

ANALYSIS OF FACTORS CAUSING DELAY IN CONSTRUCTION PROJECTS (CASE STUDY: OIL AND GAS CONSTRUCTION PROJECTS IN COMPANY X)

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Abstract.

Management of construction project is an activity of providing infrastructure which will be used to support daily activities. Completion of construction projects depend on cost, time, and quality. Project implementation often faces identified and unidentified obstacles and has the potential to hinder project completion. Delays in project completion can affect the fulfillment of the planned target time. Company X has experience delays in completing construction project between 10% to 25% of the original plan and 50% of the projects experiencing delays from the total projects for the last six years.

For this reason, it is necessary to identify the factors that cause delays in project completion from the viewpoint of the project owner. This study aims to identify risk factors for delays in construction projects and analyze the factors that cause delays in construction projects, especially on gas pipeline infrastructure projects. Factor that causing delay in project completion are weather changes during project activity (X15), communication between contractors and project owner (X7), and Site Management by Contractor (X2).

Risk identification is necessary during planning activity especially regarding two factors that already mentioned. The results of this study provide useful benefits for the stakeholders, both project implementers and contractors for the future planning activities.

Key words: risk, project schedule, risk factors, construction process, contractor

1. Introduction

The construction project is completed through several stages that need to be carried out in sequence. These stages are the Feasibility Study, Design, Procurement, Construction, and Operations. Management of construction project is an activity of providing the infrastructure which will be used to support daily activities. Completion of construction projects depends on cost, time, and quality.

Company X has projects related to the availability of gas pipeline infrastructure for operational purposes. Projects implemented have been delayed between 10% - 25% of the original plan. The numbers of projects delays are approximately about 50% from the total projects complete in the period of the last six years.

Study is needed to identify the factors that cause delays in the completion of these projects, identify the causes of delays in construction projects, activities that can be avoided during project implementation which can result in late project completion, activities that can be avoided during project implementation which can impact to project completion.

2. Objective

The objectives of this research include the following;

1. To identify the risk factors that cause project delays
2. To study the factors causing project delays
3. To analyze the factors that can be avoided during project implementation

3. Research Methodology

Research methodology is designed to answer the research objective. The questionnaire will be used as the best technique for gathering the required data. The choice of answers to the questionnaire has a value from one to four that will be filled out by respondents. The value of one on the questionnaire represents the negative things that happened during project implementation. While value four on the questionnaire represents positive things that happened during the project implementation.

2.1. Research Instruments

This research is using 29 independent variables and 1 dependent variable that obtained from literature studies and discussion with some projects team involved in construction projects of Company X.

2.2. The Respondents

Research data will be obtained through respondents which consist of project managers, project controls, and engineers that involved in construction project in Company X. Respondent are also as a project *Subject Matter Expert* (SME) who can provide information related to project implementation.

2.4. Research process

The outline of this research explained by the flowchart below.

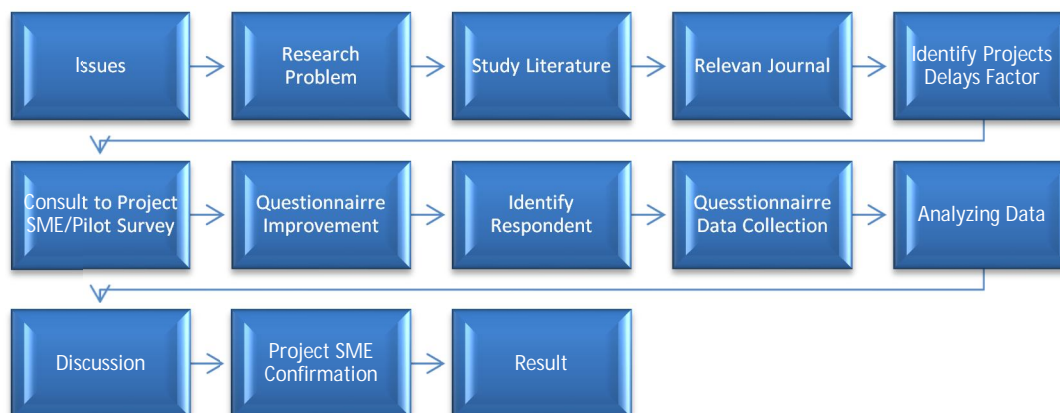


Figure 2.1 The Research Stages

Table 2.1 Research Factors and Variables

Factor	Variable	Description	Reference
External	X1	Quality of Contractor Planning	Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016), A.Kazemi et al (2018)
	X2	Site Management by Contractor	Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016), A.Kazemi et al (2018)
	X3	Contractor's knowledge and experience in completing project activities	Ravand and Salahi A. (2011), Alzara et al. (2016), A.Kazemi et al (2018)
	X4	Problems with managing project activities by the contractor	Babaei and Hoseini (2014), Atafar and Eghbali (2013), Aziz (2013), Marzouk and El-Rasas (2014), Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016).
	X5	Errors in construction work on the design	Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016).
	X6	Advice form project owner and consultant by contractor	Safavi et al. (2010), A.Kazemi et al (2018)
	X7	Contractor communication with project owner	A.Kazemi et al (2018)
	X8	Changes in contractor personnel	Gluszak and Lesniak (2015).
	X9	The use of obsolet technology or tools by the contractor	Aziz and Abdel-Hakam (2016).
	X10	Contractor's financial problem	Marzouk and El-Rasas (2014), Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016), A.Kazemi et al (2018)
	X11	Availability of materials needed	Gluszak and Lesniak (2015), Aziz and Abdel-Hakam (2016), Alzara et al. (2016).
	X12	The quality of the material used	Fallahnejad (2013), Aziz and Abdel-Hakam (2016), AlHazim et al. (2017). A.Kazemi et al (2018)
	X13	Finding workers needed by the contractor	Ravand and Salahi A. (2011), Alzara et al. (2016).
	X14	Tools used during the project	Gluszak and Lesniak (2015), Aziz and Abdel-Hakam (2016).
	X15	Changes in weather during the project	Atafar and Eghbali (2013), Marzouk and El-Rasas (2014), Babaei and Hoseini (2014), Gluszak and Lesniak (2015), Ruqaishi and Bashir (2015), Aziz and AbdelHakam (2016), Al-Hazim et al. (2017), A.Kazemi et al (2018)
	X16	Changes to regulations during the project	Gluszak and Lesniak (2015), Ruqaishi and Bashir (2015), Aziz and AbdelHakam (2016).
	X17	Timeliness of consultants in reviewing documents	Marzouk and El-Rasas (2014), Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016). A.Kazemi (2018)
	X18	Knowledge and experience of consultant personnel in carrying out project activities	Marzouk and El-Rasas (2014), Aziz and AbdelHakam (2016).
	X19	Consultant communication skills	Aziz (2013), Aziz and Abdel-Hakam (2016).

Factor	Variable	Description	Reference
	X20	Unresolved conflicts between contractors and consultants	Aziz and Abdel-Hakam (2016).
	X21	Providing technical aspects input by the consultant	Hamzah et al. (2011). A.Kazemi et al (2018).
Internal	X22	Quality of planning (planning) by project owner	Babaei and Hoseini (2014), Gluszak and Lesniak (2015), A.Kazemi et al (2018)
	X23	Timeliness of project owner in making decisions	Gluszak and Lesniak (2015), Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016), Al-Hazim et al. (2017).
	X24	Timeliness of project owner in reviewing and approving project documents	Aziz and Abdel-Hakam (2016), Al-Hazim et al. (2017).
	X25	Timeliness of project owner in payments to contractors	Ruqaishi and Bashir (2015), Aziz and Abdel-Hakam (2016), Alzara et al. (2016), Al-Hazim et al. (2017), A.Kazemi (2018)
	X26	Errors and inconsistencies of design documents	Atafar and Eghbali (2013), Gluszak and Lesniak (2015).
	X27	<i>change order/changes in scope</i>	Gluszak and Lesniak (2015), Ruqaishi and Bashir (2015),
	X28	Project administration bureaucracy	Fallahnejad (2013), Atafar and Eghbali (2013), Aziz and Abdel-Hakam (2016), A.Kazemi et al (2018)
	X29	Financial problem of project owner	Marzouk and El-Rasas (2014), Gluszak and Lesniak (2015), Aziz and Abdel-Hakam (2016), A.Kazemi et al (2018)
	Y	Project time performance	

4. Results Finding

Literature studies provided information that the risk factors which cause project delays comes from internal factors and external factors. From the processed data questionnaire, the factors can be provided as follow.

$$Y = 1.084 + 0.392X15 + 0.188X7 + 0.175X2$$

While;

Y = Variable of project completion (time)

C = Constanta (1.084)

X15 = Variable of weather change factor

X7 = Variable of communication between contractors and project owner

X2 = Variable of site management by contractor

The result showed that the variable of project completion performance (Y) is influenced by variable of weather change factor (X15), variabel of the communication between the contractor and the project owner (X7), and variabel of site management by contractor (X2).

If there is one addition to the value in the X15 variable, this will increase the project completion performance by 39.2%. If weather changes increasingly never occur during project implementation, the performance of project completion will also increase.

Likewise, if one value added to the X7 variabel, the project's completion performance will increase by 18.8%. Good communication between contractors and project owner will improve project completion performance.

For value of X2, if there is an additional one value to the X2 variabel, this will increase the project completion performance by 17.5%.

A simulation of the change in the value of each variable from the above equation will be displayed in the following table.

Table 2. Research Factors and Variables

Y	X15	X7	X2	Y	X15	X7	X2	Y	X15	X7	X2	Y	X15	X7	X2
1,839	1	1	1	2,231	2	1	1	2,623	3	1	1	3,015	4	1	1
2,014	1	1	2	2,406	2	1	2	2,798	3	1	2	3,190	4	1	2
2,189	1	1	3	2,581	2	1	3	2,973	3	1	3	3,365	4	1	3
2,364	1	1	4	2,756	2	1	4	3,148	3	1	4	3,540	4	1	4
2,027	1	2	1	2,419	2	2	1	2,811	3	2	1	3,203	4	2	1
2,202	1	2	2	2,594	2	2	2	2,986	3	2	2	3,378	4	2	2
2,377	1	2	3	2,769	2	2	3	3,161	3	2	3	3,553	4	2	3
2,552	1	2	4	2,944	2	2	4	3,336	3	2	4	3,728	4	2	4
2,215	1	3	1	2,607	2	3	1	2,999	3	3	1	3,391	4	3	1
2,390	1	3	2	2,782	2	3	2	3,174	3	3	2	3,566	4	3	2
2,565	1	3	3	2,957	2	3	3	3,349	3	3	3	3,741	4	3	3
2,740	1	3	4	3,132	2	3	4	3,524	3	3	4	3,916	4	3	4
2,403	1	4	1	2,795	2	4	1	3,187	3	4	1	3,579	4	4	1
2,578	1	4	2	2,970	2	4	2	3,362	3	4	2	3,754	4	4	2
2,753	1	4	3	3,145	2	4	3	3,537	3	4	3	3,929	4	4	3
2,928	1	4	4	3,320	2	4	4	3,712	3	4	4	4,104	4	4	4

The table above provides an overview of the variables that can affect performance of project completion. We assume, if we want to get a good project completion performance at a minimum value of three, then the things to consider are the risks associated with values in variables x15, x7, and x2. If we can not control weather that changes frequently during project activity, there are two other variables that must be optimized and controlled. The two variables are communication between the contractor and project owner and also site management by the contractor that should be well managed.

The following are risks that can be avoided during project implementation. Weather changes (X15) can be identified by recognizing risks if they occur. This risk cannot be borne by one party, whether it is the contractor or the project owner. Weather changes must be considered and included in project planning. This risk can be set forth in a contractual agreement so that both parties can anticipate if this happens.

Communication between contractor and project owner (X7) can be identified by recognizing risks such as clear communication patterns and the involvement of local contractor personnel in the construction project. Communication planning should, as far as possible, be clearly defined as patterns, mechanisms, and tools used among stakeholders. Communication forums can be the agenda of communication activities carried out during project implementation.

Identification of risk factors for project planning from the contractor side. The risks identified in project activities need to be taken into account in the project plan. Identification will provide information about all project activities. Personnel involved in project implementation have good communication skills, so that the site management activities by the contractor (X2) can be handled properly to complete the project.

5. Conclusion

From the result and discussion above we can conclude that:

1. Risk factors that cause project delays come from internal and external factors.
2. The causes of delays in construction projects are weather changes factor (X15) and contractor communication related to project owner factor (X7).
3. Factors that can be considered during project implementation from X15 risk are identifying weather changes that might occur during project implementation, taking into account weather forecast information in the project plan, and incorporating these risks into the contract agreement for risk X7, it can be implemented by identifying patterns, mechanisms and tools of communication between project stakeholders and holding communication forums with local content. The communication skills of the project personnel which involved in implementing the project will facilitate site management (X2) activities properly.

6. Recommendation

The following are recommendations that can be made to improve future research.

1. Further studies need to be done with shorter time spans to get more actual questionnaire data.
2. Further research by comparing surveys between service project owner and contractors with the same object.
3. Further research related to forecasting climate change on project schedules and plans.

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