Original Paper

How North Valley Research Break a Dilemma: A Case Study of Project Delivery Approaches

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Abstract

North Valley Research (NVR) is a start-up technology company, which was established by two founders in 2010. Those co-founders are both from the research and development (R&D) department. In the early years of the company, the whole company paid more attention to R&D and neglected the development of project delivery methodologies. Therefore, traditional project delivery approaches were always adopted in NVR at beginning. With the rapid growth of the vehicle electronic control system market, there will be an opportunity for explosive growth of NVR. However, NVR found that it was difficult to expand its revenue margin. The leadership found that the traditional project delivery method cannot meet the requirements of NVR and have led a campaign called "Corner Stone" to adopt agile method. Unfortunately, after launching this alternative method, the productivity and efficiency of NVR were still growing slowly. After several trials, project managers applied a hybrid method to get out of the dilemma. Currently, while NVR has a short history, it is becoming a professional electronic products and services provider. In addition, NVR has a large proportion in the engineering machinery market segment. It has a huge customer base, which includes Volvo, Sany, Zoomlion, and so forth.

Keywords

Project delivery methodology, Hybrid project management method

1. Introduction

As an electronic engineer, I had worked in North Valley Research (NVR) for almost 9 years. NVR is a start-up technical company, which provides professional electronic control systems for vehicles, such as telematics service, IoT service. The vision of NVR is Become leading supplier of electronic control and IoT service for Off-Road equipment. There are only 200 employers in this company, while more than 100 are electronic and software engineers. In addition, the founders of NVR also have technical

background. Therefore, the majority of employees can identify the company's culture, which is Better technology serves more people. With the development of NVR, the management has realized that the traditional project delivery methodology cannot meet the requirement. Simultaneously, agile method as a new project delivery approach is introduced into NVR. However, with the implementation of agile approach, NVR still struggle forward.

NVR as an example for the case study introduces the background, context, strategy, objectives, and barriers of NVR. This case study will illustrate the definition and strength of waterfall, agile project delivery methods, and analysis the difference between each project delivery approach, recommendations and reflection about a new hybrid methodology called agile-waterfall approach.

2. Project Delivery Approaches

As a technology company, NVR has experienced a process from traditional project delivery model called waterfall methodology to an alternative approach called Agile methodology. This charter will introduce the definition of those two approaches.

2.1 Waterfall Model

In the NVR's early days, waterfall model is the major applied method. At that time, the requirement of product is fixed and single. In addition, leadership also attached importance to the documentary output. Therefore, waterfall method can meet company's demand in the beginning. Originally, the waterfall method was created in the construction and manufacturing industries. Those industries both contain a highly structured physical environment, which means a small design change can lead to huge costs in the development phase. Just like its name waterfall, which breaks project activity up into linearly continuous phases, each phase depends on the results of the former phase and accommodates task specializations (Adel & Abdullah, 2015; Ajam, 2018). Typically, this method flows primarily in one direction from the stages of requirements, analysis, design, implementation, testing, operation or deployment and maintenance (Fagarasan, Popa, Pisla, & Cristea, 2021). Figure 1 below shows the whole process of waterfall model. Just like the figure shows, it is a linear method. Generally, each phase finishes before, then the next phase can start. This model suits for certain projects which change is uncommon. That means waterfall model requires a clearly defined requirement ahead.
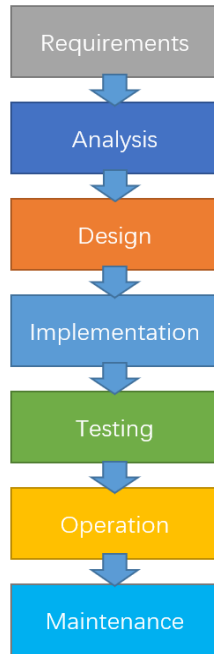
Figure 1. The Phases of Waterfall Model

2.2 Agile Model

With the development of NVR, the management vigorously promote agile model. Agile approach is a method for project management by dividing a project into several phases, which includes Scrum, Lean and Kanban (Petersen & Wohlin, 2010). Those methodologies use short cycles to build products. That means it can deliver new products rapidly and can revise constantly (Petersen & Wohlin, 2010). Actually, agile model is derived from lean thinking, which applies the concept of lean methodology. It involves continuous cooperation with stakeholders and constant improvement at all phases (Petersen & Wohlin, 2010; Bagiu, Avasilcăi, & Alexa, 2018). When work begins, the team goes through a planning, execution, and evaluation process. In addition, constant collaboration is critical to both project stakeholders and team members. Currently, scrum approach and lean method are widespread in NVR.
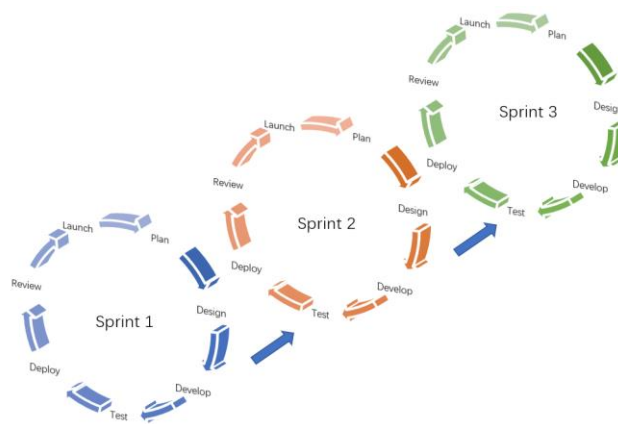

Figure 2. The Process of Agile Method

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Firstly, scrum is an agile development technique applied to develop software depended on incremental and iterative processes. Scrum is an adaptive, flexible, fast and effective agile methodology designed to provide value to clients throughout the development of a project. The major goals of scrum are to meet customers' needs by communication transparency, shared responsibility and an atmosphere of continuous evolve. Secondly, lean methodology is a continuously improving work objectives, staff and processes. It is becoming a widespread management method for creating value and optimizing work processes (Fullerton, Kennedy, & Widener, 2014). Typically, each enterprise always expects to expand its revenue margin. It is the reason why lean methodology is becoming more popular all over the world. This method focuses on offering more value to clients and reducing waste simultaneously (Abdallah, Dahiyat, & Matsui, 2019). In other words, it can help a company boost its efficiency and increase employee productivity. In addition, respect for individuals and continuous improvements are the two main heart of lean management. Lean management seems like a guide for identifying and creating value by optimizing resources to the customers. It depends on the actual clients' requirement. In addition, continuous improvement and respect for people are two major parts of lean method.

3. Analysis of Project Delivery Approach

Why need NVR develop its project delivery approach from waterfall to agile? It is because the weakness of waterfall model and the strengths of agile model. In terms of waterfall approach, the most significant strengths are its unchanged costs and predictable output. However, the greatest weakness is its inflexibility. With regards to agile methodology, which is significantly flexible. The output of agile method even can evolve into an extremely different product with original design.

In addition, there are also several differences between agile and waterfall model. Firstly, the process of waterfall approach and agile approach is varied. Waterfall approach is single direction. However, agile model is a iterative process. Secondly, the three constraints of each model are also different. Typically, the traditional waterfall approach is based on three constraints: time, cost, and scope (Ajam, 2018; Khoza & Marnewick, 2020). Adjusting one of these three variables can lead to at least one of the other variables to change. In terms of a successful project, the project manager needs to keep balance among these three interacting variables. Furthermore, adding resources to a project does not always lead to the desired objectives. In fact, adding resources late to a project is harmful. However, agile methodology adopts a different method by turning the triangle downside up, just like the figure shows below (Khoza & Marnewick, 2020). Agile approach does not consider the scope to be fixed from the beginning, while it fixes the schedule and cost. And then project scope is adjusted to focus on the first priority. Agile is constructed with the expectation that scope will evolve over time. The objective is to meet the cost of the budget and the customers' most important requirements within the time frame. Agile approach allows stakeholders to change requirements and priorities as projects progress.
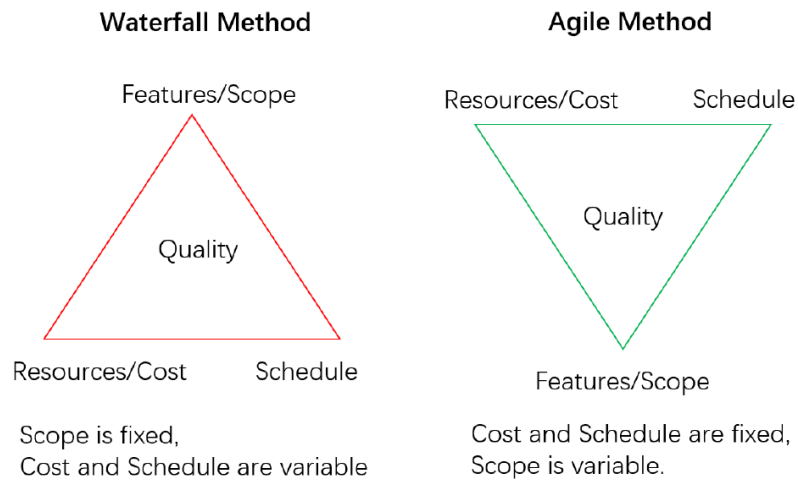
Waterfall Method   **Agile Method**

Features/Scope   Resources/Cost   Schedule

Quality   Quality

Resources/Cost   Schedule   Features/Scope

Scope is fixed,   Cost and Schedule are fixed,
Cost and Schedule are variable   Scope is variable.

Figure 3. Waterfall and Agile (Khoza & Marnewick, 2020)

In summary, the difference between waterfall methodology and agile methodology can lead to different result. Even though there is no exact success rate of software development project in NVR, software development association report can illustrate the general trend. According to the latest Standish Group report, which covers software development projects surveyed between 2013 and 2017. The overall distribution of successes, challenges, and failures during this period is shown in figure below for Agile methodology and Waterfall methodology (Vitality, 2022). Agile methodology can be about twice as successful. However, the probability of failure is reduced by 1/3.

4. Recommendation and Reflection

After analyzing the definition, strength and difference between waterfall approach and agile methodology, agile method seems more suitable for software development. In fact, NVR as an IT company also planned to abandon Waterfall model and embrace the Agile model. However, NVR have found it difficult to completely transfer from traditional method to agile approach. At that time, the whole company seems in a dilemma: both methods are not suitable for NVR. The management have to review waterfall methodology and agile methodology. They found that the strengths of traditional method can combine the strengths of agile method.

Firstly, waterfall model defines the deliverables early in the project life-cycle, so that planning and designing is more straightforward. Secondly, due to the fixed project scope, project progress can be measured easily. Thirdly, the outputs can be designed carefully, which contains less uncertainty (Adel & Abdullah, 2015; Ajam, 2018). In addition, agile method also has strengths, such as suitable for changing requirement, and it is extremely flexible. Therefore, a hybrid of those two approaches seems a better way for companies, especially the organizations which found it hard to transfer from traditional approach to agile. Agile-Waterfall approach hybrid combines the strengths of both approaches. That means this method can be adopted to both hardware development and software development. The reason why these two approaches work in harmony is that agile is an approach rather than a mindset, so

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agile can be used alongside with waterfall approach.

- Hardware teams work within waterfall methodology, while software teams stick to agile approach.

- At the enterprise level using agile methods while for requirements, design, and implementation using waterfall methods.

- In terms of low-risk projects, using a plan-driven waterfall method to keep costs down. For high-risk projects, using agile approach to repeat the activity until all issues are identified and addressed.

- With regard to projects with tight turnarounds, agile approach can satisfy customers.

- For extremely complex projects, the result of agile approach is more favorable.

In fact, agile-waterfall approach brings NVR out of the dilemma.

5. Conclusion

NVR is a technology company developing both electronic products and software applications. Neither traditional project delivery approach nor agile approach are suitable for this company. However, with the applying of agile-waterfall hybrid approach, NVR is out of the dilemma.

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