Study On Risk Handling Strategy Of Road Contruction Projects In Jayapura City

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Abstract: Project risk is an event or an uncertain condition, which if it appears will have a threat on the project object. Many contractors still do not understand the threats that occur in the project, they still assume that risks are always harmful. Based on data from the Papua Public Works procurement service that the implementation of road improvement projects always faces problems. This research is an explorative and descriptive study, which explores the risks / threats that occur in the project from the contractor's perspective in Jayapura, Papua Province Indonesia. The object of this research is the company (contractor) involved in the implementation of road improvement project in Jayapura, whereas the respondent is the project manager and the field supervisor involved in the implementation of road improvement project, The analysis result shows that the overall level of risk is in very low category, and the biggest risks affecting contractors in sequence are; (1) material delays from suppliers, (2) material inventories, (3) design difficulties, (4) incorrectly shipped material volumes, (5) changes to specifications by the owner, (6) difficulty in obtaining materials and equipment, (7) material price increases, (8) over quality, (9) damage to machine tools, (10) weakening the bearing capacity of subgrade soil. While the response to risks / threats that occur in road improvement projects is to reduce and avoid.

Index Terms: Risk handling strategy, road construction project

1 Introduction

Socio-economic activities of the community in managing the potential of the region and driving the wheels of the economy, reflected by the movement of people and goods from one place to another along with the increasing number of population and community activities. Jayapura is the capital of Papua Province located in the easternmost territory of the Republic of Indonesia. Its vast land is filled with forests, seas and biodiversity of farmland and fisheries. Papua also keeps natural gas, oil and other mining materials ready for processing. Papua Province is rich in natural potential, but the difficulty of terrain and other factors is not an easy thing to overcome. Based on data from the Papua Province Public Work Agency that the implementation of road improvement projects from year to year always faces the same problems as job delays, construction cost swelling, lack of development funding and delays in contract administration, and the quality of workers is less. This is due to several things, which is the difficult field of Papua, the lack of costs, the condition of topography, the condition of the land that does not support the development of the road, and the geographic condition.

2 Methodology of Research

The data were obtained by conducting preliminary surveys, first primary survey, and main survey of contractors who have experience working on road improvement projects in Jayapura Papua Province. Data collection is done by interview, and spread of questionnaire. As for the calculation of risk value is the multiplication of the probability score and consequences, the negative consequences for threats obtained from the respondents [1], [2], [3], and [4]. To measure risk level by using the formula:

$$R = P \times I \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where:

R = Risk Level
P = Probability of the risks that occurs
I = Level of impact risks that occur

While to assess the frequency of occurrence used criteria such as Table 1.

Table 1. *Criteria of frequency probability*

No	Criteria	Value
1	Very often	5
2	Often	4
3	Enough	3
4	Rarely	2
5	Very rarely	1

The probability of an undesirable event is measured using the indicator as shown in Table 2.

Table 2. *The indicator of undesirable event*

No	Indicator	Probability (%)	Value
1	Very often	> 70	5
2	Often	50 – 70	4
3	Enough	30 – 50	3
4	Rarely	10 -30	2
5	Very rarely	< 10	1

Using the indicator in Table 2, the risk assessment uses the interval class against cost as an indicator such as Table 3 [5].

Table 3. *The scale of risk*

No	Scale	The Risk of Cost (%)	Value
1	Very low	< 5	1
2	Low	5 - 10	2
3	Medium	10 - 15	3
4	High	15 - 30	4
5	Very high	< 30	5

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The threats on road improvement projects in Jayapura Papua obtained by interviewing, perceptions or opinions from respondents (contractors) that is project managers who have experience in road improvement projects. From the survey results of respondents to obtain sources and variables, there are added or reduced based on the survey. To assess threats the respondents were fill out the questionnaires that have been made in the form of risk identification using probability impact analysis, that is to find out the greatest risk occurring in the road improvement project. In this analysis will be searched a score that is a multiplication of the score on the probability and score of the impact obtained from the respondents.

3 DISCUSSIONS

The respondents used in this study based on the level of education and work experience in road construction projects as shown in Tables 4 and 5.

Table 4. *Education level of respondents*

No	Level of Education	Frequency	Percentage
1	Senior High School (SMU)	8	19.05
2	Vocational High School (STM)	14	33.33
3	Bachelor	10	31.25
	Total	42	100

Table 5. *Working experience of respondents*

No	Working Experience (years)	Frekwensi	Percentage
1	0 - 5	10	31.25
2	6 - 10	17	53.13
3	11 - 15	0	0
4	> 15	5	15.63
	Total	32	100

Validity test is done by using SPSS program aid in order to test whether the contents of the question items in the questionnaire have been valid based on the respondent's answer. From the primary data of respondent survey results, where there are 60 variables of validity risk. Measurement reliability questionnaire to measure internal consistency. Overall SPSS test results for reliability test can be concluded that the source of risk and 60 variables in question prepared in the form of questionnaires to measure the effect of risk is valid and reliable. According to the risk group, the probability calculation has the most dominant risk in each group. In the risk group A (conditions at the project site), the most dominant risk tendency is at the risk of weakening the bearing capacity of the subgrade soil with a probability score of 2.81. In the risk group B (force mejeure), the most dominant risk is the earthquake risk with a score of 2.18. For the risk group C (managerial), the most dominant is the risk of management experience with a probability score of 2.03. For the risk group D (finance), the most dominant risk is the risk of economic crisis with a probability value of 2.09. In the risk group E (workforce), the risk tendency is at the risk of delays in looking at problems with probability values of 2.21. For the risk group F (material and equipment), the most dominant risk is the risk of material delay from the supplier, with a probability value of 2.78. In the risk group G (design and technology), the dominant risk is the risk of difficulty of using the design with a score of 2.65. In the risk group H (external), the dominant risk is the risk of citizen error with a score of 2.34. While the last in the risk group I (contracts and regulations), the dominant risk is the risk of incomplete documents with a score of 2.31. The process of calculating risk value according to the risk group above, is a multiplication of the probability and the impact that occurs. In each group / source and risk variables have the most dominant values and ratings. Where column 1: shows the sequence of numbers, column 2: event, column 3: risk variable, column 4: probability score, column 5: impact score, column 6: risk value where negligence between probability and impact, column 7: description, while the last column 8: rank from the results of the risk assessment. In the risk group A (conditions at the project site), the dominant risk is the risk of weakening the carrying capacity of the basic soil with a value of 6.68. In the risk group B (force majeure), the most dominant risk is the earthquake risk with a value of 5.60. For the risk group C (managerial), the most dominant is the employee's skill risk with a value of 5.69. For the risk group D (finance), the most dominant risk is the economic crisis with a value of 5.03. In the risk group E (labor), the most dominant risk is the risk of delays in seeing the problem with a value of 5.61. For the risk group F (material and equipment), the most dominant risk is the risk of material delays from suppliers with a value of 8.42. While in the risk group G (design and technology), the most dominant risk is the risk of changing the specification by the owner with a value of 7.62. While in the risk group H (external), the most dominant risk is the risk of government policy to the construction service is less with a value of 6.53. While in the risk group I (contracts and regulations), the most dominant risk is the risk of incomplete documents with a value of 6.64. The results of the analysis are shown in Tables 6, 7, and 8.

Table 6. *Risk value Analysis (No. 1-20)*

No.	Event	Variables	Probability Score (P)	Impact Score (I)	Risk Value (R = P x I)	Remark	Rank
1	B6	Material delays from suppliers.	2.781	3.031	8.429	Low	1
2	C6	Material inventory	2.719	3	8.157	Low	2
3	A7	Difficulty of using design	2.656	3	7.968	Low	3
4	G6	Volume of Materials shipped volume is not appropriate	2.531	3.063	7.752	Low	4
5	B7	Changes specification by owner	2.594	2.938	7.621	Low	5
6	H6	Difficulty obtaining materials and equipment	2.531	2.938	7.436	Low	6
7	A6	Increase in material prices	2.563	2.781	7.128	Low	7
8	D7	Over quality	2.188	3.094	6.770	Low	8
9	F6	Damage to machine tools	2.281	2.938	6.702	Low	9
10	C1	Weakening of the bearing capacity of subgrade oil	2.813	2.375	6.681	Low	10
11	A9	Incomplete document	2.313	2.875	6.650	Low	11
12	D8	Government policies on construction services are lacking	2.156	3.031	6.535	Low	12
13	D1	High ground water level	2.813	2.313	6.506	Low	13

14	I 6	Theft against material	2.469	2.594	6.405	Low	14
15	E7	Expansion of the scope of work.	2.594	2.406	6.241	Low	15
16	D9	Document creation	2	3.063	6.126	Low	16
17	G7	Unspecified item of lump sum work so as to enlarge niali	2.094	2.906	6.085	Low	17
18	C5	Lack of workforce	2.188	2.75	6.017	Low	18
19	F7	Project data and information are not appropriate / less	2.625	2.25	5.906	Low	19
20	E8	Abuse of power	2.063	2.781	5.737	Low	20

Table 7. *Risk value analysis (No. 21-40)*

No.	Event	Variables	Probability Score (P)	Impact Score (I)	Risk Value (R = P x I)	Remark	Rank
21	C9	Contract handling	2.031	2.813	5.713	Low	21
22	H3	Skills of the workers they have	2.25	2.531	5.695	Low	22
23	G5	Delay in seeing the problem.	2.219	2.531	5.616	Low	23
24	C2	Earthquake	2.188	2.563	5.608	Low	24
25	C7	The wrong implementation method	2.188	2.5	5.470	Low	25
26	B1	Differences in subgrade soil / heterogeneity conditions	2.125	2.563	5.446375	Low	26
27	E6	Equipment that is not in accordance with working conditions	2.063	2.625	5.415	Low	27
28	D6	Quality of equipment used	2.126	2.531	5.381	Low	28
29	D2	Erosion	2.094	2.531	5.230	Low	29
30	E2	Weather conditions	2.094	2.531	5.230	Low	30
31	C3	Long time handling by a third party	1.938	2.656	5.147	Low	31
32	H7	Less equipment	1.844	2.781	5.128	Low	32
33	B5	Working strike	2.094	2.438	5.105	Low	33
34	B9	Unclear the articles of the contract	2.281	2.219	5.062	Low	34
35	A1	Difficulty Transporting heavy equipment to location	2.3031	2.188	5.039	Low	35
36	C4	Economy Crysis	2.094	2.406	5.038	Low	36
37	E3	The occurrence of accidents at the project site	1.938	2.563	4.967	Very Low	37
38	G9	Termination of unilateral work	1.563	3.156	4.933	Very Low	38
39	C8	People's mistake	2.344	2.063	4.836	Very Low	39
40	A5	Labor productivity.	1.875	2.563	4.806	Very Low	40

Table 8. *Risk value analysis (No. 41-60)*

No.	Event	Variables	Probability Score (P)	Impact Score (I)	Risk Value (R = P x I)	Remark	Rank
41	E5	Unskilled workers	2.031	2.344	4.760	Very Low	41
42	D4	Tax payment issue	1.938	2.406	4.662	Very Low	42
43	D5	Labor disputes	1.938	2.406	4.663	Very Low	43
44	D3	Use of safety on the project	1.906	2.438	4.647	Very Low	44
45	B8	Crime	1.906	2.438	4.647	Very Low	45
46	G3	Project monitoring process	1.813	2.563	4.647	sangat rendah	46
47	I3	Management experience	2.031	2.281	4.633	sangat rendah	47
48	F5	Demand for overtime hikes	2.125	2.156	4.582	Very Low	48
49	A3	Quality of work	1.938	2.281	4.421	Very Low	49
50	A8	Chaos caused by society.	2.156	2	4.312	Very Low	50
51	F3	Available human resource management	1.844	2.313	4.265	Very Low	51
52	B3	Labor and equipment productivity	1.875	2.156	4.043	Very Low	52
53	E1	Unfavorable weather changes (rain, wind)	1.969	2.031	3.999	Very Low	53
54	A4	Bank interest rates rise / fall	1.75	2.281	3.992	Very Low	54
55	A2	Flood	1.813	2.188	3.967	Very Low	55
56	B4	Duration of contract payments	1.875	2.031	3.809	Very Low	56
57	B2	Landslide	1.688	2	3.376	Very Low	57
58	E4	The occurrence of inflation	1.844	1.813	3.343	Very Low	58
59	E9	Terms of contract	1.813	1.844	3.343	Very Low	59
60	F9	Legal uncertainty	1.344	2.156	2.898	Very Low	60

Generally, in the field, there is never a construction project where all of the implementation process goes according to planning, especially for road improvement project. This is due to the risks in each project that identification and handling have not been properly implemented. The contractor needs to know the risks with the highest rank that must be completed immediately. In the risk rankings as shown in Tables 6-8, the top risks are calculated based on descriptive statistical analysis, which is taken by ten highest risks, among others; (1) the risk of material delay, this risk is a risk in the first rank, which often occurs in road improvement projects in Jayapura Papua province according to perception 32 respondents, this risk is a top priority and is considered important by the contractor because of the risk of material mate delay with a risk value of 8.42 that affects the project completion time; (2) material inventory risk, this risk is ranked second and

second priority in risk management by contractors, with a risk value of 8.15, where this risk causes project delays and project objectives to be unfulfilled; (3) risk of difficulty of using design, the risk of design difficulty is a risk in the third rank with a risk value of 7.96, this risk is very influential on the implementation of road improvement projects in Jayapura Papua; (4) risk of material volume shipped is not appropriate, in the delivery of material volume there are always factors affecting the transport, so that material loss occurs at the time of delivery, this risk includes a fourth rank in risk analysis with a value of 7.75; (5) risk of change of specification by the owner. In the implementation of the project changes in material specifications, as well as the design is very berpengaruk for implementation, so that will hamper the completion time of the project, the risk with a value of 7.61 is ranked fifth in the risk analysis performed; (6) the risk of difficulty in obtaining materials and equipment is the condition of the location of work away from quarry and the settlement makes it difficult to get the material and the spare parts of the equipment is very difficult, so that the implementation of the work time is delayed, this risk is ranked sixth with a risk value of 7.43; (7) risk of material price increase is if there is an increase of material price especially in Jayapura hence very influence on value and time of implementation of road improvement project later 7.12 is ranked seventh in the risk analysis performed; (8) existing quality over risk can result in unsuitable or unexpected job performance, resulting in cost swelling, risk over quality is a risk in the eighth rank with a value of 6.76; (9) the risk of damage to machine tools is that with the damage of machine tools, the job decline is not in accordance with the original plan, this risk is ranked ninth with a risk value of 6.70; (10) the risk of weakening the carrying capacity of the soil, with the existing topography that the power of existing soil conditions at very bad location, so perlua no land improvement, the risk with a value of 6.68 is ranked tenth in the risk analysis undertaken and the last priority in contractor handling.

4 Conclusions

Based on the results of the analysis that has been done, both on literature review, and the results of data processing interviews and questionnaires of the respondents, it can be concluded as follows:

1. In this research, the result of identification of risk variable and data processing on 60 risk variables from respondents said that there are ten risks that influence contractor where the risk is in the top rank, namely: (1) material delay from suppliers; (2) Material inventory risk; (3) Risk of difficulties for the use of design; (4) The risk of volumes of volumes submitted is not appropriate; (5) Risk of change of specification by the owner; (6) Risk of obtaining material and equipment, (7) Risk of material price increase; (8) Over-quality risk; (9) Risk of damage to machine tools; (10) The risk of weakening the bearing capacity of the subgrade soil.
2. Response risks are mostly done by respondents is to avoid and reduce risks.

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