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Risk Analysis of Time Delays in The Diara Cileungsi Hotel Construction Project Bogor Regency

Dwi Cahya Kusuma

Civil Engineering Faculty, Mercu Buana University, Jakarta, Indonesia
**Corresponding author E-mail: dwicahya155@gmail.com*

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Abstract

The Diara Hotel construction project, which is located in Cileungsi, Bogor Regency, with a building area of approximately 600 m2 and a building height of 24.8 m, has been delayed due to several factors. This study aims to identify risk variables and the highly variable faced by contractors in the risk of time delays in the construction project of Hotel Diara Cileungsi, Bogor Regency. The analysis in this study uses a quantitative descriptive method, which is carried out by surveys, interviews, and distributing questionnaires to respondents. Analysis using software in processing data. The results of the study indicate that there are 34 variables that become risk variables and 7 risk variables with the high ranking risk.

Keywords: *Risk Analysis, Diara Cileungsi Hotel, Bogor Regency, Time Delay, The High-Risk Variable.*

1. Introduction

Construction projects have goals certain with limitations on the quality of work (performance), budget (cost), and schedule (time), which is known as Triple Constraint [1] [2] [3]. The project must be completed at a cost that does not exceed the budget, the project must be carried out in accordance with the specified time period [4]. The project submission must not exceed the specified time limit. The final product must meet the required specifications and criteria [5] [1] [6].
At the beginning of this research, the construction project of the Diara Cileungsi Hotel [7], Bogor Regency [8], which consists of 1 basement, 1 mezzanine, 6 floors + roft with a building area of 600 m2 and a height 24,8 meters currently under structural work stage namely the process of formwork work on the foundation and should have been at the stage of superstructure work or in other words this project experienced a delay in the planned time [9] [10]. This week entered week 11 with progress work achieve of 17,3% the of cumulative plan 27,1%. The long time plan for the implementation of the project work and high work delays, become the background for conducting research that aims to identify risk variables and determine high-risk variables that affect the risk of time delays [5] [11].

2. Methodology

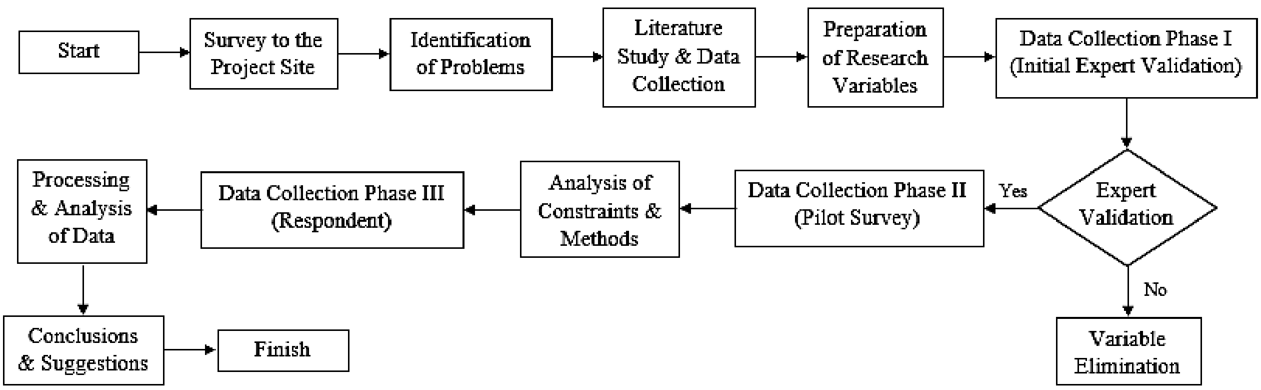

Fig 1. Research Flowchart

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2.1 Research Methods

In this study, the method used is a descriptive quantitative method, which is carried out by surveys, interviews, and distributing questionnaires to respondents. The risk rating is analyzed using statistical software based on the distribution table, which aims to determine the risk variables that have a high impact and risk value [12] [13].

2.2 Place and Time of Research

This research was conducted on the construction project of the Diara Cileungsi Hotel, Bogor Regency, which is located in the Metland Transyogi housing complex, Eboni Shop XI B, Taman Metropolitan City Street, Cileungsi Kidul, Cileungsi Districts, Bogor Regency, Jawa Barat. The time of the study is from May 2021 to July 2021 [14].

3. Result and Analysis

3.1 Data Collection Phase I (Initial Expert Validation)

Data Collection Phase 1 contains 40 variables from the delay factor in the implementation of construction projects obtained from the literature study. This questionnaire is given to the expert to be validated [15] [16] [17]. Experts are asked whether they agree or disagree with these variables and fill in the information column for input on each variable if needed. The total of experts proposed is 5 experts.

Table 1. Data Collection Phase 1 Result (Initial Expert Validation)

FACTOR	CODE	VARIABLE	EXPERT RESULTS					CONCLUSION
			P1	P2	P3	P4	P5	
Labor Factor (Man)	X1	Skill manpower is not sufficient	Yes	No	No	Yes	Yes	Agree
	X2	Lack of skilled labor	Yes	Yes	No	Yes	Yes	Agree
	X3	Management contractors and supervisors are not good	Yes	Yes	No	Yes	Yes	Agree
	X4	Inappropriate planning method	Yes	Yes	No	Yes	Yes	Agree
	X5	The Team Leader is slow in making decisions	Yes	Yes	No	Yes	Yes	Agree
	X6	The contractor method is not right	Yes	Yes	No	Yes	Yes	Agree
	X7	Undisciplined manpower	Yes	Yes	No	No	Yes	Agree
	X8	Low work productivity	Yes	Yes	Ya	No	Yes	Agree
	X9	Lack of coordination at work	Yes	Yes	No	Yes	Yes	Agree
	X10	Workers ignore K3	Yes	No	No	No	Yes	Disagree
Job Document Factor	X11	Design change	Yes	No	Yes	Yes	Yes	Agree
	X12	Changing work schedule	Yes	No	Yes	Yes	Yes	Agree
	X13	Delay in approving design document by the Owner	Yes	No	No	Yes	Yes	Agree
	X14	Late submission of design changes	Yes	No	No	Yes	Yes	Agree
	X15	Errors in design documents and contracts	No	Yes	No	No	Yes	Disagree
	X16	The design change approval process by the Owner	Yes	No	No	Yes	Yes	Agree
	X17	Change requests for completed work	Yes	No	Yes	Yes	Yes	Agree
Material Factor	X18	Limited availability of materials in the Market	Yes	Yes	No	Yes	Yes	Agree
	X19	Timeliness of ordering materials	Yes	Yes	Yes	Yes	Yes	Agree
	X20	Material damage when deviation	Yes	No	Yes	Yes	Yes	Agree
	X21	Process of delivering materials to the project	Yes	Yes	No	Yes	Yes	Agree
	X22	Shortage of construction materials	Yes	Yes	Yes	Yes	Yes	Agree
	X23	Changes type and specifications of materials	Yes	No	No	Yes	Yes	Agree
Tool Factor (Machine)	X24	Late delivery of tools to the location	Yes	Yes	No	Yes	Yes	Agree
	X25	Low equipment productivity	Yes	No	Yes	Yes	Yes	Agree
	X26	Unavailability of adequate tools or work equipment	Yes	Yes	Yes	Yes	Yes	Agree
	X27	Lack of capacity tool used	Yes	Yes	Yes	Yes	Yes	Agree
	X28	Lack of tools during implementation	Yes	No	Yes	Yes	Yes	Agree
	X29	Material and equipment management errors	Yes	Yes	No	Yes	Yes	Agree
Cost Factor (Money)	X30	Late payments to subcontractors through contractors	Yes	No	No	Yes	Yes	Agree
	X31	Funding problems from head office (contractor)	Yes	Yes	No	Yes	Yes	Agree
	X32	Inflation that affects material prices	No	No	No	No	Yes	Disagree
	X33	Using the lowest bid that results in low performance	No	No	No	No	Yes	Disagree

Natural and Environ-mental Fac-tors	X34	Constrained mobilization to the location	Yes	Yes	Yes	Yes	Yes	Agree
	X35	Lack of resources	Yes	Yes	Yes	Yes	Yes	Agree
	X36	Soil conditions in the project	No	No	Yes	No	Yes	Disagree
	X37	Environmental conditions around the project that are not as expected	Yes	No	Yes	Yes	Yes	Agree
	X38	Delay caused by weather	No	No	Yes	Yes	Yes	Agree
	X39	Social disaster (social conflict)	No	No	No	Yes	Yes	Disagree
	X40	The occurrence of unexpected things (natural disasters, etc.)	Yes	Yes	No	Yes	Yes	Agree

Result of initial expert validation, from 40 project delay variables there are 34 variables that according to experts affect project delays [18] [19] [20]. While the other 6 variables are considered to have no effect and are eliminated.

Table 2. Data Collection Phase 1 Recapitulation (Initial Expert Validation)

FACTOR	CODE	VARIABLE	RESOURCE
Labor Factor (Man)	X1	Skill manpower is not sufficient	(Tarigan & Subroto, 2018)
	X2	Lack of skilled labor	(Al-Emad et al., 2016)
	X3	Management contractors and supervisors are not good	(Tarigan & Subroto, 2018)
	X4	Inappropriate planning method	(Listianti & Sekarsari, 2017)
	X5	The Team Leader is slow in making decisions	(Listianti & Sekarsari, 2017)
	X6	The contractor method is not right	(Tafazzoli & Shrestha, 2018)
	X7	Undisciplined manpower	(Agritama et al., 2018)
	X8	Low work productivity	(Samarah et al., 2016)
	X9	Lack of coordination at work	(Al-Emad et al., 2018)
Job Document Factor	X10	Design change	(Samarah et al., 2016)
	X11	Changing work schedule	(Salain et al., 2019)
	X12	Delay in approving design document by the Owner	(Fafazzoli & Shrestha, 2018)
	X13	Late submission of design changes	(Samarah et al., 2016)
	X14	The design change approval process by the Owner	(Salain et al., 2019)
	X15	Change requests for completed work	(Salain et al., 2019)
Material Fac-tor	X16	Limited availability of materials in the Market	(Putra Agritama et al., 2018)
	X17	Timeliness of ordering materials	(Ghaithi et al., 2017)
	X18	Material damage when deviation	(Ghaithi et al., 2017)
	X19	Process of delivering materials to the project	(Salain et al., 2019)
	X20	Shortage of construction materials	(Tarigan & Subroto, 2018)
	X21	Changes type and specifications of materials	(Tarigan & Subroto, 2018)
Tool Factor (Machine)	X22	Late delivery of tools to the location	(Ghaithi et al., 2017)
	X23	Low equipment productivity	(Agritama et al., 2018)
	X24	Unavailability of adequate tools or work equipment	(Salain et al., 2019)
	X25	Lack of capacity tool used	(Natalia et al., 2018)
	X26	Lack of tools during implementation	(Natalia et al., 2018)
	X27	Material and equipment management errors	(Agritama et al., 2018)
Cost Factor (Money)	X28	Late payments to subcontractors through contractors	(Idawati et al., 2016)
	X29	Funding problems from head office (contractor)	(Idawati et al., 2016)
Natural and Environmental Factor	X30	Constrained mobilization to the location	(Natalia et al., 2018)
	X31	Lack of resources	(Samarah et al., 2016)
	X32	Environmental conditions around the project that are not as expected	(Salain et al., 2019)
	X33	Delay caused by weather	(Natalia et al., 2018)
	X34	The occurrence of unexpected things (natural disasters, etc.)	(Salain et al., 2019)

From table Data collection phase 1 Recapitulation to answer the formulation of the first problem, which is to identify the risk variables faced by contractors at the risk of delays in the implementation of the construction project time in Diara Cileungsi Hotel, Bogor Regency.

3.2 Data Collection Phase II (Pilot Survey)

Data collection phase 2 using online questionnaire to get an opinion whether variables easy to understand or still need improvement. In addition, pilot survey is also a test of the questionnaire instrument in order to get input before the questionnaire is delivered to the real respondents.

Data collection phase 2 result to 5 prospective respondents, namely all research variables are easy to understand correctly by all respondents.

3.3 Data Collection Phase III (Respondents)

Respondents on data collection phase 3 are people who are directly involved in the construction of the project Diara Cileungsi Hotel, Bogor Regency and people who are experienced in a construction project. In this research number of respondents is searched using Lemeshow formula.

$$n = \frac{Z^2 \; x \; P \; (1 - P)}{d^2}$$

Keterangan :

n = number of sample P = maximum estimate = 0.5

Z = Z score on trust 95% = 1,95 d = alpha (sampling error)10% = 0.1

By using Lemeshow formula on number of population unknown, get sample value (n) by 96 people. After questionnaire the result is that majority of respondents were last educated Strata 1 (S1) by percentage 62% (59 respondents) and majority of respondents more than 5 years of working experience with a percentage 51% (49 respondents). Questionnaire result data will later be analyzed to get variable which is a high risk faced by contractors at the risk of delays in the implementation of construction project time Diara Cileungsi Hotel, Bogor Regency.

Table 3. Data Collection Phase III Result (Respondents)

VARIA-BLE	FREQUENCY					IMPACT				
	1	2	3	4	5	1	2	3	4	5
X1	3	29	51	11	2	-	8	46	28	14
X2	-	22	51	17	6	-	9	40	29	18
X3	3	26	54	13	-	-	17	28	33	18
X4	8	14	45	23	6	-	-	10	57	29
X5	8	12	38	29	9	-	-	29	55	12
X6	6	16	40	27	7	-	-	12	56	28
X7	2	18	55	9	12	-	12	47	27	10
X8	2	9	61	11	13	-	9	41	29	17
X9	2	14	29	37	14	-	11	39	41	5
X10	8	32	22	18	16	-	12	55	29	-
X11	11	32	31	13	9	-	26	31	25	14
X12	2	44	28	18	4	-	20	47	14	15
X13	2	53	28	5	8	-	25	41	13	17
X14	2	53	33	4	4	-	16	50	21	9
X15	6	47	31	5	7	6	22	29	23	16
X16	13	29	37	10	7	7	23	38	19	9
X17	11	20	45	15	5	-	9	47	27	13
X18	16	31	45	4	-	5	14	50	20	7
X19	16	21	45	12	2	6	21	47	17	5
X20	15	38	34	4	5	-	25	38	24	9
X21	5	45	35	6	5	-	24	43	24	5
X22	16	23	39	15	3	2	9	47	27	11
X23	11	24	36	17	8	2	19	29	34	12
X24	15	14	41	20	6	2	14	22	36	22
X25	7	19	38	26	6	-	11	28	39	18
X26	5	20	35	28	8	-	12	51	31	2
X27	13	26	34	20	3	3	25	18	41	9
X28	3	30	40	14	9	6	17	42	15	16
X29	9	29	48	6	4	3	10	43	26	14
X30	8	16	36	28	8	-	2	33	42	19
X31	6	19	28	38	5	-	19	27	32	18
X32	10	21	40	20	5	-	24	16	48	8
X33	2	10	25	34	25	2	8	21	54	11
X34	18	31	34	6	7	2	13	25	29	27

3.4 Validity Test

Validity test to find out how much consistency of a variable. If the instrument used in this study is valid, then the instrument can be used for further data testing. Validity test is carried out by comparing the calculated r value with the r table value for degree of freedom (df) = n – 2. With df = 94 and significance value 5% get the value of r table = 0,201. If the value of r count > r table value (0,201), then the research instrument in the questionnaire can be said to be valid and vice versa. From validity test result can be concluded that each variable have Corrected Item Total Correlation value > r table value (0,201), so all indicator on this research declared valid and can be used in the next test.

3.5 Reliability Test

Reliability test to measure the level of consistency of variables from a questionnaire. The way to determine whether a questionnaire is considered reliable or not is look at the alpha value of the test result. Reliability test done by looking at the value of the cronbach alpha coefficient. Criteria for this test is if the cronbach alpha coefficient (r11) > 0,90, then it is included in perfect reliability. If coefficient value between 0,70 – 0,90 then high reliability. If coefficient value between 0,50 – 0,70 then moderate reliability. If < 0,50 then low reliability (Natalia, 2017). Reliability test result got cronbach's alpha value on frequency and impact of 0,945 and 0,942 from 34 variables. That can be concluded that the instrument in this study are reliable/consistent and fall into the perfect reliability category.

3.6 Descriptif Analysis

Descriptif analysis test is used to obtain the value of each of the high time delay risk variables by looking at the total value of each variable or to risk rating analysis. Risk rating analysis was carried out using the data from the third stage of the quesionnaire which had been tested for the validity and reliability of the research variables. This risk rating analysis using help of statistics software in processing and analyzing data. Here is the calculation of the average value of frequency and impact obtained from the results of the third stage of data collection which is accumulated on each variable multiplied by value in frequency and impact scale, then totaled and divided by the number of respondents that is 96. This research used linkert scale, where the frequency value and impact value is taken from the weighting on the frequency and impact scale.

Table 4. Frequency/Probability Scale

FREQUENCY CRITERIA	1	2	3	4	5
Description	Very Seldom	Seldom	Sometimes	Often	Very Often
Weighting	0,1	0,3	0,5	0,7	0,9

Table 5. Impact Scale

IMPACT CRITERIA	1	2	3	4	5
Description	Very Small	Small	Medium	Big	Very Big
Weighting	0,05	0,1	0,2	0,4	0,8

Table 6. Average Frequency/Probability Value

VARIABLE	FREQUENCY					TOTAL FRE-QUENCY	AVERAGE FREQUENCY
	1	2	3	4	5		
	0,1	0,3	0,5	0,7	0,9		
X1	3	29	51	11	2	44,5	0,46
X2	-	22	51	17	6	49,4	0,51
X3	3	26	54	13	-	44,2	0,46
X4	8	14	45	23	6	49	0,51
X5	8	12	38	29	9	51,8	0,54
X6	6	16	40	27	7	50,6	0,53
X7	2	18	55	9	12	50,2	0,52
X8	2	9	61	11	13	52,8	0,55
X9	2	14	29	37	14	57,4	0,6
X10	8	32	22	18	16	48,4	0,5
X11	11	32	31	13	9	43,4	0,45

Table 6. Average Frequency/Probability Value - Advanced

VARIABLE	FREQUENCY					TOTAL FRE-QUENCY	AVERAGE FREQUENCY
	1	2	3	4	5		
	0,1	0,3	0,5	0,7	0,9		
X12	2	44	28	18	4	43,6	0,45
X13	2	53	28	5	8	40,8	0,43

X14	2	53	33	4	4	39	0,41
X15	6	47	31	5	7	40	0,42
X16	13	29	37	10	7	41,8	0,44
X17	11	20	45	15	5	44,6	0,46
X18	16	31	45	4	-	36,2	0,38
X19	16	21	45	12	2	40,6	0,42
X20	15	38	34	4	5	37,2	0,39
X21	5	45	35	6	5	40,2	0,42
X22	16	23	39	15	3	41,2	0,43
X23	11	24	36	17	8	45,4	0,47
X24	15	14	41	20	6	45,6	0,48
X25	7	19	38	26	6	49	0,51
X26	5	20	35	28	8	50,8	0,53
X27	13	26	34	20	3	42,8	0,45
X28	3	30	40	14	9	47,2	0,49
X29	9	29	48	6	4	41,4	0,43
X30	8	16	36	28	8	50,4	0,53
X31	6	19	28	38	5	51,4	0,54
X32	10	21	40	20	5	45,8	0,48
X33	2	10	25	34	25	62	0,65
X34	18	31	34	6	7	38,6	0,4

Table 7. Average Impact Value

VARIABLE	IMPACT					TOTAL IMPACT	AVERAGE IMPACT
	1	**2**	**3**	**4**	**5**		
	0,05	**0,1**	**0,2**	**0,4**	**0,8**		
X1	-	8	46	28	14	32,4	0,34
X2	-	9	40	29	18	34,9	0,36
X3	-	17	28	33	18	34,9	0,36
X4	-	-	10	57	29	48	0,5
X5	-	-	29	55	12	37,4	0,39
X6	-	-	12	56	28	47,2	0,49
X7	-	12	47	27	10	29,4	0,31
X8	-	9	41	29	17	34,3	0,36
X9	-	11	39	41	5	29,3	0,31
X10	-	12	55	29	-	23,8	0,25
X11	-	26	31	25	14	30	0,31

Table 7. Average Impact Value - Advanced

VARIABLE	IMPACT					TOTAL IMPACT	AVERAGE IMPACT
	1	**2**	**3**	**4**	**5**		
	0,1	**0,3**	**0,5**	**0,7**	**0,9**		
X12	-	20	47	14	15	29	0,3
X13	-	25	41	13	17	29,5	0,31
X14	-	16	50	21	9	27,2	0,28
X15	6	22	29	23	16	30,3	0,32
X16	7	23	38	19	9	25,1	0,26

X17	-	9	47	27	13	31,5	0,33
X18	5	14	50	20	7	25,3	0,26
X19	6	21	47	17	5	22,6	0,24
X20	-	25	38	24	9	26,9	0,28
X21	-	24	43	24	5	24,6	0,26
X22	2	9	47	27	11	30	0,31
X23	2	19	29	34	12	31	0,32
X24	2	14	22	36	22	37,9	0,39
X25	-	11	28	39	18	36,7	0,38
X26	-	12	51	31	2	25,4	0,26
X27	3	25	18	41	9	29,9	0,31
X28	6	17	42	15	16	29,2	0,3
X29	3	10	43	26	14	31,4	0,33
X30	-	2	33	42	19	38,8	0,4
X31	-	19	27	32	18	34,5	0,36
X32	-	24	16	48	8	31,2	0,33
X33	2	8	21	54	11	35,5	0,37
X34	2	13	25	29	27	39,6	0,41

After getting average value of frequency and impact each variable, next search risk value by multiplying the two average values of each research variable. Result of the multiplication, then matched with probability impact matrix table to determine the category of each variable.

Table 8. Probability Impact Matrix

PROBABILITY	**RISK SCORE - PROBABILITY x IMPACT**				
0.9	0.05	0.09	0.18	0.36	0.72
0.7	0.04	0.07	0.14	0.28	0.56
0.5	0.03	0.05	0.10	0.20	0.40
0.3	0.02	0.03	0.06	0.12	0.24
0.1	0.01	0.01	0.02	0.04	0.08
	0.05	0.10	0.20	0.40	0.80
	Very low	Low	Medium	High	Very High
			Impact		
Explanation:					
	Low		**Medium**		**High**

The range risk rating is as follows
Low risk = 0,01 - 0,05
Medium risk = 0,06 - 0,19
High risk = 0,20 - 0,72
Here are values and risk categories that will be used to determine the high-risk variables faced by contractors at the risk of delays in the implementation construction project time of the Diara Cileungsi Hotel, Bogor Regency.

Table 9. Values and Risk Categories

VARIABLE	FREQUENCY AVERAGE	IMPACT AVERAGE	RISK VALUE	DESCRIPTION
X1	0,46	0,34	0,15	Medium
X2	0,51	0,36	0,19	Medium
X3	0,46	0,36	0,17	Medium
X4	0,51	0,5	0,26	High

X5	0,54	0,39	0,21	High
X6	0,53	0,49	0,26	High
X7	0,43	0,31	0,16	Medium
X8	0,41	0,36	0,2	High
X9	0,42	0,31	0,12	Medium
X10	0,44	0,25	0,14	Medium
X11	0,46	0,31	0,14	Medium
X12	0,38	0,3	0,13	Medium
X13	0,42	0,31	0,12	Medium
X14	0,39	0,28	0,13	Medium
X15	0,42	0,32	0,13	Medium
X16	0,43	0,26	0,11	Medium
X17	0,47	0,33	0,15	Medium
X18	0,48	0,26	0,1	Medium
X19	0,51	0,24	0,1	Medium
X20	0,53	0,28	0,11	Medium
X21	0,45	0,26	0,11	Medium
X22	0,49	0,31	0,13	Medium
X23	0,43	0,32	0,15	Medium
X24	0,53	0,39	0,19	Medium
X25	0,54	0,38	0,2	High
X26	0,48	0,26	0,14	Medium
X27	0,65	0,31	0,14	Medium
X28	0,4	0,3	0,15	Medium
X29	0,43	0,33	0,14	Medium
X30	0,41	0,4	0,21	High
X31	0,42	0,36	0,19	Medium
X32	0,44	0,33	0,16	Medium
X33	0,46	0,37	0,24	High
X34	0,38	0,41	0,17	Medium

From the results of calculations and matching in the table above 7 variables are included in the high category. So it can be concluded the high risk variables faced by contractors at the risk of delays in the implementation contruction project time of the Diara Cileungsi Hotel, Bogor Regency there are 7 variables.

Table 10. High-Risk Variable

CODE	VARIABLE	RISK VALUE	DESCRIPTION
X4	Inappropriate planning method	0,26	High
X5	The team Leader is slow in making decisions	0,21	High
X6	The contractor method is not right	0,26	High
X8	Low work productivity	0,20	High
X25	Lack of capacity tool used	0,20	High
X30	Constrained mobilization to the location	0,21	High
X33	Delay caused by weather	0,24	High

3.7 Discussion of the Results of Data Collection and Analysis

Based on the results of the data collection stage, obtained 34 variables from 40 risk variables. Then tested whether or not the research variables are valid and reliable before being processed and analyzed to find high-risk variables.

The results of risk analysis according to the value and category obtained 7 variables that become high-risk variables faced by contractors at the risk of delays in the implementation construction project time of the Diara Cileungsi Hotel, Bogor Regency.

4. Conclusion

Based on the results of the study it can be concluded that:
1. Process of collecting data with expert research to identify risk variables, from 40 research variables get 34 variables that become high-risk variables faced by contractors at the risk of delays in the implementation construction project time of the Diara Cileungsi Hotel, Bogor Regency.
2. From the stage of descriptive analysis with statistic software to looking at variables with high-risk values, obtained 7 variables that become high-risk variables faced by contractors at the risk of delays in the implementation construction project time of the Diara Cileungsi Hotel, Bogor Regency. 7 high-risk variables are inappropriate planning method (X4), Team Leader is slow in making decisions (X5), contractor method is not right (X6), low work productivity (X8), lack of capacity tool used (X25), constrained mobilization to the location (X30) and delay caused by weather (X33).

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