Analysis of delay factors on drilling projects on PT China Oilfields Services Limited

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Abstract. In carrying out drilling projects at PT China Oilfields Services Limited (COSL) Indo, especially Project 1 to Project 4, there were a mismatch between the initial plan of the project and the actualisation in the field because there were inhibiting factors in implementing the project. The purpose of the research was to look the factors that caused for the additional time in well drilling project at PT. COSL Indo, to build a relationship model of these factors, and formulate a strategy for the company to be able to overcome the occurrence of additional time in the future project. Data analysis was conducted by using a factor analysis method and the location of the research was carried out in just one company with 102 valid respondents. The results of the research indicate that there are four factors that influence the time gap, namely Project Management Activities, Risk Analysis and Procurement, Manage Stairs, and Project Planning Development. By knowing the causes of the delay, companies can find the best solutions for future learning and the impact on environmental, social and economic problems can also be anticipated so that sustainable development occurs in the context of petroleum management.

Keywords: delay factor, drilling project, private company

1. Introduction

China Oilfield Services Limited Indo or in short COSL Indo is an oilfield service company. That is a company which gives services to the oil exploration and production industries. This company gives services in form of oil exploration and oil drilling that will be produced to its clients. On the oil and gas drilling project carried out by COSL Indo, there are experiencing some delays in project 1 to project 4 illustrated in the graphs below. Form the graph, there is an increase in time that occurs. If the project is completed according to plan, then the company will get more profit and does not interfere with other projects. Figure 1.
2. Literature review
2.1. Project management
Project is a temporary endeavor undertaken to create a unique product, service or result (PMBOK, 2017). Based on PMBOK 2017, in one project there are five process groups that are process group initiating, planning, executing, monitoring and controlling, and closing. This process has 49 activities that have to be taken. However, this process groups has relationship with ten knowledge management in carrying out the activities, where every knowledge management has their own set of activities. Ten knowledge management that will be use are project integration management, project scope management, project schedule management, project cost management, project quality management, project resource management, project communication management, project risk management, project procurement management, and project stakeholder management [1].

2.2 Factor analysis
Factor analysis is a technique for discovering patterns among the variables to determine if an underlying combination of the original variables (a factor) can summarize the original set (Cooper and Schlinder, 2014). This method transform the variable into a new set of fewer variables where these variable is linear and incorrelate with each other. There are some measuring instrument for measuring the adequacy of

Figure 1. Project 1 – Project 4, Plan vs Actual

![Project 1 - Project 4, Plan vs Actual](image-url)
3. Methodology
Research Design can be shown at Figure 2.

![Figure 2. Research Design](image)

3.1. Data collection techniques
The research uses primary and secondary data. Primary data is obtained from company data in the form of historical data by seeing the reports from well drilling project activities. While questionnaire contains about question with multiple choices, the question were construct from scientific journals in the year 2009 to 2019 that has teori similarity with the research indicator that are theories about project management. There are 27 indicators are taken from 49 processes from ten knowledge management. The selected sample for distribute the questionnaire are well drilling project stakeholders with total respondents 102 respondents. Secondary data take from books or scientifict journal that has some connection with the topic of research [2].

3.2. Research instrument
Indicators used in the research for delays in the well drilling project are in Table 1.
3.3. Data analysis method
Data analysis data is conducted after getting the results of the questionnaire. The results are tested using validity test and reliability test. Realibility test uses internal consistency by looking at the coefficient Cronbach’s Alpha. Meanwhile, validity test uses KMO and Bartlett’s test. After the results pass from the two test, next the result uses anti-image matrices test and then examine the indicators using factor analysis so that it obtains the model for reference of the research.

4. Results and discussion
Steps that can be taken by companies in managing project work, namely involving project managers in planning and managing project activities. According to PMBOK, 2017 project managers have an important role as leaders of the project team to be able to achieve the objectives of the project. The project manager also has the responsibility for the work of the project and the final results of the project. Therefore, the company must be able to involve the project manager from the initiation process to closing so that the project manager can manage the drilling project work in order to achieve project objectives and take action if something goes wrong in the work.
In Figure 3. Making Work Breakdown Structure (WBS) is also important in managing work. This is because WBS defines work to be completed to complete the project and WBS also helps determine the cost of the project and its scheduling (El-Reedy, 2016). The project team can brainstorm in building project activities which later can be useful for controlling and implementing projects right at the time of execution. In making the breakdown of WBS into a detailed component, the company must be able to plan, manage and control the work properly so that there is no excessive decomposition. Excessive decomposition can lead to unproductive management efforts, inefficient use of resources, reduced efficiency of work performance, and data aggregate difficulties at different levels at WBS (PMBOK, 2017).

4.1. Research limitations
There are several limitations in the research, those are
1. Distribution of questionnaires is only in one organization where the number of samples is 102 respondents and carried out in a limited period of time, that is in April 2019.
2. In conducting the research, the literature used as a theoretical basis from one source and 27 indicators are used and was conducted only four well in one organization.

From the results of data processing, it can be obtained some optimal solutions with the formation of four new variables in accordance with the description in Table 4.

Respondent Demographics
Filling out the questionnaire is done through direct writing and google form. Questionnaire given to all workers that are involved for the drilling project with 102 respondents. In majority, there are 61 respondents with male gender, 40 respondents with staff position in the organization, 50 respondents with 31-40 years old, 46 respondents with less than 5 years work in the organization, 90 respondents with S1 last education, and 43 respondents with less than 2 years of experience in well drilling project.

4.2. Reliability Test

| Reliability | Statistic |
|-------------|-----------|
| Cronbach’s Alpha | N of Items |
| 0.93         | 27        |
Realibility test was obtained by 0.93. The test results state that the questionnaire has met the condition. Because Cronbach’s Alpha coefficient greater than dari 0.70 [31].

4.3. Validity test

**Table 3. KMO and Barlet’s Test Results**

|                         | KMO and Barlett’s Test |
|-------------------------|------------------------|
| Kaise-Meye Sampling     | Olkin Mrasure of Adeuacy | 0.837 |
| Bartett’s Test of Sphericity | Sig.                 | 0.000 |

In Table 3. The result for KMO is 0.837 and for Barlett’s is 0.000. This test result state that all indicators test has met the condition and can conduct further analysis. Because for KMO coefficient > 0.5 and for Barlett’s coefficient < 0.001.

4.4. Anti image matrices

From 27 indicators uses, all of them have MSA ≥ 0.50 [31]. So that all of the indicators uses for this research have met the condition and can conduct for factor analysis.

4.5. Factor analysis

The result of factor analysis can be seen in Table 4.

**Table 4. The New Factors of Project Control**

| Management Project Activities | Create WBS |
|-------------------------------|------------|
|                               | Control Schedule |
|                               | Plan Scope Management |
|                               | Plan Resource Management |
|                               | Monitor Risk |
|                               | Monitor and Control Project Work |
|                               | Plan Schedule Management |
|                               | Control Scope |
| Risk Analysis and Procurement Arrangement | Plan Risk Management |
| Control Procurement |
| Plan Risk response |
| Plan Procurement Management |
| Manage Stakeholder Cost | Plan Stakeholder Enggagement |
| Identify Stakeholder |
| Plan cost Management |
| Control Cost |
| Project Planning Development | Develop Project Management Plan |
| Develop project Charter |
| Develop Schedule |
| Perform Integrated Change |
| Control Resource |
| Plan Communication Management |
5. Conclusion
Based on the results of the analysis of respondent data processing related to the operational activities of oil and gas well drilling projects, it can be concluded that:

1. The indicator used were 27 indicators from ten knowledge area of project management. From 27 indicators, factor analysis is used to obtain four factors that is low management project activities, risk analysis and procurement arrangements, failure to manage stakeholders cost, and less specific project planning development.
2. Organization must optimize and watch every factor to decrease the delays in well drilling project for project in the future. If organization doesn’t optimize this factor, it can be increasing the delays in well drilling project. In every factors there are some strategy that the organization can use for optimize the four factor.

By knowing these four new factors, the organization is expected to be able to develop strategies for further drilling activities that are in harmony with the environment, social capital, and economic capital. Therefore, the sustainability of the projects is achieved, including:

1. Management project activities factors, strategies that can be used by the organization, and project activities adjustment with the scope of the project along with the available resources to minimize the risk of failure in the project. The organization must be fully committed to their planned work breakdown structure (WBS). The WBS must also be able to be managed and controlled so that the work will not break out from the planned schedule. The project manager involvement to control and achieve the objective of the project is needed.
2. Risk analysis and procurement arrangements. The organization must be able to consider the environmental conditions of the well drilling project location and conduct a risk analysis and make procurement arrangements in accordance with the environmental conditions of the project site. So, organization must look at enterprise environmental factors (EEFs) that effects the projects. The organization can also recognize the geographic conditions of the drilling location and understand the surrounding environment so that it can analyse the risks and manage the procurement required in accordance with the geographical well drilling location.
3. The factor of manage stakeholder cost, the organization must be able to group each stakeholder so that they can determine the approach strategy with the criteria of each stakeholder and reduce unnecessary expenses. To control and manage costs, companies can use earned value management (EVM).
4. Project planning development factor, The organization can involve stakeholders from the project to get additional information along with the expectations of the final outcome of the project and plan good communication if there is a change when the project still running.
5. The project delays can decrease productivity and increasing the capital cost of the process and also the delays of project, potential can be affecting to the environment since more time is needed and more carbon dioxide emission will be produced.

There are several suggestions for the future research, those are:
1. The research can be done in a larger population and sample. It can be done by increasing the number of organization and wells studied.
2. Conduct research for other factors by using the same methods or by using other methods.

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