Risk Analysis of Agile Framework in Project Management Exploration Drilling in Oil and Gas Sector

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Abstract. Energy sector in particular of oil and gas industry is the industry that became main income in the State of Indonesia before 2015, but in the same year there was a significant change in oil and gas prices. A more rapid and systematic project management pattern is required using Agile, Agile is a management project pattern that will be implemented in the current decade, using agile activities to make it easier to think, understand and implement prioritization at each stage. In this research will be mapping priority and risk based on expert on determining risk matrix, job priority and risk mapping. The results of this study indicate that subsurface activity is the main sub-project that must be prioritized.

Keyword : Risk, Agile Framework, Project Management, Drilling, Exploration,

1. Introduction

The energy sector in particular the oil and gas industry is the industry that became the main income in the State of Indonesia before 2015, but in the same year there was a significant change in oil and gas prices. The oil price pattern initially has a value of about 100 (one hundred) to 120 (one hundred and twenty) barrels of oil / day to about 50 (fifty) to 60 (sixty) barrels of oil per day (Energy Information Administration US Data, 2016). Based on the results of non-tax state revenue [8] reports, oil and gas revenues decreased by Rp.2.7 trillion, among others, influenced by the weakening of crude oil prices [8] This is the basis for the system of planning and implementation of oil and gas project management especially in full cycle of upstream business sector, starting from exploration drilling activities, exploitation and oil and gas production activities. Exploration well drilling is a mandatory phase of ensuring subsurface data that begins to ensure oil and gas reserves predicted by an exploration team of a company or institution.

Project Management Drilling is a management project that requires an investment cost of more than 5 (five) million US Dollars, requiring preparation of approximately one to two years from the approval stage of the drilling cost budget plan, environmental permit process to traffic permit permits, making process of location until commencement of drilling activity.

In its preparation, of course, many involve and communicate with the local people and government in assisting the smoothness of management projects in the area of drilling which certainly employs hundreds of workers in the implementation from local workers to expat / international workforce. This, of course, poses a challenge to every oil and gas company as it is affected by the decline in investment and opportunities in drilling projects with limited time and cost (Data word 2016). Project
management continues to influence the emergence of the latest technology and change the pattern of project management so that it can adapt the pattern of changes associated with declining oil and gas prices as well as declining investment value [17]. The organization and the oil and gas industry team must, of course, ensure overall and be able to begin adopting the pattern of agile management projects [6] with some state of the oil and gas industries experiencing limited time and costs, and some companies with organizations with a strong centralized system, project management is required with future and future agile framework implementations [3]. Agile is a pattern or system for managing team patterns and project management [11]. Agile is a pattern of management projects that will be implemented in the current decade, using agile all forms of activity to be easier to think, understand and implement [17], in oil and gas project management can implement a scrum approach with all forms of strategy clear companies, specially formed project management teams, prioritization of each stage of the preparation process, drilling and post drilling, and daily intensive monitoring and control and daily coordination meetings to accelerate the preparation system by scrum muster. [3] team competence in solving problems is required [19] and the importance of the leadership of each project management member to influence all forms of drilling project implementation With the declining investment of oil and gas, in this research will be the pattern of project management of drilling exploration wells by using agile method to see the effect on time and cost of project management.

2. Literature review

In order to improve data, oil and gas reserves and needs in Indonesia, the energy sector especially the oil and gas management project in Indonesia must be continuously carried out so that Indonesia can meet the target of oil and gas consumption needs in Indonesia without having to import oil and gas, in the face of the challenges, especially the limited budget and time of the exploration well drilling project which would require about 1-2 years of preparation and in its work has a dynamic operation that has the potential to increase the time and cost [14], hence the need for an agile management project to be monitored in real time and on target [1].

| Table 1 agile execution of typical types of projects evaluation. (Perdo, et al,. 2015) [14] |
|---------------------------------------------------------------|
| Model research needs | Agile development of products | Projecting construction, engineering | Building construction without planning | Managing, interpreting, processes application | Establishing comparable standards, other functions, other functions | Organization strength |
| Fully unknown unexpected method | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Rough demand at the beginning/next verification later | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Expected changes | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| n: due to activities of the competition (e.g., new product) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| n: client proposal | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| n: management of new technologies (e.g., technology) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| n: new market demands (e.g., demand) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| n: new developments of team members | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Consequence of the changes in the last phase (compared to the total project) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Possibility to estimate inherent | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Inherent development of the team | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Most important functions are normal at the beginning (less important, etc.) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Rough outline of the end and more planning for such situations | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Planning, assess the need to present the results of the previous one | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Evaluation, measure, test or present the conclusions | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Necessary flexibility (adapting to the situation) | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Partial results can be completed | ✔ | ✖ | ✖ | ✖ | ✖ | ✖ |

- ✔ - YES, possible | ✖ - impossible, but rarely | ✖ - not possible
Risk is value that might be lost (health, asset, reputation) [15]. That always happened in business project and organization. Risk try to mitigate by several future event that particularly happened in specific oil and gas industry. These risk identification, which is the result of combination [16].

The expert fill in the questionnaire by give the value on each project, risk and sub risk category that impacted to project implementation. As shown in figure 2 first level from AHP result from comparison Level 1 on figure 1 above such as from Social, Government, Politic, Subsurface, Operation, HSSE Issue and environmental had been discussed with expertise from more than 10 years experience in oil and , it will be clear that it will be shown which parameter will got the highest choice from the expert.

![Figure 1 Risk Identification by agile framework prioritization (adapted from Mutalibov, 2017) [16]](image)

Table 2 First Level of AHP
(Adapted from Mutalibov, 2017) [15]

| Risk Category       | Eigenvalue |
|---------------------|------------|
| Operational (O)     | 0.202      |
| Financial & Economy (F) | 0.128     |
| People & Organization (P) | 0.116   |
| Environmental (E)   | 0.2        |
| Legal & Political (L) | 0.051     |
| Social (S)          | 0.066      |
| Reputation (R)      | 0.107      |
| Act of God (A)      | 0.129      |

3. Hypothesis and conceptual model
Initial phase of research design conducted study of literature about the required variables and looking for gap of research as theoretical basis. The next step is to collect data of time and cost of land drilling project with depth below 2000 meter, kemudiaan made risk management project acceleration analysis by using AHP (Analytical Hierarchy Process) by getting input from experts to get a clear concept about risk matrix and risk register prioritization by using agile framework.

In risk register, we discussed with the expertise with more than 10 years experience to finalize risk matrix and its reference from OSHA, ISO 15001 and ASA4306, then based on literature regarding project list activities we conduct other survey from the expert with 10 years experience in project management oil and gas to select project priority based on each department with AHP [14].
4. Methodology

4.1 Project Management

According to PMBOK (Project Management Book of Knowledge), project management is the application of science and techniques to prepare project before and during implemented. Project management is divided into five process groups: initiation, preparation, implementation, monitoring, review, and accomplished the project.

Managing projects includes identifying stakeholders needs, concerns, and expectations. It designed to be sustainable, intensify management and integrate complex activities to achieve specific goals or add it is recognized as the key enabler of business change and an important contributor to a successful business future (Project Management Institute, 2013).

4.2 Scope Management of Oil and Gas Drilling

Project Scope refers to the company's targets in drilling preparation starting from the annual work plan discussed internally by the company and through government institutions in this case Scope management ensures have the same understanding of drilling which is conducted. Activities included in project scope management are: a. The activity of authorizing a company to start a project or switch to a subsequent project with the result of an initiation process is a contract agreement which is a key document that formally recognizes the existence and provides extensive coverage of a project. b. Scope planning develops useful documents as the basis for future decision-making, including the criteria for determining whether the project or phase is complete. c. Definition of scope, deliverables deliverables in priority and easy in kelolad. Ensuring project scope and contractor e. Control, make corrections, control and monitor project work. In this case the authority is SKK Migas related to project approval from the technical side, cost and time, after which the company aims to prepare the project schedule and stages clear from the social side, government issues, sub surface issues, operation, safety and also environment.

4.3 Project Schedule Management

The main activities that are part of the project schedule management are: a. make sure the activities are align with the project goals and target b. A series of activities align with support document c. Estimated time of activity, estimating the number of working periods d. Developing a schedule, analyzing a series of activities, estimating the duration of activity, and the need for resources to establish a project schedule. e. Controlling schedules, controlling and managing changes to project schedules.

4.4 Project Cost Management

It includes the activities required to ensure the project is completed in accordance with the approved budget. The project manager must ensure that the project is well defined, has accurate time and cost estimates, has a realistic cost at the time the approval is made. There are 4 (four) main activities in project cost management, namely: a. Resource planning, estimating resources (human, equipment, or materials) as well as the amount of resources to be used for project activities. b. Estimate costs, develop approaches or cost estimates of the resources needed to complete the project. c. Budget cost, allocating overall cost estimates on the work unit to build a baseline to manage performance. Cost control, controlling changes in project budgets.

4.5 Agile Framework Project is a planned work program with the time and budget specified.

Generally projects have goals and targets to be achieved. In order for the two things to succeed, appropriate business and planning is required. There are several things that distinguish Agile Project Management with others, including: a. Agile stressed that all members of the team must unite into a solid team and able to establish a compact cooperation. The team consists of developers, quality assurance, project management, and custom. Frequency communication is one of the key factors that can make teamwork solid. Therefore, agile teams always make daily meetings that discuss the progress and strategy of the current project and find a solution if there is a problem. Make delivery within a short time of 1 - 4 weeks. This process is called sprint or iteration. Open communication techniques that allow each team member (including the customer) to provide feedback feedback and views on the project. These inputs will be considered in project
work. Projects are always dynamic with a fast working climate and support each team member to grow. The members of this team are individuals with enthusiasm, high, passionate, and always motivated. Each team member must have a sense of ownership of the project, so they will always try their best to produce the highest quality products. Scrum Framework.

| Table 3 Table difference traditional development and agile |
|------------------------------------------------------------|
| **Basic Assumption** | **Standard Project Management** | **Agile Project Management** |
| System specific and predictable | Easily adaptive with every condition in companies or organization |
| **Description** | One Leader and Control | Leadership & collaboration |
| **Knowledge management** | Explicit | Tacit |
| **Communication** | Formal | Informal |
| **Improvement** | Activities | The evolutionary-delivery model |
| **structure** | usually in big companies | Flexible and competitive |
| **QC** | Plan and Control | Continuous control |

4.6 Traditional vs Agile

The differences between standard and agile project management are clearly defined at the beginning of the project so large scale changes are not expected. The standard project management concept of working on a project regularly and can be repeated using a template that has been created. The agile concept prepares the project team for large scope changes [17].

Agile project management is perfect for projects that need complex and unclear so that can not be defined all the requirements at the beginning of the project. The advantage of agile project management and specifically Scrum-based approach is its simplicity. In an agile project, the roles of each team member are very clear and there is no cross-role. Features can be fully developed and tested in short iteration cycles. As each team member assumes primary responsibility for their part of the project. The method enforces high communication, which helps the team manage its work more effectively. Agile project management can lead to higher productivity for everyone involved, this method allows all parties to do more productive work.
5. Results and discussion

5.1 Evaluation Analysis of AHP Calculation Result

The AHP calculation for the several criteria hierarchy of job priority selection classification through expert choice software have been completed by initially considering the prioritization of agile framework as shown in Figure 4.1 selected [15].

After that, discussions with experts to choose the priorities in project management and also list the risks that are divided from the social, government and politics, subsurface, operations, HSSE and also the environment. Seen in table 4.3 of the attached subcriteria.

![Figure 2 Project Prioritization](image)

**Table 4. AHP Result by Expert Choice**

| GOAL                  | EIGEN VALUE |
|-----------------------|-------------|
| Social                | 0.086       |
| Government & Political| 0.143       |
| **Subsurface**        | **0.260**   |
| Operation             | 0.214       |
| HSSE Issue            | 0.150       |
| Environmental         | 0.146       |

Table 4. above shows of AHP first level calculations from five expertise, based on its calculation the highest eigenvector value is subsurface issue with the number around 0.26, for the second eigenvector value is for operational issues with value of 0.214, with an inconsistency rating of 0.09 so it can be said that the results of AHP calculations for multi-criteria classification prioritization of oil and gas drilling project management.
5.2. AHP Calculation Analysis for Multi-Criteria Classification
AHP calculations will then be analyzed for multi-criteria classification of prioritization of oil and gas project management work based on calculations made in sub chapters in chapter three.

Table 5. AHP Sub criteria Result by Expert Choice

| GOAL                  | RISK FACTOR          | EIGEN VALUE |
|-----------------------|----------------------|-------------|
| Social                | Crime                | 0.309       |
| Government & Political| Permit Issue         | 0.263       |
| Subsurface            | Exploration Well Proposal | 0.265   |
| Operation             | Drilling Material    | 0.132       |
| HSSE Issue            | Priority Crew Recruitment | 0.187   |
| Environmental         | Air Pollution        | 0.340       |

Based on the result of first level AHP computation with the result as shown in table 4.4 above. The results of a composite AHP calculation represent of experts support and information, in this research. Then the second priority is for operational issues with a priority vector or eigenvector value of 0.293 and the last one is for social issues with an eigenvector value ois 0.086. This shows that for the most important is subsurface and the critical factor of drilling project management is the issue of operation, from the results of drilling project management is better to prioritize the factors is subsurface issues.

But in terms of risk based on the selection of experts, environmental issues have the highest level of risk, especially for environmental pollution with a priority vector or eigenvector of 0.340. Then the second is social especially for crime issues with the value is 0.309 and the last one is for operating issues especially for drilling material with eigenvector value of 0.086.

6. Conclusion

From the calculation and analysis of the research above can be obtained the following conclusion:

- Based on the interview results and based on the risk matrix reference is compressed the risk matrix is divided into 5 levels of severity which depends on the impact of human side, environment, loss of assets and reputation of the company.
- In this research has been made a classification of the priorities and risks that are obtained by using the method of calculating the AHP multi criteria method with expert choice software. Through this research, oil and gas project management experts have tried to disclose that based on the results of the calculation of the most prioritized method in drilling project management to support the preparation and implementation of subsurface issues.
- In the risk analysis in this study it is seen that each expert has different subjective sides related to severity selection and also probability, but not significant enough and they have a nearly uniform understanding related to risk mitigation.
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