Risk Analysis Of Project Performance At The Development Of High Vehicle Air Transport (SUTT) 150 KV In East Java

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Abstract: During SUTT tower construction starting from survey, foundation work, steel installation, tower towing and other, the possibility of risk must exist. These constraints are found both technical and non-technical that can affect the performance of the project. What is discussed is what dominant risks arise that affect the length of time of implementation and how the determination of risk categories and ratios occurring in SUTT development. The purpose of writing is to identify the risk due to the project and analyze the most dominant risk that can affect the implementation time of the project SUTT. Questionnaires were spread to the contractor and analyzed with Analytical Hierarchy Process (AHP) to determine the risk rating, then using risk factors SNI. From interviews with experts, handling responses were obtained for the 3 highest risk ratios: difficult site locations should be made of work paths for material transport and when passing community land must seek permission from the landowner. Bad weather should stop work to keep workers safe and wait for the weather to improve. Socialization of the community by taking a social approach to the local government and community leaders who are in the project environment.

Index Terms :Analytical Hierarchy Process; Risk Analysis; Risk Identification

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1 INTRODUCTION

The construction project of 150 kV High Voltage Air Line (SUTT) in East Java is a construction project of 150 kilovolt transmission line that connects the Sub-Main in East Java. Has 45 tower with length of track ± 15 km. The implementation of SUTT project work includes; Survey with measuring instruments EDM (Electronic distance measurement), Sondir, a tower foundation working, Assembly iron tower (Erection Tower), and Withdrawal wire (Stringing). In the process of building construction of SUTT tower the possibility of risk such as licensing problem, difficulty socialization with society, bad weather, condition of difficult site location and others must often be happened. These constraints are often found both technical and non-technical that can affect the performance of the project itself. The purpose of this study was to identify the risks posed by the construction of 150 kV SUTT towers in East Java and analyze the most dominant risks that could affect the implementation time of the 150 kV SUTT development project in East Java.

LITERATURE REVIEW

Project Risk Management Process:

1. Risk identification
   A process of risk assessment and uncertainty that is done systematically and continuously. In order for risk to be managed effectively the first step is to identify the type of risk. Risk identification is categorized based on potential sources of risk or may also be impacted by project objectives [1]
2. Risk assessment
   Done with the objective of knowing dimensions, measures, or weights in relation to the types of risks, their impacts, and their likelihood of occurrence [2]
3. Response to risk
   Processes, techniques, and strategies for tackling possible risks. These responses can include risk aversion, losses, and mitigate negative impacts. The response is also a means to improve the understanding and awareness of personnel within the organization concerned [3].
4. Risk monitoring and control
   Risk monitoring and control in order to be effective, it is generally made a regular or monthly report on the use of contingencies and residuals that are still available. Basically control can be done by identifying specific risks or uncertainties, then assigning responsibilities and authority to specific project personnel according to the hierarchical level within the project organization or the company concerned, for example to project leaders and project coordinators [4].

RESEARCH METHOD

Data obtained from survey results and questionnaires

- The survey was conducted by asking questions on several respondents. Interviews to contractors who serve as a source of information on SUTT projects.
- Questionnaires distributed to respondents were then identified to determine the most dominant risk factors

RESULT AND DISCUSSION

Conducted through interviews and questionnaires distributed to 30 respondents came from contractors and subcontractors

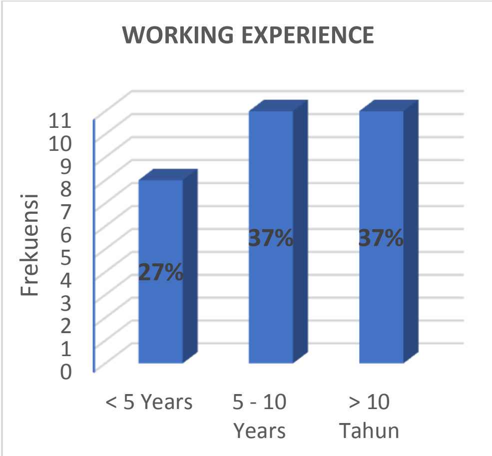
Data Research Results

1. Distribution of questionnaires based on work experience:

Table 1 *Working Experience*

Experience	Frequency	Percentage (%)
< 5 Years	8	27%
5 - 10 Years	11	37%
> 10 Years	11	37%

From the table above obtained the results that respondents based on experience 5-10 years and> 10 years have the same value that is as much as 11 with percentage 37%. Here is the old distribution of respondents' work using the image Column chart:



The guidelines used to accept or reject the proposed null hypothesis (Ho) are:
- Ho is accepted if p-value is in Asymp column. Sig. (2-tailed)> level of significant (α) of 0.05 and the value of chi square <of the value x2 with df = 2 and the significance level of 5% (0.05)
- Ho is rejected if p-value is in Asymp column. Sig. (2-tailed) <level of significant (α) of 0.05 and the value of chi square> of the value x2 with df = 4 and the significance level of 5% (0.05)

Tabel 2: *Results of testing the influence of work experience of respondents*

	A1	A2	A3	A4	B1
Chi-Square	1.841	1.115	1.987	1.163	1.348
Df	2	2	2	2	2
Asymp. Sig.	.398	.573	.370	.559	.510
	B2	**B3**	**B4**	**C1**	**C2**
Chi-Square	2.099	.815	.862	4.290	3.476
Df	2	2	2	2	2
Asymp. Sig.	.350	.665	.650	.117	.176
	C3	**D1**	**D2**	**D3**	**E1**
Chi-Square	.491	3.671	.777	1.738	4.622
Df	2	2	2	2	2
Asymp. Sig.	.782	.160	.678	.419	.0.99
	E2	**E3**	**F1**	**F2**	**G1**
Chi-Square	2.225	5.106	.870	4.141	.116
Df	2	2	2	2	2
Asymp. Sig.	.329	.0.78	.647	.126	.943
	G2	**G3**			
Chi-Square	1.543	.418			
Df	2	2			
Asymp. Sig.	.462	.811			

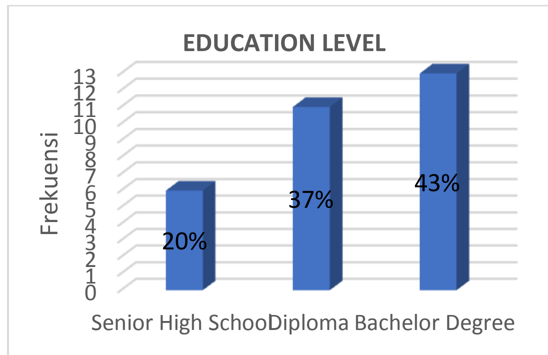
From the above table it is found that the value of chi-square <value x2 (0.05, df = 2) = 5.991 (based on Chi-Square Value Table) and Asym. Sig (2-tailed)> level of significant (α) 0.05, It can be concluded that Ho accepted and Ho rejected, meaning there is no difference of perception of answer from respondents who have different working experience.

2. Distribution of questionnaires by education:

Table 3 *Education*

Education	Frequency	Percentage (%)
Senior High School	6	20%
Diploma	11	37%
Bachelor Degree	13	43%

From the above table obtained the results note that most respondents based on the last education average S1 educated that is as much 12 with a percentage of 40%. Here is the education distribution of respondents using the image Column chart:



The guidelines used to accept or reject the proposed null hypothesis (Ho) are:
- Ho is accepted if p-value is in Asymp column. Sig. (2-tailed)> level of significant (α) of 0.05 and the value of chi square <of the value x2 with df = 2 and the significance level of 5% (0.05)
- Ho is rejected if p-value is in Asymp column. Sig. (2-tailed) <level of significant (α) of 0.05 and the value of chi square> of the value x2 with df = 4 and the significance level of 5% (0.05)

Tabel 4: *Result of examination influence of respondent education*

	A1	A2	A3	A4	B1
Chi-Square	1.088	1.961	1.825	2.328	.999
df	2	2	2	2	2
Asymp. Sig.	.580	.375	.402	.312	.607
	B2	**B3**	**B4**	**C1**	**C2**
Chi-Square	3.987	1.605	4.722	3.310	.799
df	2	2	2	2	2
Asymp. Sig.	.136	.448	.094	.191	.671
	C3	**D1**	**D2**	**D3**	**E1**
Chi-Square	2.808	2.263	1.422	1.511	2.492
df	2	2	2	2	2
Asymp. Sig.	.246	.322	.491	.470	.288
	E2	**E3**	**F1**	**F2**	**G1**

Chi-Square	3.156	.094	2.117	2.457	1.230
Df	2	2	2	2	2
Asymp. Sig.	.206	.954	.347	.293	.541
	G2	**G3**			
Chi-Square	2.270	.560			
Df	2	2			
Asymp. Sig.	.321	.756			

From the above table it is found that the value of chi-square <value x2 (0.05, df = 2) = 5.991 (based on Chi-Square Value Table) and Asym.Sig (2-tailed)> level of significance (α) 0.05, It can be concluded that Ho accepted and Ho rejected, meaning there is no difference perception of answers from respondents who have different levels of education.

Validates Test

Validation test is performed on 30 correspondents, with product Moment formula from Person known that correlation coefficient value (r count) must be bigger than r table value (r table = 0,361) so that 2 items from 22 (twenty two) items have coefficient value Correlation <0.361 which the data is invalid i. e the security variable of the project environment and the accident and occupational safety variable. Validation test is performed on 30 correspondents, with product Moment formula from Person known that correlation coefficient value (r count) must be bigger than r table value (r table = 0,361) so that 2 items from 22 (twenty two) items have coefficient value Correlation <0.361 which the data is invalid i. e the security variable of the project environment and the accident and occupational safety variable.

Reliabilities Test

Test Reliability or reliability test is measured using Cronbach's Alpha where the provisions are as follows:

- The Cronbach Alpha value ≤ 0.6 indicates that the research questionnaire is not reliable.
- The Cronbach Alpha value ≥ 0.6 indicates that the research questionnaire is reliable

Table 5: *Cronbach's Alpha Result*

Cronbach's Alpha	N of Items
.649	22

From the results of the reliability test, the value of Cronbach's obtained is 0.649 which is greater than 0.6, it can be said that this research questionnaire is reliable.

Risk Factors Analysis

The first stage in risk analysis using AHP is to make a comparison matrix for the frequency of occurrence of risk, and the impact of risk.

Table 6: *Matched Matrices for Risk Frequency*

	Very Often	Often	Fair	Seldom	Rarely
Very Often	1	3	5	7	9
Often	0.333	1	3	5	7
Fair	0.200	0.333	1	3	5
Seldom	0.143	0.200	0.333	1	3
Rarely	0.111	0.143	0.200	0.333	1
Total	1.787	4.676	9.533	16.333	25

Table 7: *Matched Matrices for Risk Impact*

	Huge	Big	Fair	Small	No Effect
Huge	1	3	5	7	9
Big	0.333	1	3	5	7
Fair	0.200	0.333	1	3	5
Small	0.143	0.200	0.333	1	3
No Effect	0.111	0.143	0.200	0.333	1
Total	1.787	4.676	9.533	16.333	25

Based on the calculation of matrix pairs can then be calculated the element weight of each frequency and the impact of risk Calculation of element weights by taking from column "very often" Table Frequency;

- row value "very often" 1: 1.787 = 0.560
- line value "often" 3: 4.676 = 0.642
- "enough" line value 5: 9.533 = 0.524
- and so on for rows and on columns,
- and so do the calculations on the impact matrix table.

Next is calculated the number of each line;

- "Very Frequent", 2.514 = 0.560 + 0.642 + 0.524 + 0.429 + 0.360
- "Frequently", 1.301 = 0.187 + 0.214 + 0.315 + 0.306 + 0.280
- and so on for "Fair", "Rarely", "Very Rare".

And the result is 2.514 + 1.301 + 0.627 + 0.339 + 0.174 = 5

So is the calculation on the impact matrix table.
Then we get the weighting value for each unit of scale in this study on the table of element weights as summarized as follows:

Table 8: *Element Weight for Risk Frequency*

	Very Often	Often	Fair	Seldom	**Rarely**
Weight	1	0.518	0.267	0.135	0.069

Tabel 9: *Element Weight for Risk Impact*

	Huge	Big	Fair	Small	No Effect
Weight	1	0.518	0.267	0.135	0.069

Next performs a matrix consistency calculation obtained from the eigenvector vector. The column vector (average) is multiplied by the original paired matrix, the average column and the matrix in pairs. This is multiplied to generate a value for each row, which then each value is subdivided by the corresponding mean value matrix. The value of λmax = 5.243 which approximates the number of elements (n) in the matrix is 5 and the remaining eigen value is 0.243 which means close to zero, the matrix is consistent To test the hierarchy consistency and the degree of accuracy, the number of elements in the matrix (n) is 5, then

$$CI = \frac{5.243 - 5}{5 - 1} = 0.061$$

Then:

$$CR = \frac{CI}{RI} = 0.0545$$

$$CR = \frac{0.061}{1.12} = 0.0545$$

The CR value obtained is quite small or below 10% means a consistent hierarchy and a high degree of accuracy Local Values and Leveling of Risk Based on the consistency test, the calculation of local value of frequency and impact of risk can be done. By entering the weight of each element in accordance with the calculation of the weight of the previous element. Next determine the level of risk (risk ranking) with the equation of risk factors that can be calculated by means of the following SNI factors:

$$FR = L + I - (L \times I)$$

Where as:
FR = Risk factors with a scale of 0-1
L = probability or frequency of risk occurrence
I = The magnitude of the impact of risk in the form of changes in scope and increase in time

Table 10: *Frequency Factors and Risk Impact*

Variable	Average Local Value Frequency **(L)**	Average Local Value Impact **(I)**	**FR**
A1	0.197	0.371	0.494
A2	0.333	0.451	0.634
A3	0.384	0.660	0.790
A4	0.358	0.340	0.576
B1	0.227	0.399	0.535
B2	0.214	0.546	0.643
B3	0.155	0.425	0.514
B4	0.157	0.478	0.560
C1	0.384	0.522	0.705
C2	0.380	0.485	0.681
C3	0.183	0.248	0.386
D1	0.139	0.354	0.444
D2	0.122	0.303	0.388
D3	0.126	0.442	0.513
E1	0.223	0.392	0.528
E2	0.177	0.383	0.492
E3	0.100	0.333	0.399
F1	0.144	0.277	0.381
F2	0.122	0.417	0.488
G1	0.100	0.109	0.198
G2	0.117	0.337	0.415
G3	0.104	0.299	0.372

From the risk factor value (FR) in the above table it can be determined the risk ranking (risk ranking) and risk level below.

Table 11*: Ranking of Frequency Risk and Impact*

Variable	**FR**	**Risk Rank)**	**Risk Level**
A1	0.494	12	S
A2	0.634	5	S
A3	0.790	1	T
A4	0.576	6	S
B1	0.535	8	S
B2	0.643	4	S
B3	0.514	10	S
B4	0.560	7	S
C1	0.705	2	T
C2	0.681	3	S
C3	0.386	19	R
D1	0.444	15	S
D2	0.388	18	R
D3	0.513	11	S
E1	0.528	9	S
E2	0.492	13	S
E3	0.399	17	R
F1	0.381	20	R
F2	0.488	14	S
G1	0.198	22	R
G2	0.415	16	S
G3	0.372	21	R

From the analysis of risk ranking AHP and risk level of SNI, from 22 variables that influence the project performance there are 2 variables that have high risk influence, 14 variables with medium risk effect, and 6 variables with low risk influence

Discussion with Experts
After obtained the dominant variable in table 11 with 3 highest weight ranking, then the next step is an interview with 5 experts to find out what responses can be done on the dominant risk.

Summary
From the results of research that has been done, it can be concluded as follows:

1. There is no difference in perception of answers given by respondents who have different educational background and different work experience.
2. Based on the risk ranking of AHP and the determination of risk category of SNI method there are 3 dominant variables consisting of 2 variables with the highest risk above the value of 0.7 and 1 variable of medium risk risks approaching the value of 0.7 high risk
   - A3 = Condition of difficult site location with weight of 0.790
   - C1 = Influence of weather (Rain, Wind, Lightning) with weight 0.705
   - C3 = Socialization with the public with the weight of 0.681

2. The results of interviews with experts from the 3 dominant variables are obtained response handling with the answers summarized as follows:

- Difficult site conditions should be made for road access to facilitate material transport and when passing community land around the project must seek permission from the landowner.
- The effect of bad weather should stop work to keep workers safe and wait for better weather to work again.

Socialization with the community that is doing various social approaches to local government and community leaders so they know the benefits of the construction of SUTT transmission.

Referencess

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