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The Development of Planning and Controlling Procedure for Gas Well Drilling Projects to Improve Time Performance Based on PMBOK 2017. (Case Study of XYZ Gas Field Well Drilling Project in West Papua)

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Abstract:

Lack of attention to proper procedures in the planning and controlling system is one of the main causes of delay of many projects. In the exploration project of gas field in West Papua, delay is one of the main problems that occur. Project delays during the exploration drilling period caused many losses mainly related to delays in the monetization period of the gas field, while the duration of the production sharing contract for the gas field with the Indonesian government cannot be extended in the near future. This research was conducted to provide development of the project planning and control system procedures for to improve the time performance of gas wells drilling projects on the XYZ Gas Field by using project management scientific principles based on the PMBOK 2017. The method used in this research is a risk analysis using a case study of XYZ Gas Field exploration drilling operations and also a survey to determine the dominant risk that can affect time performance of the project. Furthermore, preventive and corrective actions will be designed and recommended to develop the exploration well drilling project procedures so that time performance can be improved. The results in this research indicate that there are three aspects needed for the development of planning and controlling procedures of well drilling projects in the XYZ gas field; the project risk management system that is applied to all phases of the project life cycle, the application of a project management software and inclusion of project communication risk analysis in the risk management system. It is expected that the results of this study can provide input to ABC Co., the contractor managing the XYZ Gas Field in determining and making improvements to the performance of the drilling operation and completion of the development well and also the production well that will be carried out in the future.
Keywords: *control procedure, oil and gas well drilling, planning procedure, PMBOK 2017, project risk, time performance.*

I. INTRODUCTION

The purpose of oil and gas operations is including drilling of exploration and development wells is to find, extract, purify and sell oil and gas, processed products and related products [1]. The exploration well drilling aims to obtain more detailed data on the distribution and volume of oil and gas reserves, while the development wells aim to produce and maximize economic production from that reserves [2]. Gas reserves in the XYZ Gas Field located in West Papua are currently operated by ABC Company and will be used as raw material for producing methanol in the petrochemical industry in Indonesia. In 2020 Indonesia stills a methanol

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importer country and if production from the project of XYZ Gas Field started, Indonesia will become a methanol exporting country.

A project delay is defined as the duration of time that exceeds the planned project completion date where the project's feasibility has been determined [4]. The general impact of poor project time performance results in delays in project completion, increased costs, disruption to work, reduced productivity, claims by third parties, dispute, and waiver or termination of the contract [5]. The feasibility of a gas field to be developed is very dependent on the size of the gas reserves and the duration of the field can be produced which is directly affected by large investments and high involvement from the government [3]. The ABC Company contract with the Government of Indonesia to develop the XYZ Gas Field was previously agreed, namely for 30 years and an exploration period of 10 years has seized a third of the contract duration for the development of the XYZ Gas Field, thus the production or the monetization period of discovered gas reserves can only be done for less than 20 years. In addition, because gas from the XYZ Gas Field will be used for the petrochemical industry as a raw material for producing methanol, the project's delay has an impact on the duration of Indonesia becoming a methanol importing country before becoming a country for exporting methanol. Poor preparation and planning can cause many problems in many stages of the construction of large projects and will eventually delay the relation of the duration of the project [6]. The familiar saying, "failing to plan is the same as planning to fail," seems to be very applicable to this issue [7].

The causes of project delays can be grouped into three main groups, namely delays in decision making, poor planning processes and poor control [6]. Effective project planning and control is the most important aspect and will highly influence the failure of a project [8]. To produce good quality project planning requires more time, experience and more effort in the initial phase of planning [9]. Project management includes a number of planning and control processes that must be implemented to meet requirements related to project time performance [10]. Project management practices and techniques are widely used in many successful projects and therefore, project management positively influences project success [8]. Currently the project management system is developing and the main resource used is PMBOK 2017. PMBOK 2017 or A Guide to the Project Management Body of Knowledge (PMBOK® Guide) 2017 is the main publications and resources of PMI (Project Management Institute) for effective project management and is a guide to be applied in all industries [11]. This research is improving the planning and controlling procedure of oil and gas well drilling project to enhance the time performance with reference to PMBOK 2017 by using the method of project risk analysis.

II. Literature Study

A. Well Drilling Project Management

Oil and gas well drilling is a method for making oil and gas wells using a drill bit so that the contents in a reservoir can be flowed to the surface, while Project management is the application of knowledge, abilities, tools and procedures for project activities to achieve the objectives of the project [12]. Operational conditions in the hinterland of Papua provide many challenges to increase the complexity of the project, including complex geological conditions, steep forest terrain, extreme rainfall, sensitive ecosystems, various cultures related to land ownership, and difficult logistics [13]. Other constraints such as problems due to wellbore and formation being drilled, as well as changes in the scope of work also contribute to its own challenges [12].

There are a total of ten (10) exploration wells drilled in the project of XYZ Gas Field. The depths of these wells range from 1,600 m to 6,000 m below ground level and were drilled and tested from 2010 to 2015 using a Drilling Rig with a capacity of 2,000 HP. Comparison of plans and actual well depths in the operation of 10 XYZ Gas Field exploration wells can be seen in the Fig.1. In the oil and gas exploration well drilling, the plan and actual depth of the well will be different, this happens because the depth of the well is planned based on geological and geophysical analysis and estimation using the acquired seismic data acquired [12]. Refer to the list of depths of the exploration wells on Fig.1; well F1 is

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a well with the deepest Total Depth (TD) in Papua as well as in Indonesia at the moment.

B. The Concept of Time Performance

Time performance is defined as meeting duration baseline in the initial project planning process [14]. Time overruns occur when there is an extension of time beyond the planned completion date that can be tracked by key stakeholders [14]. Based on the project management approach that refers to the PMBOK 2017 Guide, the time performance of a project can

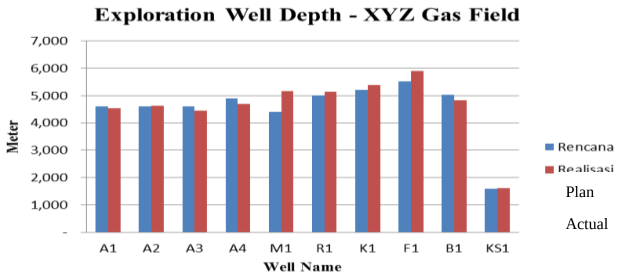

Fig. 1. Plans vs Actual of Exploration Wells Depth in the XYZ Gas Field

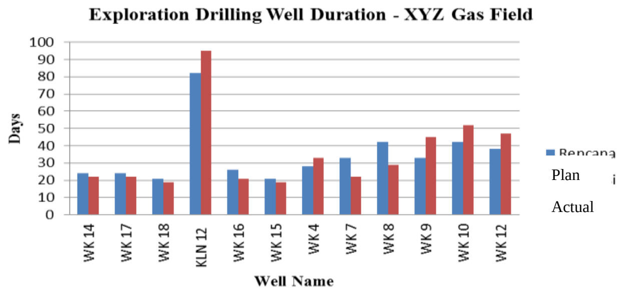

Fig. 2. Plans vs Actual of Exploration Wells Duration in the XYZ Gas Field

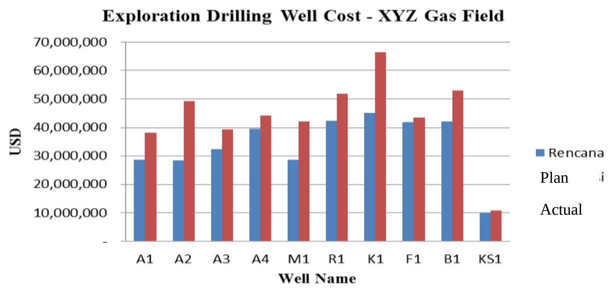

Fig. 3. Plans vs Actual of Exploration Wells Cost in the XYZ Gas Field

Table. 1. Time Performance Scale

Scale	Value	Description
5	Very Good	Ahead >4%
4	Good	Ahead Between 0 % to 4%
3	Fair	Behind < -8%
2	Poor	Behind Between -8% to -16%
1	Very Poor	Behind > -16%

be measured using the Variance Analysis and Trend Analysis methods [11]. Both methods show how the time performance of a project can be measured and quantified so that an assessment of the time performance of the project can be carried out. Based on the Category and the time delay described in Table 1, it can be seen that the delay schedule is based on a predetermined range and the value of the category [15]. Comparison between plan and actual duration as well as the cost of well drilling in the operation of 10 XYZ Gas Field exploration wells shows a very significant difference referring to Fig. 2. and Fig. 3.

C. Project Planning and Control Process

Planning and control procedures for drilling of exploration wells at the XYZ Gas Field do not use PMBOK 2017 as a basis. The performance of planning procedures at the XYZ Gas Field has never been evaluated so it is not yet known whether the poor performance of the project time is a result of poor project planning procedures.

The project planning and control process based on the PMBOK 2017 includes 10 knowledge areas consisting of; 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 [11].

D. Risks in the Planning and Control Process

As in PMBOK 2017 [11], the definition of risk is an event or situation that cannot be determined, and if it appears can have an impact on project implementation and performance that can be related to time, cost, quantity and also the quality of the project. Risks in the planning process have also been studied further in the aspects of well drilling and testing. Detailed well planning, including risk planning for various fields of well operations, is one of the essential effects of the well drilling management system [16]. While in the control

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process, structured efforts are required to control risk for good project management. Implementation of the risk response plan is also included in the risk control process [11].

E. Effect of Planning and Control Processes on the Quality of Project Related to Time Performance

Controlling the scope of the project during the execution process is one of the challenges that must be faced by the project manager [17]. Project conditions that are highly uncertain must be taken into account in the planning process [18]. Planning and Control are known to improve project performance in terms of cost, time and quality [19]. Appropriate planning and effective control strategies can improve project time and cost performance [20].

III. Research Method

The research methodology used and the operational model in this research can be seen in Fig. 4. and Fig. 5. Based on the Fig. 4., there are two X variables which is planning and controlling process which will affect the Y variable which is the drilling project time performance. Based on Fig.5, the research instrument used was questionnaire. Moreover, expert validation was carried out twice in this research.

Literature review is the initial process carried out to obtain indicators and risk factors which will then be validated by experts, thus the indicators and risk factors can be argued as relevant factors and risks. In this validation process the experts can also add or replace the indicators and risk factors. The pilot survey is carried out next so that it can be known with certainty that the respondent already has sufficient understanding of the research instrument and the results or data obtained are valid. Data collection will be carried out by measuring the opportunities and also the impact of each risk factor based on the opinions of the respondents.

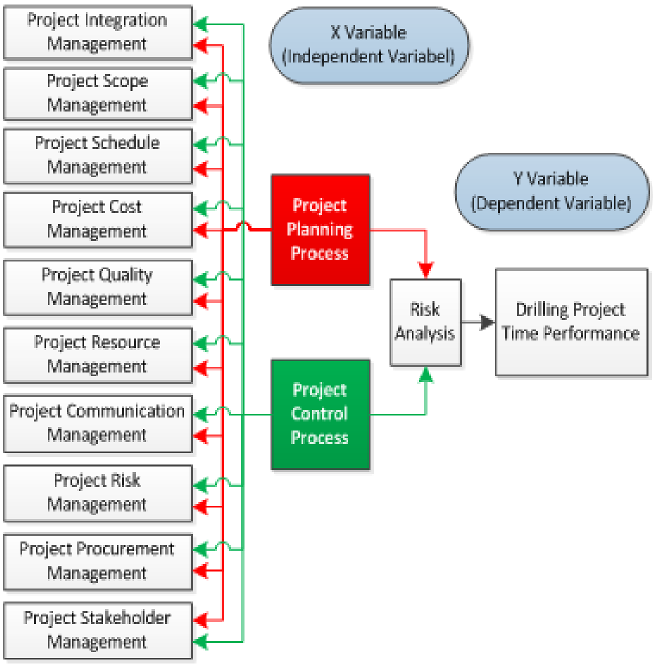

Fig. 4. Operational Model of Research

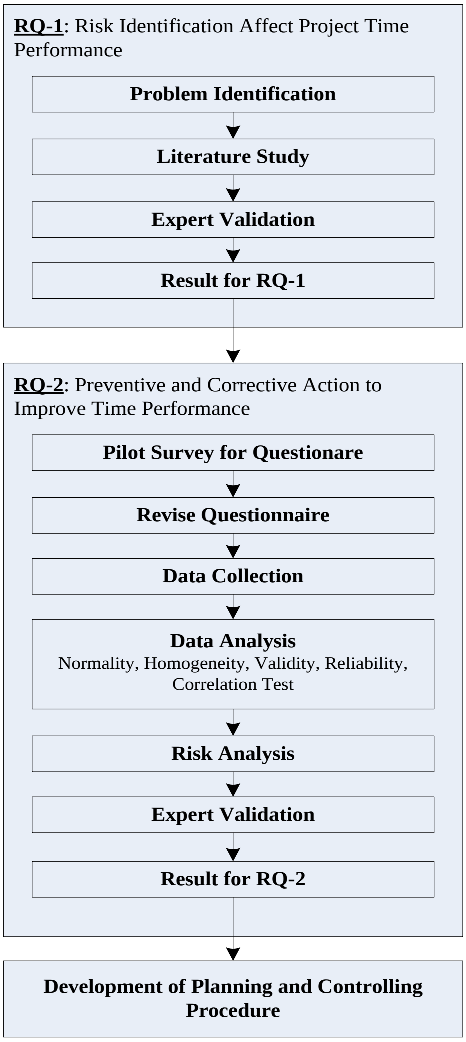

Fig. 5. Research Methodology

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35 respondents have been included for the data to become valid. Respondents who will participate at least have a Bachelor's educational background with at least 2 years' experience in oil and gas well drilling projects. Validation of the respondent's data that has been analyzed will be done next and become the final stage of validation. The purpose of this stage is to get advice and opinions from 3 experts to assess whether the research results are in accordance with current conditions so that preventive and corrective steps can be formulated.

IV. Results and Discussion

Based on the results of literature studies by the author as well as validation with the experts, the initial risks that could affect time performance in each project planning and control process based on PMBOK 2017 are identified. These risks are shown in the Table.2.

Homogeneity tests are carried out based on job position, experience and last education background. These three groups have more than two categories, so the testing is done using the Kruskal-Wallis test. The hypothesis in this test is; Ho = There were no differences' in respondents perceptions with different job positions, last education and work experience background, Ha = There were differences in respondents' perceptions with different job positions, last education and work experience background. Ho is accepted when Asymp. Sig > level of significant which is 0.05, and Ho was rejected if otherwise. The results of the risk variables that have passed the homogeneity test is shown in Tabel.2.

Internal validity test is used to determine whether the instrument used in this research is valid. The instrument used is valid if it has a value of r count > r table. The 95% confidence level or 5% significance was used for the 2-sided test with 35 respondents so that it had a degree of freedom of 33. The r table obtained is 0.325. The results of the risk variables that have passed the internal validity test are shown in Tabel.2.

Reliability test is used to measure the extent to which the instrument in this research produces the same and consistent measurements. Cronbach Alpha with value less or equal to 0.6 shows that the research instrument is not reliable and vice versa if the Cronbach Alpha value is higher or equal to 0.6. The Cronbach Alpha value of instrument in this research shows the value of 0.985 which shows the instruments is reliable.

Correlation test is a bivariate analysis used to analyze the relationship between two variables and the direction of the relationship as well. The Kaiser-Meyer-Olkin Test (KMO) is a test conducted to find out how suitable a data is for factor analysis. This test measures the adequacy of the sample for each variable in the model in relying on the complete model. The results of these two tests are shown in Table.2.

Risk ranking analysis is performed on the variable X which has been tested in the reliability test, factor test and KMO test. This analysis is a multiplication between the average frequency value and the impact of each X variable so that the risk value can be obtained. Weighting to get the average value of risk's frequency and impact refers to the PMBOK 2017. For weighting the risk frequency the following values are used; Very Low = 0.10, Low = 0.30, Medium = 0.50, High = 0.70, Very High = 0.90. Moreover, for weighting the risk impact the following values are used; Very Low = 0.05, Low = 0.10, Moderate = 0.20, High = 0.40, Very High = 0.80. After the risk value is obtained, the value will be compared in the Probability and Impact Matrix referring to the PMBOK 2017, thus these risks can be classified as low risk: 0.01 - 0.07; moderate risk: 0.08 - 0.20; or high risk: 0.21 - 0.72. The risks are also ranked according to the risk value from the highest value to the lowest value. The results of the risk analysis can be seen in Table.2.

Refer to the results of research instrument and data testing, as well as the risk rating analysis shown in the Table. 2, there are two risk variables in the planning process and two risk variables in the control process that have a strong correlation to project time performance. The four risk variables also have a high risk rating based on the results of the risk analysis. The four risk variables are; XA51 and XA59 on project planning processes; XB4 and XB27 on project control processes.

XA51 "*High likelihood and impact on the project risk due to the absence of risk management plans*", is ranked No. 1 in the correlation test, and ranked No. 3 in risk analysis for project planning process group.

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This risk variable is in "*Project Risk Management*" knowledge area, which is in the "*Plan Risk Management*" indicator.

XA59 "*Mistakes in estimating the process and tools that will be used*", is ranked No. 5 in the correlation test, and ranked No. 1 in risk analysis for project planning process group. This risk variable is in "*Project Risk Management*" knowledge area, which is in the "*Perform Quantitative Analysis*" indicator.

XB4 "*Project Management software is not used comprehensively for project control*", is ranked No. 2 in the correlation test, and ranked No. 5 in risk analysis for project monitoring and controlling process group. This risk variable is in "*Project Integration Management*" knowledge area, which is in the "*Monitor and Control Project Work*" indicator.

XB27 "*The unavailability of adequate communication media in accordance with the plan*", is ranked No. 1 in the correlation test, and ranked No. 1 in risk analysis for project monitoring and controlling process group. This risk variable is in "*Project Communication Management*" knowledge area, which is in the "*Monitor Communications*" indicator.

Based on the list of top and significant risks identified above, the grouping based on knowledge areas of those risks is carried out. "*Project Risk Management*": XA51 and XA59. "*Project Integration Management*": XB4. "*Project Communication Management*": XB27.

Validation of the four risk variables that have been identified is then carried out through interviews and discussions with experts who have been previously involved in the validation of initial risk variables. Based on these interviews and discussions, cause and impact of these risks was validated thus a preventive and corrective response was formulated to reduce the high level of those risks to an acceptable level. Table.3. shows the results of the interview and discussion that are the causes, impacts, preventive responses and corrective responses to these significant risks.

Table. 2. Result of Risk Analysis, Data and Instrument Testing

Risk Code	Normality Test[1]	Homogeneity Test (Asymp. Sig)[2]			Validity Test[3]	Correlation Test	Risk Analysis
	Asymp. Sig. (2-tailed)	Position	Experience	Education		Ranking	
Risk on Well Drilling Project Planning Processes							
XA1	0.2433	0.9338	0.5893	0.929	0.801	9	Moderate
XA2	0.0981	0.5193	0.5390	0.327	0.773	17	Moderate
XA3	0.3410	0.8519	0.5705	0.403	0.742	24	Moderate
XA8	0.3303	0.3840	0.2109	0.816	0.707	12	Moderate
XA9	0.4193	0.4290	0.3438	0.593	0.600	37	Moderate
XA12	0.3468	0.3324	0.5809	0.495	0.665	4	Moderate
XA13	0.0394	0.9312	0.7973	0.906	0.758	6	Moderate
XA14	0.4659	0.9789	0.8757	0.802	0.838	32	Moderate
XA17	0.2447	0.8254	0.8264	0.915	0.637	36	Moderate
XA20	0.0691	0.6615	0.3420	0.556	0.790	35	Moderate
XA26	0.3555	0.2634	0.1763	0.723	0.634	27	Moderate
XA27	0.1813	0.6628	0.2209	0.708	0.680	2	Moderate
XA28	0.3992	0.3481	0.4345	0.611	0.713	7	Moderate
XA29	0.1946	0.5990	0.9618	0.124	0.746	29	Moderate
XA30	0.2866	0.7547	0.8582	0.734	0.614	30	Moderate
XA32	0.4929	0.9623	0.5022	0.352	0.690	28	Moderate
XA33	0.2808	0.7645	0.9249	0.361	0.783	22	Moderate
XA35	0.4615	0.8171	0.7189	0.725	0.781	38	Moderate
XA36	0.4568	0.9957	0.8591	0.821	0.722	18	Moderate
XA37	0.3220	0.9175	0.8510	0.897	0.741	21	Moderate
XA38	0.0464	0.5882	0.5369	0.279	0.683	23	Moderate
XA39	0.5007	0.8920	0.1591	0.777	0.771	31	Moderate
XA40	0.6087	0.3949	0.0780	0.415	0.674	15	Moderate
XA44	0.2222	0.4649	0.9172	0.693	0.682	8	Moderate
XA46	0.1790	0.6986	0.8613	0.626	0.738	20	Moderate
XA49	0.2875	0.6859	0.9315	0.280	0.732	10	Moderate
XA51	0.5318	0.2573	0.8194	0.680	0.681	1	High
XA53	0.3208	0.2138	0.5770	0.874	0.754	11	Moderate
XA56	0.1908	0.2176	0.7554	0.777	0.693	14	High
XA58	0.1748	0.9340	0.8844	0.656	0.696	13	High
XA59	0.1973	0.9776	0.6729	0.478	0.818	5	High
XA60	0.4417	0.7016	0.8510	0.641	0.802	16	Moderate

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XA61	0.2682	0.4884	0.9634	0.879	0.635	34	Moderate
XA63	0.2891	0.8199	0.4044	0.366	0.579	26	Moderate
XA64	0.3034	0.9573	0.6682	0.076	0.683	33	Moderate
XA65	0.2889	0.3378	0.5167	0.946	0.811	3	Moderate
XA66	0.2173	0.6299	0.5399	0.780	0.771	19	Moderate
XA68	0.4798	0.8827	0.4631	0.981	0.741	25	Moderate
Risk on Well Drilling Project Controlling and Monitoring Processes							
XB2	0.4830	0.175	0.365	0.234	0.667	11	Moderate
XB3	0.3684	0.370	0.658	0.956	0.654	4	Moderate
XB4	0.7530	0.692	0.227	0.941	0.608	2	High
XB6	0.2988	0.896	0.795	0.940	0.677	21	Moderate
XB7	0.2952	0.948	0.998	0.917	0.716	22	Moderate
XB9	0.6189	0.772	0.819	0.850	0.647	10	Moderate
XB10	0.0855	0.414	0.999	0.954	0.766	13	Moderate
XB13	0.3685	0.260	0.656	0.883	0.737	19	Moderate
XB14	0.3940	0.691	0.885	0.968	0.687	12	Moderate
XB16	0.4150	0.456	0.709	0.296	0.503	14	Moderate
XB17	0.7610	0.883	0.976	0.960	0.561	15	High
XB18	0.0622	0.607	0.714	0.573	0.800	17	Moderate
XB20	0.6811	0.712	0.342	0.712	0.817	8	Moderate
XB21	0.1820	0.936	0.574	0.733	0.669	20	Moderate
XB24	0.4378	0.452	0.327	0.680	0.558	16	Moderate
XB25	0.5425	0.863	0.356	0.532	0.651	18	Moderate
XB26	0.4871	0.732	0.930	0.339	0.761	6	Moderate
XB27	0.6524	0.792	0.710	0.482	0.525	1	High
XB28	0.3684	0.522	0.261	0.158	0.399	3	High
XB29	0.6532	0.816	0.985	0.728	0.570	5	High
XB33	0.2191	0.793	0.153	0.569	0.495	9	High
XB34	0.3711	0.711	0.942	0.425	0.766	7	Moderate

[1] Asymp. Sig. (2-tailed) bigger than 0.05 = Normal Distribution

[2] Asymp. Sig. bigger than 0.05 = Accepted

[3] Corrected Item-Total Correlation is less than Cronbach's Alpha if Item Deleted; 0.984 – 0.985 for XA and 0.962 – 0.965 for XB

Table. 3. Validation Results of Variable with High Risk Ratings and Correlations.

CODE	RISK	CAUSE	PREVENTIVE ACTION	IMPACT	CORRECTIVE ACTION
Knowledge Area Management: Project Risk Management					
Planning Process Group					
XA51	**Project Risk Management** High likelihood and impact on the project risk due to the absence of risk management plans	**C1** The existence of a corporate risk management system results in an opinion that the risk management system at the project level has also been managed.	**PA1** Risk Management System for the project level including risk management plan needs to be designed and applied in all phases of the project. Risk Response Type: Mitigate	**I1** Risks at the project level cannot be identified results on poor risk response planning and risk control, which impacts the duration and cost of the project.	**CA1** Refer to the Company's Standard Operating Procedures because a risk management plan has not been established. Risk Response Type: Accept
		C2 The risk management plan undertaken is not specifically intended for the drilling project but rather at the corporate level.	**PA2** The risk management plan should be designed and discussed together with experienced people who are directly involved later on project work in the field. Risk Response Type: Mitigate	**I2** Risk response to the risks that occur is not implemented well thus, it affects the duration of the project.	**CA2** The risk response that has been applied must be reviewed and then immediate improvements must be made to the risk response Risk Response Type: Accept
XA59	**Project Risk Management** Mistakes in estimating the process and tools that will be used	**C3** The absence of a risk management system at the project level results in the verification process of the design process and tools not being carried out properly.	**PA3** Risk Management System for the project level including the quantitative risk analysis process needs to be designed and applied in all phases of the project. Risk Response Type: Mitigate	**I3** Mistakes in quantitative analysis of risks will occur and will result in deviations and not achieving project targets, especially related to the duration and cost of the project.	**CA3** Verification process will be established and improvements to the process and tools will provide an updated quantitative risk analysis. Risk Response Type: Accept
		C4 Information about the work is incomplete and the risk analysis system is not well planned.	**PA4** The risk management system in the planning phase must include verification of complete project information. Risk Response Type: Mitigate	**I4** Poor quality of quantitative analysis of project risks which will impacts the duration and cost of the project	**CA4** Immediately do the re-identification followed by quantitative analysis of risk using new processes and tools that have been identified. Risk Response Type: Accept
Knowledge Area Management: Project Integration Management					
Monitoring & Controlling Process Group					

CODE	RISK	CAUSE	PREVENTIVE ACTION	IMPACT	CORRECTIVE ACTION
XB4	**Project Integration Management** Project Management software is not used comprehensively for project control	**C5** The drilling project is considered to be relatively not as complicated as the EPCI project or construction project with a relatively shorter duration.	**PA5** Application of project management software and implement a comprehensive data management system. Risk Response Type: Mitigate	**I5** The difficulty of the project planning and control process thereby increasing the risk of not achieving the objectives of the project mainly related to the target duration of the project.	**CA5** Project management should be done immediately by using an ongoing management system and focus on the application of risk response in accordance with the company's standard operating procedures Risk Response Type: Accept
		C6 Interpretation and response to output from project management software which is not followed up properly.	**PA6** Added verification process for required information and output from project management software. Risk Response Type: Mitigate	**I6** Failure to estimate the duration of project activities and control the project activities.	**CA6** Analysis and verification of input and output from project management software is carried out immediately so that an appropriate response to project conditions can be carried out properly. Risk Response Type: Accept
Knowledge Area Management: Project Communication Management					
Monitoring & Controlling Process Group					
XB27	**Project Communication Management** The unavailability of adequate communication media in accordance with the plan	**C7** The condition of the project location, which is in an inland location in West Papua often causes the previously planned communication media to become unavailable and cannot be used optimally.	**PA7** Adding units for the same communication media as backup and adding types of project communication media. Risk Response Type: Mitigate	**I7** Miscommunication occurs and can have a major impact on the achievement of the planned duration and project costs.	**CA7** Immediately apply the planned risk response in the planning phase and do the analysis at the site and office to find the cause so that corrective action according to the SOP can be done immediately. Risk Response Type: Accept
		C8 Poor risk analysis and identification related to project communication systems.	**PA8** Conduct a process of identifying and analyzing risks related to the project communication system in more detail and comprehensively. Risk Response Type: Mitigate	**I8** The information sent is not complete or even wrong and is not received on time so that it can result in wrong and late decision making.	**CA8** Immediately make the provision and improvement of communication media in accordance with the plan. Risk Response Type: Accept

A. Cause and Impact Analysis

This analysis is carried out to find out the root causes and impacts that might occur from each of significance risks identified. The significance risk is associated with each of the causes and impacts that have been previously validated. To further illustrate risk mapping, the risk mapping is also associated with preventive and corrective actions. Codes of causes and impacts as well as preventive and corrective actions on significance risks can be seen in table.3. The mapping is then carried out again by linking the causes, impacts, and corrective and preventive actions of each variable.

The details analysis of causes, impacts, preventive actions, and corrective actions can be seen in Fig.6. Risk event (XA51) can occur due to causes (C1 & C2), causes (C1) can be prevented by taking preventive action (PA1) and causes (C2) can be prevented by taking preventive action (PA2).

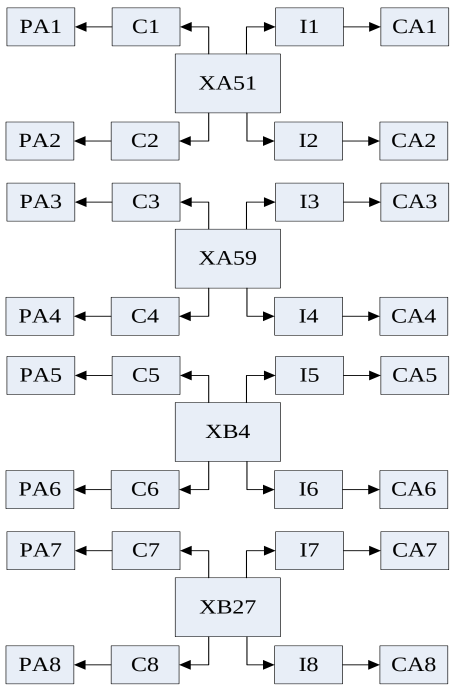

Fig. 6. Pattern Recognition

If a risk event (XA51) occurs, it will have an impact (I1 & I2), the impact (I1) can be corrected by a corrective action (CA1) and the impact (I2) can be corrected by a corrective action (CA2). Risk events (XA59) can occur due to causes (C3 & C4), causes

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(C3) can be prevented by taking preventive action (PA3) and causes (C4) can be prevented by taking preventive action (PA4). If a risk event (XA59) occurs, it will have an impact (I3 & I4), the impact (I3) can be corrected by corrective action (CA3) and the impact (I4) can be corrected by corrective action (CA4). Risk events (XB4) can occur due to causes (C5 & C6), causes (C5) can be prevented by taking preventive action preventive action (PA5) and causes (C6) can be prevented by taking preventive action (PA6). If a risk event (XB4) occurs, it will have an impact (I5 & I6), the impact (I5) can be corrected by corrective action (CA5) and the impact (I6) can be corrected by corrective action (CA6). Risk events (XB27) can occur due to causes (C7 & C8), causes (C7) can be prevented by taking preventive action (PA7) and causes (C8) can be prevented by taking preventive action (PA8). If a risk event (XB4) occurs, it will have an impact (I7 & I8), the impact (I7) can be corrected by a corrective action (CA7) and the impact (I8) can be corrected by a corrective action (CA8).

B. Risk Response Strategy

Risk response strategies are grouped according to the type of risk response, which are preventive action (PA) and corrective action (CA). Referring to Table.3, all preventive actions (PA) are a type of mitigation risk response, which is an action that can reduce the frequency of occurrence of risk or the impact caused by the risk. Meanwhile, all corrective actions (CA) are a type of accept risk response, i.e. the act of accepting the risk occurs, however control / monitoring of the risk event as the project progresses continues. By developing these risk responses, development of the drilling project planning process can be carried out. The development plan of the risk response to the project planning process can be seen in Table. 4. In the table. 4. it can be seen that all preventive actions as a risk response to the identified risks in this research have not been applied in the project management process at ABC Company. The development of mitigation action procedures referring to the preventive response identified needs to be formulated and tested its application.

C. Risk Management System

The discussion of project planning with the combination of project risk management and the influence of organizational culture on project success has been a topic of discussion in a number of studies [5]. Risks in the planning process have also been studied further in the aspects of well drilling. Detailed well planning, including risk planning for various fields of well operation, is one of the essential effects of the well drilling management system [13]. Reference [9] shows risk control is an activity carried out as a result of risk response, the purpose of which is to reduce the probability of risk and also recognize potential risks, after evaluating the risk management activities at work.

Based on the findings of this study, it is known that there are three significant risks associated with Project Risk Management that have a significant effect on project time performance. The three risks are XA51, XA59 and XB27. XA51 and XA59 are risks in the project risk planning process while XB27 is a risk that occurs in the project communication control process. These three risks indicate that the planning and control of the drilling project at the XYZ Gas Field requires the development of procedures especially in the aspect of project risk management.

Table. 4. Gap Analysis Preventive Action (Mitigation).

Code	Process at ABC Co.	Development Action
PA1	Absence of Project Risk Management System	Development of a Project Risk Management System that is applied to all phases of the project life cycle and verification process.
PA2	The execution team in the field was not included in the risk management system planning	
PA3	Absence of Project Risk Management System especially on quantitative risk analysis	
PA4	Absence of verification process on risk management system planning	
PA5	Project management software is not used in all phases of the project	Application of a Project Management Software and training of personnel
PA6	Lack of verification and personal competence in using and interpreting the results of project management software.	
PA7	The options and back-up of communication media used are minimal	Inclusion of risk in project communication in the project's risk management system analysis
PA8	The risk in communication process is not included and discussed in the project risk management system	

The Risk Management System that is currently

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applied to the management of ABC Co. is a corporate risk management system using iRISK™. The risks managed by the system are more on corporate risks rather than project operating risks. However, the existence of this system results in an opinion that the risks of the whole company operations are well managed, where this opinion conflicts with the results of data analysis in this study. Referring to the analysis of data from this study, it is known that the risk of drilling projects at the XYZ Gas Field has not been well managed due to the absence of a risk management plan at the project level. The impact of these conditions results in risks at the project level that cannot be identified properly so the risk response cannot be planned. In addition, the absence of a risk management system at the project level also results in the verification process of the design process and tools not being carried out optimally so that an impact on errors in quantitative analysis of risks will occur. Risk analysis and identification related to project communication systems that are less comprehensive is also a result of the absence of a risk management plan at the project level. The combinations of all of these results in poor risk control which impacts on the duration of the project. Project risk management is required to be designed and applied in each project phase lifecycle. Project risk management in this case can be designed in the form of a risk management system or RMS. RMS is a separated process which is risk management process that is attached to the current project management process. RMS has a process in every phase and project lifecycle so that in every project management process there is also an associated RMS process. Each of the RMS phases and processes must be carried out through discussion by the team involved in all phases of the well drilling project, especially in the project execution phase. The team at least consists of geologists, reservoir engineers, geophysicists, drilling engineers, construction engineers, completion engineers, production engineers, drilling supervisors and HSE engineers. Service contractors such as rigs and other services that will be used must be involved in phases three, four and five of RMS process. The process in RMS can be broadly categorized as follows;

Phase-1: Project initiation; determining the prospect of the well work continued with risk analysis related to objectives, scope and value drivers. The output of phase-1 is the phase-1 well approval.

Phase-2: Selection of alternatives and uncertainties analysis; Analyze the objectives of selected wells based on value engineering analysis, continue with planning uncertainty risk management, selecting alternatives and conducting risk assessments of selected alternatives. The output of phase-2 is the alternative agreement chosen.

Phase-3: Detailed Engineering; Conduct a risk assessment of well engineering, design and plan, including the plan communication management. The output of phase-3 is approval of the well design plan and budget.

Phase-4: Well execution; Risk management is carried out primarily by risk control and risk response procedures. The output of phase-4 is the handover of the well to the production department.

Phase-5: Evaluation; Perform a look-back analysis and lesson learned analysis. The output of phase-5 is the completion of the well drilling project.

D. Project Management Software

The drilling project is considered to be relatively not as complicated as the EPCI project or the construction project. Drilling projects also have relatively shorter project duration. Therefore, procurement of project management software has not been felt necessary for managing drilling projects. Software used in drilling project operations in general is software engineering and data management. This is one of the reasons why Project Management software is not used comprehensively for project control. In addition, another cause is the lack of competence and ability of personnel in using project management software in drilling project operations. Managing projects manually and not using project management software can cause difficulties in the project planning and control process. This increases the risk of not achieving the objectives of the project mainly related to the target duration of the project. The use of project management software and implementing a comprehensive data management system are appropriate preventive measures for this risk. In addition, adding the verification process to the information required by the software and the output of the project management software can also reduce

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the probability and impact of this risk.

E. Project Communication Management

Reference [9] shows the project communication media should have been planned before in the project planning process and listed in the communications management plan. The condition of the project location, which is in an inland location in West Papua often causes the previously planned communication media to become unavailable and cannot be used optimally. The unavailability of adequate communication media in accordance with the plan can result in the information being sent to be incomplete or even incorrect and received not on time so that bad and late decision making can occur. Actions that can be taken to prevent this risk are by adding the unit of communication media as a backup and also add the type of project communication media as alternatives. The backup media in this case can become the main communication media if one of the planned communication media fails.

Real-time drilling parameter data monitoring; all data parameters for well drilling include, but are not limited to WOB (Weight on Bit), RPM (Rotation Per Minute), ROP (Rate of Penetration), Drill Pipe Pressure, Pump Pressure, Gas Reading, Torque, Pit Gain and Reverse Flow should always supervised by a well supervisor at the project site. Miscommunication that occurs can be reduced both the possibility and impact if the drilling parameters also can be monitored real-time by the engineering team in the office at any time.

Real-time CCTV monitoring of the project site; CCTV can be installed in the drilling rig so that the working conditions can be monitored in real time from the office. Unsafe working conditions that are not in accordance with the plan can be immediately confirmed with the project supervisor in the field. If these conditions deviate from the project plan, corrective actions can be taken immediately.

All contractors involved in the drilling project must provide their representatives to be able to attend morning meetings each day. During the meeting a 5-day plan for the future work of the project will be discussed in detail, so that the contractor can immediately coordinate material and service needed including mobilization needed for the next 5 days of operation.

Daily work instructions compiled by the project supervisor must also be sent to the head office to be reviewed. This step is expected to be an additional process of supervision and verification of project operations every day.

The addition of communication media will improve project time performance; however there may be additional project costs. Further analysis of project cost performance, especially related to the additional cost of communication media that can improve project performance needs to be carried out.

CONCLUSION

In this research, four significant risk factors have been identified. The four risks, XA51, XA59, XB4 and XB27, highly affect the quality of project planning and control which directly impacts on time performance. Description of the knowledge area & process group of these risk variables can be seen in Table.5.

The development of project planning and control procedures to improve the quality of project planning and control must be carried out by adding three aspects identified.

These three aspects are; the project risk management system that is applied to all phases of the project life cycle, the application of a project management software and inclusion of project communication risk analysis in the risk management system.

Table. 5. Risk Factor Affect Time Performance

Variable Code	*Knowledge Area*	*Risk Variable*
XA51	Project Risk Management	High likelihood and impact on the project risk due to the absence of risk management plans
XA59	Project Risk Management	Mistakes in estimating the process and tools that will be used
XB4	Project Integration Management	Project Management software is not used comprehensively for project control
XB27	Project Communication Management	The unavailability of adequate communication media in accordance with the plan

These three aspects are; the project risk management system that is applied to all phases of the project life cycle, the application of a project management software and inclusion of project communication risk analysis in the risk management system.

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procedures in this research is expected to improve the time performance of the development and production well drilling project at the XYZ gas field.

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