

Designing An Application of Software Project Management By Using Framework Scrum (SPM-Scrum)

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Abstract. Most of failures of startup application in many countries reached 75%, while the startup failures in Indonesia reached 90%. These failures were caused by non-technical or management factors in managing startup. The RPL (Software Engineering) Laboratory of FILKOM of Brawijaya University has a roadmap to develop an application to support the successfulness of a management software project. The data analysis had been performed on FILKOM student's thesis work which generally develops software that has main obstacle in the management. A study solution which was developed through scientific SDLC and PMLC combined with Scrum method becomes an application named SPM-SCRUM. The results of analysis carried out on several software development projects refer to the Iterative SDPM process. Furthermore, the strategy of Iterative SDPM combined with Scrum method produces a system architecture design that separates the Front End and Back End.

Keyword : software, SDLC, project, development

1 Introduction

The developing of industrial revolution 4.0 are increasingly enough to create any challenging job especially in Information and Communication Technology (ICT) world. The role of ICT for industrial world is significant in operations to improve efficiency. Automatic keywords on IoT (Internet of Things) and data exchange make industries grow exponentially fast. Starting from the production process, order, finance is based on adequate ICT-based software and systems that make transactions transparent, easy, fast, and accurate. It causes companies which do not apply ICT on their operational process out of business soon.

The role of software in the industrial revolution 4.0 is significant and very important. The development of software investment in the form of software service development activities in the business arena has made many startups appear. Based on the report of the Indonesian Digital Creative Industry Society, the number of startup companies reached 992 companies per 2018. Although they seemed substantial, but only a few startups survived [1].

The cause of the failure was dominated by non-technical issues, or rather the vision and management of startup management. According to Alyssa, Management skill is one of the things that must be possessed by start-ups to reduce failures [2]. Thus it can be seen that the focus of software development is not solely on technical software development. The characteristic of software is not only the fabrication but how to develop the software with some steps that we can see through Software Development Life Cycle (SLDC).

RPL (Software Engineering) Laboratory of FILKOM UB, knows the importance of management handling in software development. This is stated in one of the missions

of roadmap which develops tools to monitor the management of software development using the latest methods. The development of methods and frameworks to guarantee qualified software continues to be observed, the current method that is most wanted is Scrum [3].

Scrum has the definition of a framework that allows teams and organizations to iteratively and incrementally deliver valuable products in 30 days or less. Scrum is also helps people and teams to solve the problem effectively with the collaboration on complex projects [4]. Scrum can also deal with complex systems [5]. The phases that combine SDLC (Software Development Life Cycle) and PMLC (Project Management Life Cycle) can guarantee the steps of working on agile software projects. In this study application tools were developed to monitor the software development process using the Scrum method and framework. Thus, the FILKOM RPL Laboratory will have applications that can be continuously developed to ensure the quality of software created by the Laboratory.

The complexity and uncertainty of a software project becomes a very important subject to know the characteristics of a software project. Error in assessing a software project is the initial step of failure in working on the project. A manager must understand the characteristics of the project used in determining the right strategies and methods to ensure the success of the project.

The study of the characteristics of a software project is shown by a diagram based on the goals of the stakeholders versus the solution offered by the software developer. The mapping of project characteristics is shown in Figure 1.

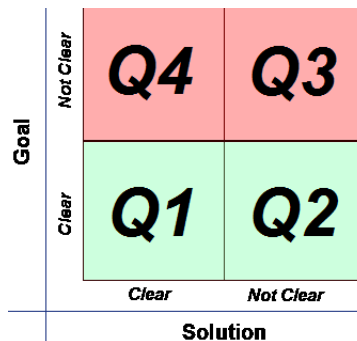


Figure 1 Diagram of determining the Quadrant of PL Project Characteristics [6]

Quadrant Q1 is a simple project characteristic because of its very clear goal and solution, so the developer can apply it directly. Q2 needs more attention because of its unclear solution. Domain of Q3 and Q4 are in unclear goal positions. For Q3 and Q4, the role and management factor are required to secure the success of working on the software compared to technical factors.

Success factors in a project team is influenced by (1) project management tools, (2) practical experience on project management and management support, individual performance, and project development measurement. Those are showing that the role of project management application is significant to make sure the success of project performance.

The scope of software project is not less than 5 (five) variables that need to be considered, namely: (1) The characteristics of software project itself; (2) Discipline of software development, called SDLC (Software Development Life Cycle); (3) Discipline of project management of PMLC (Project Management Life Cycle); (4) Human resource in the project team; (5) Technology that supports the project's needs.

The most dominant of five variables is on the process of software development and how to handle it in PMLC. The combination of the two will decide the strategy used in facing and handling the software development project. The two of disciplines will be the competence of a software project manager. Determination of a very dynamic strategy in handling projects depends on understanding the characteristics of the software project. It cannot be said which strategy is the most appropriate, but which strategy is the most effective for the success of the project. This depends on the skill of a project manager, the strategy determined in handling the project. For a project manager determining the setting composition of people, process, and technology that

are appropriate in determining decisions can be an intuition that cannot be based on scientific theory. The skill of a project manager will be improved according to experience in dealing with the conditions of decision making in a project cycle. The competence of a project manager is one factor in the software development process [7].

A project manager who is trapped in the mindset that a software project is a mere construction of engineering, will certainly be oriented to the closure of the project. There is something that is not considered, namely: the future software development. Every project manager should be more open in thinking how to effectively provide the best service to customers by thinking about the possibility of future software development. Very often, the next projects were given to other developers because the software on the previous project did not meet the needs going forward as the user's wishes. Things that need to be owned by a Modern Software Development Manager are Open-minded and able to apply the scientific discipline of software engineering with qualified software targets, and understand and be able to apply the convergence of the two disciplines of SDLC and PMLC to determine strategies in accordance with the characteristics of software projects.

Before describing the characteristics of a software project, you should first understand what software is and how it is. Of course, software is a product like any other product, but there are special things that distinguish software from other finished goods. The difference lies in several things, including: (1) Considering from the manufacturing process, fabrication products depend a lot on machines, while the software makers are human (not just programmers); (2) The success of a software product depends on the management of activities; (3) Critical. Software assets are intangible. The value of software is very relative, it cannot be stated precisely, even its value can change. Many things that cannot be predicted affect the value of a software application. Changes in business requirements that force software to follow, there are bugs during production, even functions that are not damaged but are unable to keep up with business needs that are very fast growing; (4) The constituent components are libraries that enable development, so that they force maintenance of a software carried out. If not, the dependence on this library makes the software not functioning. Management dependency and artifact repository techniques need to be kept in mind for the benefit of the maintenance and operational period.

The activities to develop software can be classified into 2 (two) terms, namely: (1) Making product. This activity is common, software designer absolutely wants that his product sold and can be used by many customers; (2) Doing projects. Activities to develop software are done at the request of certain consumers. In this case, the business process handled by the software is specific. If the needs of consumers can be met by existing software products, thus they want to buy the software.

This study focuses on the software project problems. A project is an activity that are limited to 3 things to do: (1) delivery; (2) time; and (3) cost/budget. Therefore, this limitation means that project is not a routine activity. The success of a project is determined by delivery, time, and cost. If one of them is not fulfilled, the project will be failed.

Scrum Framework is a framework used to handle a complex product development and allows change [8]. Scrum is not a process or technique or a method, but it is a management framework that is easy and effective to handle the management of product manufacturing, especially software. Scrum implementation works in a team by applying clear disciplines of roles, activities, artifacts, and work rules. The empirical scrum process will guarantee the successful development of software products with a periodic (iterative) and incremental approach to improve progress monitoring and risk control [9].

The implementation of scrum applies the role of each scrum team consisting of [9]: (1) Product Owner, is part of the team responsible for the vision of the software product, as well as monitoring the progress of the product process. The product owner is the person who is shown to represent the decisions of all stakeholders for the product being developed; (2) Scrum Master, someone with special specification who understands the process of implementing Scrum in software development. Basically a scrum master is the leader of the whole Scrum team. The Scrum Master serves the product owner and understands the needs and expectations of the product owner and interpretes them to the rules of the main scrum rules phase; (3) Team Members, commonly referred to the development team, consist of several people with different capability specifications. This team is responsible for the execution process of developing a software product. Accountability for all work is not partially borne by one

person, but the whole involved in the development team.

Events or activities on the Scrum implementation must be in accordance with applicable rules. This stage of activity is used to establish continuity of work among Scrum teams. Every activity in the Scrum is stated in the Sprint terms. One sprint cycle can be stated in a fairly short time limit, can be 2-4 weeks. During the sprint activity phase all work rules must be understood by the Scrum team in accordance with the Scrum workflow. Figure 2 shows the Scrum Workflow process that must be interpreted by the Scrum Team.



Figure 2. Scrum Workflow [11]

Processes on a sprint workflow relate to scrum artifacts: (1) Product backlog, is a list made by product owner to work during the sprint phase. Product backlog consists of simple and clear sentences that can be understood by development team. It is dynamic and changeable like the needs required; (2) Sprint backlog, a technical translation of product backlog into functional items of software compiler stated in sprint backlog. Detailed plan for formulating the sprint log needs to be discussed with the developer team according to the expertise of each person involved in the development team; (3) Sprint, is sprint backlog execution process that has time limit of 2-4 weeks. During the process, daily scrum activities are carried out to find out the extent of progress and problems that arise. This daily scrum process can take approximately 15 minutes to optimize and collaborate on teamwork performance; (4) Burndown Chart, is a tool that is very helpful for product owner to monitor the progress achievement used to determine the total progress of the desired product goals. Burndown charts contain task boards for mapping the status of sprint backlog items to Todo, in Progress, and Done.

Sprint review is made at the end of each Sprint process. This inspection is carried out to determine the addition and adjustment of the product backlog needed for the next sprint. During the review process the Scrum team and stakeholders need to collaborate to determine whether what has been done in the sprint is appropriate.

2. Research Method

The research framework refers to the roadmap of RPL (Software Engineering) Laboratory of FILKOM Brawijaya University in the scope of Software Project Management. The focus on observing high failures in the process of working on software projects is mainly experienced by today's Start Ups. Description of research activities performed on DIPA 2019 consists of:

Laboratory Roadmap on failure analysis of software project work. The software project management expertise focuses on how to find the right method to be able to ensure the execution of software projects that meet the target of software projects on time, cost, and scope of work.

The analysis on the Thesis of Students of FILKOM Brawijaya University commonly performs the software project. Failures on thesis project performance were found both on technical problems and management process. Therefore, in this study the data analysis is required from critical students of 2013 who are in their last 1 year of

college.

Literature and Journal Studies, software project failure analysis process and methodology solutions are described in many journals. This becomes the main step to get the right problem solving strategy by referring to trusted references. The process of analyzing literature studies is focused on the following: PMLC Project Management, Agile methodology, Scrum Framework, and Iterative SDLC.

Research hypothesis: "The success of the software development process is largely determined by the assistance of the application to monitor the work process based on the technical aspects of SDLC and PMLC management aspects and complemented by a modern framework strategy namely Scrum Framework". Henceforth, the tool is called SPM-Scrum.

A more specific analysis of the application needs of the SPM-Scrum needs to be done in order to obtain the right conditions for the project characteristics and the right handling solutions. Based on the observation of some thesis which is be written by FILKOM's students and examined by our teachers, the need analysis could be described.

Analysis and design of the Scrum SPM application. The process of design analysis in the software domain was carried out using the OOAD (Object Oriented Analysis and Design) paradigm. OOAD provides convenience to the reusable nature of the design so that it is flexible to develop.

Implementation of the application is done separately between the Back End and Front End. This separation is carried out to further develop multi-platform applications both web and mobile. The middleware-based system design will facilitate monitoring of the Scrum SPM application architecture and facilitate further development. Whereas, testing will be done separately between the Front End and Back End. Testing the whole system was done in stages and developed using the concept of Continuous Integration testing.

3. Results and Analysis

3.1. Needs Elicitation

The identification of application needs is determined based on an analysis of the following questions: (1) Every software development process uses SDLC. What are the specific SDLC properties that can be applied to the Scrum SPM application?; (2) The success of a software project is not only on the technical aspects of writing program code, but lies in the scope of the client's meta project. How to accommodate the success of the project in accordance with expectations of the client?; (3) How to determine the right methodology or framework to monitor the success of a software project both from the management and the technical of software development?

The SDLC analysis process was carried out in several test cases on thesis process of students of FILKOM Brawijaya University. The student evaluation process is determined on the implementation schedule P0, P1, and P2. P0 Period is the presentation of student proposals before the supervisors. P0 becomes an important part of the thesis as a form of agreement on the scope and capabilities of the software capabilities that will be made by students [11]. This means that the features and scope of the software have been determined at the beginning of the thesis process. Thus, it is known that SDLC that is suitable for the execution of the software project is an iterative SDLC. Iterative SDLC has needs that can be clearly identified at the beginning of project work. Figure 3 shows the iteration process occurred.

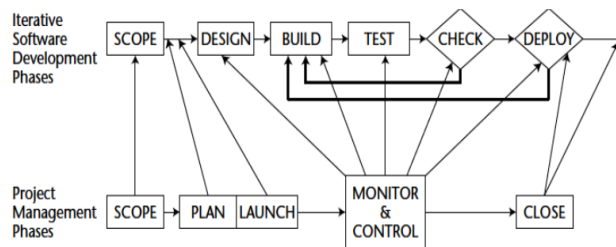


Figure 3. Iterative SDLC [12]

The software development strategy used is iterative where there is no significant change in the needs. The SDLC will focus on the design process, writing program code, and testing that takes place periodically.

After knowing the type of project characteristics that are iterative then the SDLC strategy used must be iterative as well. The application of PMLC to the iterative SDLC process can be referred to Iterative SDPM (Software Development Project Management). The process of meeting between SDLC and PMLC is shown in Figure 4.

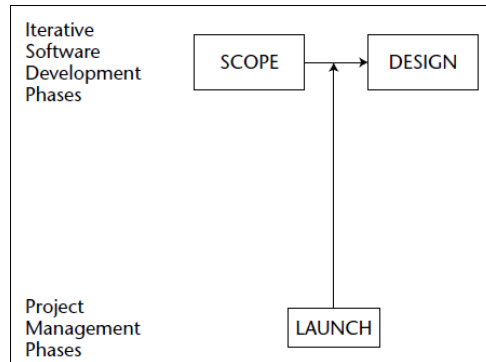


Figure 4. The Process of software work between project and design scopes [12]

In Iterative SDPM the iteration process occurs in the SDLC phase of design, implement, and testing. While it is expected that the scope of the project has been stated correctly. Henceforth, what is more important to determine is the length of the iteration process to be taken. The process of identifying the scope of the project is stated in the planning phase as a RBS (Requirement Breakdown Structure) diagram. RBS contains a modular system that is depicted using a tree diagram as the process of system decomposition according to the desired scope.

The Scrum framework was chosen to handle the work of software projects with Iterative SDPM characteristics because the process that guarantees the success of the project is about how many iterations and the length of iteration during project work. Scrum has a long duration of sprint between 1 week to 2 weeks. This is a length of work that is quite ideal and detailed in the process of implementing the software. The development team will focus more on certain problems during the Scrum day. In this article, the model which has been build to create the design of management software. The implementation of scrum framework will describe in the next article.

Thus, the application analysis process provides the SPM-Scrum application description which has the following features: (1) Project Overview {Name, code, project leads, problems, goals, objectives, success criteria, assumptions, risks, obstacles}; (2) The scope of the software project is stated in RBS (Requirements Breakdown Structure); (3) The SDLC strategy used is iterative; (4) Implement Scrum as a framework for developing software projects.

Figure 5 shows the high-level design of the SPM-Scrum application. All software project development activities with Iterative SDPM will be recorded and monitored through the SPM-Scrum Application.

The decomposition of the Scrum SPM application function can be expressed by mapping the RBS (Requirement Breakdown Structure) module as shown in Figure 6.

In the execution of RBS software projects the scope of the software function needs to be considered. With a clear RBS, the function of PMLC activities can be planned properly.

4. Conclusion

In the research process, conclusions can be drawn as follows: (1) Thesis work of students of FILKOM Brawijaya University using the Iterative SDLC approach. Thus the right strategy for project implementation and ensuring project success is the Iterative SDPM; (2) The strategy of Iterative SDPM combined with Scrum method

produces a system architecture design that separates the Front End and Back End.

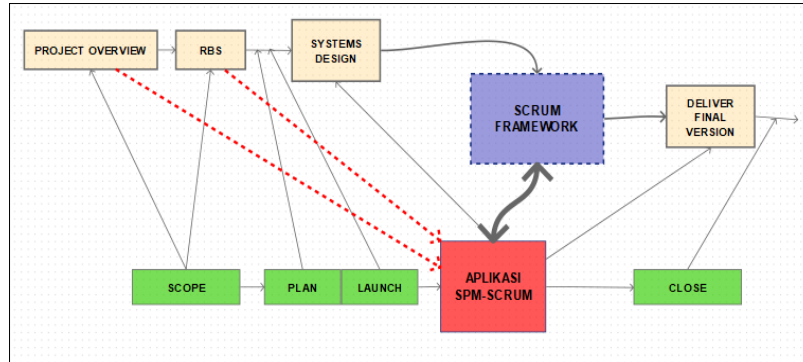


Figure 5. Abstract design of SPM-scrum application

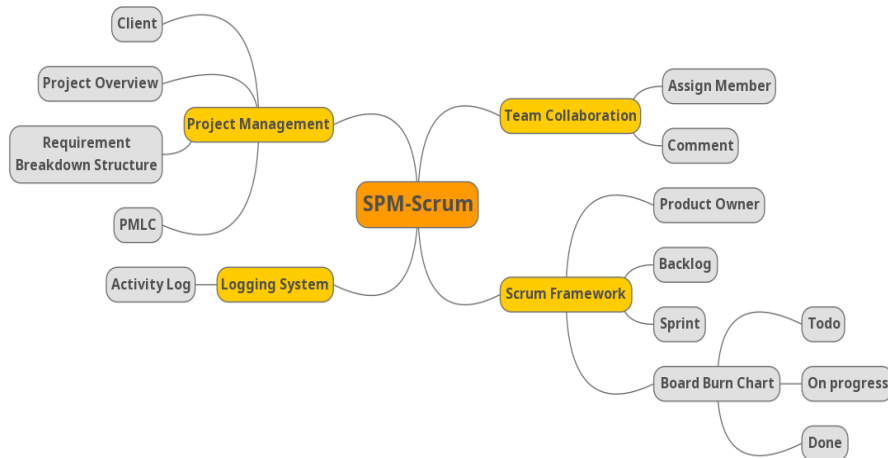


Figure 6. RBS of SPM Scrum Application

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