. Because of a minor bug, there can be major project failures leading to heavy financial losses and many other losses. Therefore, effective project management in the case of information technology is extremely vital.

A typical notion about project management is just filling up forms, documents and reporting on the project progress. Rather, it is a job where you are challenged each day with new issues and problems. The project managers are called upon to be an effective leader, to function at the limits of their creativity, and to be courageous at all times.

Project Management Institute (PMI) defines project management as: "The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.". That is a broad definition of project management. However, to explain the above statement in detail, project management can be considered to be answering the below six questions.

1. What business situation is being addressed by this project?

A business situation can be is either a problem that needs to be addressed or innovation and untapped opportunity. For a problem, typically the solution is clearly defined and dictated by the customer, making the delivery of the solution is relatively straightforward. If the project team is not given with a predefined solution, then the project management approach changes to adhering continuous learning and discovery around the solution.

1. What does business need to do?

The answer to this question will be very straight forward and obvious, which is to create a solution for the problem mentioned in the first question. Despite the business is aware of the problem and the solution, the skilled resources may not be available to do the project. When the solution is not known or partially known, finding the complete solution is typically difficult. Either case, the business needs to document what needs to be done in a statement of solution requirements.

1. What will you do?

A project manager needs to create an objective statement with the goal of the project. A Project Overview Statement (POS) document will be created that will clearly state the intentions of the project manager.

1. How will you do it?

A project plan document will be created and submitted. In this document, the plan for each of the phases will be fully elaborated, like the plan for procurement, analysis, design, and implementation.

1. How will you know you did it?

The project should have a list of success criteria in the form of increased revenue or avoided cost or improved services. Regardless of the form of success criterion, the report should be created and displayed in a quantitative form. As part of the post-implementation audit, this report can be analyzed to showcase the success of the project.

1. How well did you do?

To answer the above questions, the project manager analyzes the four things within the team and optionally present this to the customer.

* Quality of the deliverables – The deliverables must meet the success criteria of the project.
* Project team performance – This might be an internal assessment where the project team will retroactively analyze how well they have followed the selected project model.
* The success of the project management approach – Assessment of the project management model followed.
* Lessons learned in the project and how they will be applied in the future.

As the above defines the project management in information technology, now we can see how these methods are applied in a different form of software development life cycle (SDLC). The following sections will detail out the project management processes that are typically followed in those methods.

# **Project Management in Traditional Waterfall Model**

The waterfall model is the most popular software development model which goes through the traditional project phases. Let’s discuss briefly about the phases in waterfall model before discussing more about Agile. The phases are listed below.

* Definition – Project proposal is created and submitted for sign off. The stakeholders are identified in this phase, who may be the subject matter experts or potential decision-makers.
* Analysis – Project needs are analyzed to create detailed requirements (Ahmed, 2012). A work breakdown structure may be created in this phase.
* Design – This phase is solely meant for creating the architecture of the proposed system (Ahmed, 2012). No coding is done in this phase, but the team may establish the specs such as programming language, hardware, and environment. Also, the procurement process starts in this phase and expected to finish before the next phase starts.
* Implementation – Coding is done using the platform and programming language identified in the previous phase. Typical small pieces of code are implemented and planned to be integrated at the end.
* Testing – Functional and non-functional testing takes place in this phase. A test plan is created beforehand specifying the approach for testing and the activities to be performed.
* Closing – Deployments and other deliveries are done in this phase. The team may provide user training and/or may create a user manual. Plan for maintenance may a part of this phase too.

## **Scope management**

The scope management is one of the most important responsibility in a waterfall project. “While doing things right is vital, it is not immediately clear in many organizations that the list and mix of the things they are doing and have planned to do over a given timeline are the "right" things: balancing the needs of the environment, capabilities, and assets of the organization with constraining factors such as risk, costs, dependencies, and resources to produce the optimal portfolio of investments (change initiatives), as aligned to the companies' missions, strategies, and objectives” (Davis & Radford, 2014). The project manager must ensure the team demonstrates the execution competence of the right things at the right time and maximizes the relevance. Therefore, the in-scope and out-of-scope features are identified at the beginning and outlined in the project plan document clearly.

## **Risk Management**

Another major challenge for the project manager in case of waterfall model is managing the risks involved in a project. Using a waterfall model to execute the project involves many risks. Typically, outcome of the project is ready only after all the phases of the whole project is completed after a prolonged period of time (Ahmed, 2012). Many unplanned or unexpected events may change the complete course of the project too. Risks involved in each phase must be identified beforehand during the analysis phase itself.

# **Project Management in Agile**

The agile method of software development is relatively new compared to the traditional waterfall model. This method is based on the agile manifesto and follows certain principles. There are many different types of agile methods, but all of them follow the principles scribed in the agile manifesto. The different types are listed below.

* + 1. Scrum
    2. Extreme Programming (XP)
    3. Test-driven development

Typically, these methods have a product owner, a scrum master and a development team. The product owner role is pretty analogous and comparable to a business analyst role in the traditional method. The product owner is responsible for communicating with the customer, writing user stories for the business features that need to be implemented in an iteration, and prioritizing the user stories based on their urgency. Then the scrum master’s role is to facilitate the meetings, remove impediments and ensure the development team is focused. Unlike the traditional method, the development lifecycles are shorter, and the teams are leaner. However, development lifecycles are repetitive and incremental. Therefore, the processes are repeated in every iteration. Here is a list of techniques that are applied in the case of the agile method (Layton, 2012).

* Frequent inspection of the product
* Welcoming changes and feedbacks
* Aligning the project with company goals
* Co-location of resources to the same workspace
* Self-organization and accountability
* Becoming a team player
* Elimination of “waste” and “ceremony”
* Demonstration of results
* Customer feedback is always a priority
* Focus on key planning events: product planning, release/feature planning, iteration planning

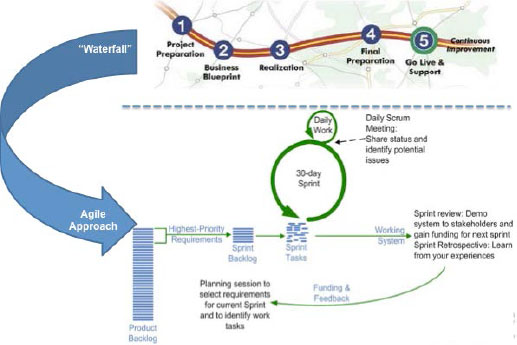
Having discussed the basics of agile methodology, now we can discuss more about the differences it has with the traditional waterfall model from the project management perspective and some of the challenges it has and how it can be mitigated.

## **Agile project management v/s Traditional waterfall project management**

As the project life cycles are completely different from each other, agile and traditional software developments follow different project management techniques as well. Here are a few differences between the two from the project management point of view.

|  |  |
| --- | --- |
| **Waterfall Model** | **Agile Project** |
| Long-term project plans with a fixed schedule timeline. Typically covers the low level and granular details about the project. | Shorter planning based on iterations and multiple deliveries. Typical sprint planning is a short meeting and requires less documentation. |
| Definitive and rigid project management and team roles. (Fair, 2012). Because of the specific team roles, people end up working in silo. | Flexible, cross-functional team composition, which makes exchanging roles and making the team more skillful. |
| Changes in deliverables are discouraged and costly. The requirements are scoped out from the beginning of the project and the scope boundaries are honored strictly. Changes are planned separately and considered as a shorter project. | Changes in deliverables are expected and welcome. |
| Fully completed product delivered at the end of the timeline. | Product delivered in functional stages and typically at the end of every iteration. |
| Contract-based approach to scope and requirements. | Collaborative and interactive approach to requirements. |
| Customer is typically involved only at the beginning and end of a project which sometimes creates confusion and delay in the project delivery. | The customer is involved throughout the sprint, which makes the requirement understanding smooth. Very valuable feedback from the customer is then implemented. |
| The linear-phased approach creates dependencies. | The concurrent approach seeks to reduce dependencies. As the implementations are done parallelly, it makes the delivery faster. |

As the below diagram displays, the phases in the case of the waterfall model are linear, which leads to "waste". However, in the agile method, the tasks are performed more synchronously. The project manager may monitor the progress of the project and guide the team if they deviate.



## **Challenges in Agile project management**

The iterations in agile are typically 2 to 4 weeks. So, the new changes, features, and enhancements will be released to the customer at the same frequency. Typically, many customers are not prepared to accept such a fast-paced release method. Getting frequent client feedback is also critical to discovering the complete solution and ultimately to project success, but the organization can't absorb change as fast as the agile project management (APM) models would like. That is also a challenge for the project team if they can support frequent releases along with demos, training, documentation, and support. From a project management perspective, these issues can be mitigated in many ways (Layton, 2012). Two of them are listed here (Wysocki, 2014).

1. Fully supported production versions of the partial solutions are released to production less frequently; maybe quarterly or semi-annually. This will facilitate the end-users to get used to the application change, gives sufficient time for the users to experiment with the new features released and provide their valuable feedbacks. Additionally, the project team will also gain valuable insight into the intuitive properties of the solution and see what the learning curve looks like. A part of the project team may be employed just to support the releases in the next iterations.
2. Intermediate non-production versions are released to a focus group every 2–4 weeks. This does not change the iterative release plan that the typical agile team follows. However, the versions are released to a group of subject matter experts but not to the production end-users. This lets the development team proceed on the new implementations and not just stand by and wait for end-user feedback from the quarterly or semi-annual releases. At the same time, the focus group would work on experimenting with the released non-production version to gain more insight and give feedback. The project team will work very closely with the focus group on every version of the solution—both those that are released quarterly to end-users and those that are not released. By the end of the production period, as the focus group is already comfortable with the release version, minimal documentation, training, and support will be required. It is recommended to choose the focus group members from all user groups, who can also provide some support to the end-users for the quarterly and semiannual production versions. That way they can become a conduit from the end-users back to the project team.

# **Conclusion**

With the development of new programming languages and other advancements in the information technology industry, there have been tremendous changes and evolution within the methods that are being followed in software development methods. As described above, the agile methodology may be considered to be far different from the waterfall model. So are the project management techniques.

Currently, there are highly experienced project managers who have more experience in the traditional waterfall model than the agile, which is relatively new. Since both of the techniques have the same end goal to deliver the final product and fulfill the customer’s requirement, some may debate that the waterfall project management techniques can be applied in agile software development. However, as the differences mentioned in the above sections, the traditional project management techniques may not suit the agile projects. The traditional projects go through sequential phases and the scope of the application development is bound by a contract or a statement of work. But the agile method supports ad-hoc change requests and typically tasks are carried out in parallel. Traditional project management has a specific time limit, which makes it easy to plan for. However, agile projects are long term projects and some time they are open-ended as well, which makes planning for the whole project near to impossible.

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