Application of Scrum Maturity Model: A Case Study in a Telecommunication Company

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Abstract. Digitalization and internet penetration force telecommunication companies to perform a transformation to survive, to face competitions, and to gain opportunities. PT XYZ is a telecommunication company that has introduced a new leaner and agile working method for digital transformation. The organization is undergoing a transformation to implements an agile approach using a scrum framework. There are two divisions that use scrum that currently plagued with time estimation difficulties and inability to create an agile backlog due to the old change request mechanism. Scrum Maturity Assessment (SMM) is used to measure current scrum practice maturity. The data is retrieved using a questionnaire that was given to two Scrum Master from two divisions which have been implementing Scrum. There are 83 questions derived from SMM assessment questions. SMM assessment indicated the scrum practice is Level 1 (Initial). There are 31.76% of scrum practices in IT division and 36.25% of scrum practices in CS division need to be improved to achieve Level 5 Optimizing. In order to achieve Level 5, we proposed 38 steps and six recommendations which will guide the scrum practice improvement process.

1. Introduction

Digitalization and internet penetration are an opportunity in the telecommunication industry. However, fierce competition among telecommunication companies in a changing business landscape forces them to perform the transformation in order to survive and to gain advantages. Service quality and customer experience are top priorities for a telecommunication company in order to survive and to stay competitive [1].

Telecommunication is a mature industry that currently hard to deliver service satisfaction to fast-changing user requirements especially among the young generation. It pushes them to take up an agile mindset in order to maintain existing market share and remain competitive [1]. Agile takes customer satisfaction as the highest priority [1]. Scrum is one of the widely used agile frameworks.

PT XYZ is one of the biggest telecommunication companies in Indonesia that introduced a new leaner and agile working method for the last couple of years for the digital transformation [2]. Corporate Strategy (CS) and Information Technology (IT) division are divisions that utilize Scrum for inhouse project and development process. Scrum has been applied by IT since 2016 and by CS since 2017. Scrum helps the company to speed up the development process by aligning top priorities user requirements and smaller deliveries. Scrum is lightweight, easy to understand, however difficult to implements correctly [3].
1.1. Problem analysis
Scrum is currently implemented as a replacement for predictive waterfall methodology. The transition is plagued by estimation difficulties during sprint planning which made the sprint rhythm does not follow the common practices. Another issue arose from business to create fast and dynamics requirements that are hindered by the old change request mechanism. In order to analyze the problems, we categorized problems into four problem domains, namely process, technology, human, and organization [4]. The problem is analyzed using fishbone (Figure 1) to obtain root causes [5]:

- **Process.** Legacies processes that were created using predictive waterfall methodology induced barrier to fully implement new agile and dynamics processes.
- **Technology.** Some applications and legacy systems are difficult to integrate into continuous integration/continuous deployment (CI/CD). The use of CI/CD in the agile approach helps ensure software development processes become more agile and adapt more quickly to frequent changes. The selection of the software is limited by those that are approved by the company. The limited software selection can disrupt the agility of the company in making a change or create a new product and features.
- **Human.** People are not ready to change their mindset to agile from their predictive habit. The agile approach requires any change from a fragmented functional structure, task and result oriented into a cross-functional structure, autonomous, and value-oriented.
- **Organization.** There is fragmentation among divisions. Some divisions use predictive functional management that creates division silos. Unpreparedness among divisions makes it hard to adopt agile to achieve company-wide agility.

1.2. Research questions
Problems in 1.1 have made us ask: "What is the current maturity level of the Scrum at the company? What are the recommendations to improve the Scrum application?". The purpose of this study is to provide recommendations to the company to improve scrun implementation by measuring the scrum practice maturity level and perform improvement analysis of scrum practice.

2. Scrum maturity model
The maturity model enables an organization to evaluate and classify its capability and encourage it to improve capabilities through a staged method [6]. The most widely used maturity model is Capability Maturity Model Integration (CMMI) [6]. Most companies found that it is difficult to get a higher CMM level [7][8][9][10]. Utilizing CMMI for agile methodology is also a challenging issue. Hoogveld and Koster [11] compared various agile maturity models and provides insight on how to choose a suitable maturity model. Among various agile maturity models, there is Scrum Maturity Model (SMM) [6] which is designed specifically for scrum practice. Hoogveld and Koster [11] classified SMM into an agile maturity model with a high level of detail and applied in practice. Another case study utilizing SMM is
research by Costa, R. et al. [12] that improve the obedience of an agile development project to scrum. Costa, R. et al. [12] indicates SMM as a maturity model to assess the condition of the company before and after implementing improvement. The result indicated a good improvement in the scrum application. In this study, we use SMM as a maturity model to evaluate and to make improvements to the scrum practices. SMM by Yin [6] proposes five levels of maturity, which are:

- **Level 1: Initial.** This level is the earliest level of an organization in adopting Scrum. This level is marked by the absence of Goals and Process Definition or its improvement.
- **Level 2: Managed.** Level 2 is a more structured and complete level of scrum practice. In this level, there are two goals that become criteria, namely (a) Basic Scrum Management and (c) Software Requirement Engineering. There are seven objectives of this level namely (a) Scrum Role Exist, (b) Scrum Artifacts Exist, (c) Scrum Meeting Occur and are Participated, (d) Scrum Process Flow is Respected, (e) Clear Definition of Product Owner, (f) Product Backlog Management, and (g) Successful Sprint Planning Meetings.
- **Level 3: Defined.** Level 3 is the level of the practice of Scrum that focuses on the relationship with the client with the delivery of products that suit the time. There are two goals at this level, namely Customer Relationship Management and Iteration Management. There are six objectives of this level namely (a) Definition of Done Exists Product Owner Available, (b) Successful Sprint Review Meetings, (c) Sprint Backlog Management, (d) Planned Iterations, (e) Successful Daily Scrum, and (f) Measured Velocity.
- **Level 4: Quantitatively Managed.** Level 4 is the level of the practice of Scrum levels of the organization that is more standardized and development tools software that comes with the management performance through measurement and analysis. At this level, there are two main goals namely (a) Standardized Project Management and (b) Process Performance Management. There are two objectives of this level namely (a) Unified Project Management and (b) Measurement and Analysis Management.
- **Level 5: Optimizing.** The level of the practice of Scrum most top which is already focusing on the improvement of sustainability to be the best in the competition and give satisfaction is good for consumers. The Goal at this level is Performance Management. There are two objectives of this level namely (a) Successful Sprint Retrospective and (b) Positive Indicators.

### 3. Research design and methodology

**3.1. Research design**

Our research design is a case study at a telecommunication company with a specialization in the application of project management based on the Scrum approach. We used mixed-method sequential explanatory as our research method and inductive method to take a conclusion.

We used the model from SMM as the basis of the quantitative part to measure the maturity of scrum application. The quantitative part of the research instrument uses the scale of Yes (1-fully performed), No (0-not performed), Partial (0.5-partially performed), and N/A (not applicable) which have been used in the Agile Maturity Model [13]. In the qualitative part, we continued the results of the quantitative section. We processed it using gap analysis to identify which part of the scrum maturity section has not been implemented. The results of the gap analysis are recommendations for improving the application of scrum. We asked experts and stakeholders to validate the recommendations using open-ended questions and processed the result using a narrative approach.

**3.2. Research methodology**

We designed the research into five phases, there are (a) research background, (b) literature review, (c) questionnaire processing, (d) gap analysis, and (e) expert validation and conclusion phase. Our research methodology is described in Figure 2.
The research background phase contains how issues explored through interviews of the PT XYZ’s parties which implement projects using Agile. The interview results are then analyzed using gap analysis so we could get problems are faced by the company. The literature review phase is an exploration of the research and sources of knowledge that are associated with the problems that occurred found in the research background. Then, from the literature review, we could find a suitable research design and research instruments were used as a reference to solve the problem.

Retrieval of data using a questionnaire that was given to two Scrum Master from two divisions that have been implementing Scrum. The scrum masters have more than ten years of experience in software development. The questionnaire processing phase is a phase to obtain a baseline of current conditions and practice applied in the company. There are 83 questions derived from SMM assessment questions. The questions span across seven goals and 18 objectives. Calculation of the questionnaire data uses an equation that is adopted from research by Patel and Ramachandran [7]. The equation is:

$$R = \frac{\sum N_{yes} + \sum (0.5 \times N_{partial})}{P - P_{N/A}} \times 100\%$$

which R is a result in percentage, $N_{yes}$ is a total question with “Yes” answer, $N_{Partial}$ is a total question with “Partial” answer, $P$ is a total question, and $P_{N/A}$ is a total question with “N/A” answer.

The results are then used as material to build improvement steps and recommendations. The validation phase is a phase to validate the steps and recommendations by an expert according to best practices and the company. The expert is from an external company that has work experience for 11 years in the field of IT and currently is working as the manager of the project of IT with the environment Agile. The company representative to validate is a Scrum Master who has working experience for two years as Scrum Master and more than ten years of working experience. The results of the validation are used to answer the research question about improvement recommendations.

4. Result and analysis

4.1. Assessment result

Table 1 is a result of the scrum maturity assessment of two divisions. A higher percentage indicates a more mature Scrum practice performed. Overall, from all objectives are used to assess the maturity, we found that the average implementation of the scrum is 57.8% with 63.9% in the CS division and 51.8%
in the IT division. Partially, the average scrum implemented is 37.5% with 26.5% applied in CS and 48.2% in the IT division. Under 5% of the scrum, practice is not fully implemented in the divisions.

From the presented data, we also can get information that the IT division has implemented scrum all the practice but not all the practices are fully applied in the division (51.8% fully applied, 48.2% partially applied). In the CS division, there are 6% of practices which not applied yet, but CS division has a higher value in fully performed practice (63.9%).

**Table 1. Scrum implementation assessment result.**

|                  | ‘Yes’ Answer | ‘Partial’ Answer | ‘No’ Answer | N / A |
|------------------|--------------|------------------|-------------|-------|
|                  | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| CS       | 53    | 63.9%   | 22    | 26.5%   | 5     | 6%      | 3     | 3.6%    |
| IT       | 43    | 51.8%   | 40    | 48.2%   | 0     | 0%      | 0     | 0%      |
| Average  | 48    | 57.8%   | 31    | 37.5%   | 2.5   | 3%      | 1.5   | 1.8%    |

From the Scrum Goal perspective of SMM in Table 2, we can see that there is no division to implement SMM’s goal fully. The average Scrum Goal application is 64.4% with 60% in the CS division and 68.87% in the IT division. The Scrum Goals need to be fulfilled 100% to reach maturity at each level.

Table 3 is table implementation of the SMM per Level. From the table, we can conclude that currently, PT XYZ has not reached Level 2 yet in the Scrum Maturity Model. The company is in the Initial Level (Level 1). However, we also see that not many things need to be applied to reach Level 2 or even Level 3. Level 2 can be achieved by applying only less than 21% of practices. But to achieve all level of SMM, the company need to improve the application of Scrum with apply 31.76% of practices in the IT division and 36.25% of practices in CS division.

**Table 2. Percentage of SMM’s goal.**

| Goals                                      | Max Value | CS          | IT          |
|--------------------------------------------|-----------|-------------|-------------|
| Level 2 Basic Scrum Management              | 28        | 23.5        | 83.93%      |
| Level 2 Software Requirement Engineering   | 14        | 10          | 71.43%      |
| Level 3 Customer Relationship Management   | 9         | 7.5         | 83.33%      |
| Level 3 Iteration Management               | 19        | 14.5        | 76.32%      |
| Level 4 Unified Project Management         | 1         | 0           | 0.00%       |
| Level 4 Measurement & Analysis Management  | 2         | 0.5         | 25.00%      |
| Level 5 Performance Management             | 10        | 8           | 80.00%      |
| Average                                    |           | 60%         | 68.87%      |

**Table 3. Percentage of SMM’s level.**

| Level | Max Value | CS Percent | IT Percent |
|-------|-----------|------------|------------|
| Level 2 | 42 | 33.5 | 79.76% | 35 | 83.33% |
| Level 3 | 28 | 22 | 78.57% | 19.5 | 69.64% |
| Level 4 | 3 | 0.5 | 16.67% | 1.5 | 50.00% |
| Level 5 | 10 | 8 | 80.00% | 7 | 70.00% |
| Average |       | 63.75% | 68.24% |

**4.2. Improvement steps and recommendations**

We analyzed the results using the gap analysis. The gap is the difference between the results of the assessment and the maximum scale on the SMM. We propose improvement steps to reaching each level.
in the SMM framework which applied partially and not applied yet category from the assessment. The improvement steps are in (a) Scrum team commitment and coordination, (b) changing mindset of scrum, (c) maximizing supporting tools for scrum, (d) building an environment, (e) regulation, and (f) KPI with right metrics for scrum team. The total steps are 38 steps where 14 steps for improvement to level 2, 19 steps to level 3, three steps to level 4 and two steps to level 5.

Recommendations list for improvement based on the gap analysis which is conducted in the previous section and has been validated by the expert and the company representative:

- Enforcing periodic key performance indicators or process metrics to measure activities based on scrum guidelines.
- The improvement of process and individual quality is carried out together and in a measurable manner with the support of Stakeholders and is supported by Scrum Masters and Product Owners and strives for a sense of ownership from the Scrum Team.
- The Product Owner is equipped with training and the result is evaluated regularly. So, the Product Owner’s performance is aligned with the company's strategy and is able to have product visions.
- Process measurement metrics should be used as a reference for process improvement and team performance. Metric monitored by all Scrum Team are transparent so that each individual to know and evaluate how the quality of the process of Scrum and quality of the other agreed.
- Potentially Shippable Product Increment is evaluated in value by involving stakeholders (both in the form of demonstrations and testing) so that what is done is in accordance with the value to be given to consumers.
- Maximizing the use of equipment that is suitable for the Scrum Team to record metrics, perform evaluations process, and help each Scrum Ceremony that happens.

5. Conclusions

PT XYZ has maturity Level 1 (Initial) based on SMM assessment. There are 31.76% of practices in the IT division and 36.25% of scrum practices in CS division that need to be improved to achieve Level 5 Optimizing. There are 38 improvement steps and six recommendations to improve scrum practice in PT XYZ.

This study takes a sample of two divisions that use Scrum so that there may be less in-depth information explored. The improvement steps and recommendations need to be applied and evaluated continuously to get better results and it can become the next study. Future research can explore deeper about the company’s changes that apply scrum in a certain time span. The next research also can take a different perspective regarding the acceptance of the employees towards scrum.

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