

PROJECT RISK MANAGEMENT INFORMATION SYSTEM IN CV. AGRO GEMILANG

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ABSTRACT

CV. AGRO GEMILANG is a company that engaged in construction field. The company was founded in 2013, has handled various construction projects in the Bandung area, especially government projects. The company has problems in project risk management so that the Project Manager has difficulty in determining the level of risk interest and does not know the impact of the risk is big or small for the project. The next problem is that the Project Manager has difficulty in planning to handle the risk of inconsistency in the project cost budget than planned. Solution to project risk management problems using Failure Modes and Effects Analysis (FMEA) method to determine the level of risk interest and Expected Monetary Value (EMV) method for determine risk costs. Based on the problems above, a project risk management information system in CV. AGRO GEMILANG which can assist the Project Manager in determining the level of interest in risk and determine the cost of risk. Based on the test results it can be concluded that the project risk management system can assist the Project Manager in determining the level of interest in the risk and determining the cost of risk.

Keywords: Project Risk Management, Information Systems, Risk Management, Failure Modes and Effects Analysis, Expected Monetary Value

1. INTRODUCTION

CV. AGRO GEMILANG is a company engaged in the construction field. The company was founded in 2013, has been handling various construction projects in the area of Bandung, especially government projects. Work will include drainage, roads, and buildings.

Based on the interview with Mr. Supriyanto as Project Manager, stated that there are still difficulties in determining the level of interest risk. Project Manager to handle these risks based on risk whichever is earlier reported, so the Project Manager does not know the impact of these risks are big or small the project.

In the development project of drainage / sewer with the package name

PDR.PL.128/Rehabilitasi/Pemeliharaan Saluran Tepi Jalan Pasir Impun RW.10 Ds. Cikadut experiencing some problems, namely, the presence of illegal payments during the project implementation, the weather (rain) which does not support to complete the work. Based on weekly reports in the first week by Mr. Supriyanto as Project Manager, project implementation there are some constraints, namely, illegal payments (bribes) when the project will begin. Then in the third week of project implementation, it was raining so the weather is not conducive to finishing work mortared stonework according to the weight ditentukan

Based on project realization report, the company has the addition of the project cost budget. Companies handling risks by using the company's cash money to cope with increased costs is not in accordance with the plan. But by using the company's money will hurt the company if the same risk occurs again.

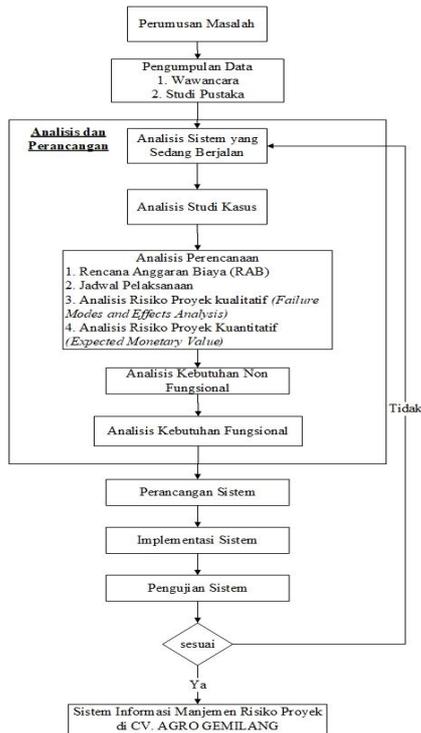
Based on the problems occur, it can be concluded that there are no difficulties in the project monitoring and not good risk mitigation arrangements made by the company. Of the problems it will build a web-based information system to overcome the problems that exist in the CV. AGRO GEMILANG.

The information system is a system in an organization that can support activities at managerial levels [1], PHP is a web-based programming language that is very popular in the web development [2].

2. RESEARCH CONTENTS

2.1 Research Methodology

The research methodology used in this research is descriptive research methodology.



Picture 1 Research methodology

2.2 Analysis Project Planning

The project is a means to fulfill a request to create a certain product suatu [3], In the management of activity which is needed to achieve certain goals one planning [4], Project planning analysis contains analysis covering the Budget Plan (RAB), schedules, qualitative risk analysis using a Failure Modes and Effects Analysis (FMEA), and quantitative risk analysis using Monetary Earned Value.

2.2.1 Schedule

Plan schedule on the construction project of drainage / sewer with the package name PDR.PL.128 / Rehabilitation / Maintenance Channel Tepi Jalan Pasir Impun RW.10 Ds. Cikadut.

Table 1 Plan Project Schedule

NO	Uraian Pekerjaan	Minggu Ke-				Ket
		I	II	III	IV	
	DIVISI 1 - UMUM					
1.2	Mobilisasi & Demobilisasi					Pelaksanaan 30 (Hari kalender)
1.3	Pengaturan Lalu Lintas					
	DIVISI 2 - DRAINASE					
2.1(2)	Galian untuk Drainase Selokan dan Saluran Air dengan Buruh					(12 April 2018 s.d 11 Mei 2018)
2.2(1)	Pasangan Batu dengan Mortar					
	DIVISI 3 - PEKERJAAN TANAH					
3.2(2a)	Timbunan Pilihan dari Sumber Galian					

2.2.2 Risk Analysis Using Failure Modes and Effects Analysis

Qualitative risk analysis using the method of Failure Modes and Effects Analysis is used to identify and determine the level of importance of risk that may occur on the project [5], Activity analysis and identification of risk used for a base in the decision if a risk occurs to see the importance of risk [11].

1. Risk identification

Risk identification process is performed to determine and make a list of risks that have occurred to the project or that may occur on the project.

Table 2 Risk identification

No.	type Risk	Risk Codes
1	External Risk	
1.1	Weather	R1
1.2	Material prices suddenly rise	R2
1.3	Traffic conditions	R3
1.4	extortion	R4
2	Risk Tools and Materials	
2.1	Delay materials	R5
2.2	Damage to the work tool	R6
2.3	Material damage	R7
2.4	The loss of material	R8
3	Labor Risk	
3.1	Work accident	R9
3.2	Labor pain	R10

2. Determine the Value of Severity, Occurrence and Detection

After getting a list of the risks derived from the risk identification process risk list rated by Severity (severity), Occurrence (occurrence), and Detection (detection) with parameters that can be seen in Table 3, Table 4 and Table 5 [6].

Table 3 Severity Level

Effect	Criteria: Severity Effect	Ranked
Dangerous (Without Warning)	Testing not carried damage with damage that affects the system, but without warning tool	10
Dangerous (The Warning)	Testing not carried damage with damage that affects the system but there is still a warning tool	9
Very high	Testing can not be implemented due to severe damage	8
High	Testing can not be implemented because of significant damage to equipment	7
moderate	Testing can not dilaksanakan as little damage	6
Low	Testing can not run normally with or without damage	5
Very low	Tests can be carried out, but there is a significant decrease in performance	4
Minor	Testing can continue to be implemented, but there is a decrease in the performance of the tool	3
Very minor	The test continues to run, only a slight annoyance	2
Nothing	No effect	1

Table 4 Level Events

Effect	Criteria: Level Events	probability	Ranked
Almost always	Risk always happen	> 9	10
Very high	Very high risk of loss	> 8-9	9
High	High-risk occurring	> 7-8	8
rather high	The risk that occurs rather high	> 6-7	7
moderate	Risks that occur at a moderate level	> 5-6	6
Low	Risks that occur at low levels	> 4-5	5
a little	Risks that occur slightly	> 3-4	4
The least	The risk that occurs very little	> 2-3	3
Almost never	Risks are rare	> 1-2	2
Never	Risk never happened	0-1	1

Table 5 level Detection

Detection	Criteria: Level Detection	Ranked
Not sure	Undetectable	10
Very small	difficult to detect	9
small	Relatively difficult to detect	8
Very low	Very rarely detected	7
Low	Relatively rarely detected	6
moderate	Quite easily detected	5
High enough	can be detected	4
High	easily detected	3
Very high	difficult to detect	2
almost definitely	definitely detected	1

Here is the value of Severity (severity), Occurrence (occurrence), and Detection (detection) one of them on the work of mobilization and demobilization that have been identified based on interviews with the Project Manager at CV. AGRO GEMILANG can be seen in Table 6.

Table 6 Value Severity, occurrence, and Detection

Risk Codes	Risk	Severity	occurrence	Detection
	Mobilization and Demobilization			
R1	Weather	3	7	3
R2	Material prices suddenly rise	7	6	4
R3	Traffic conditions	5	5	4
R4	extortion	3	4	6

Risk Codes	Risk	Severity	occurrence	Detection
R5	Delay materials	7	4	5
R6	Damage to the work tool	7	4	6
R7	Material damage	7	4	6
R8	The loss of material	7	4	7
R9	Work accident	4	2	7
R10	Labor pain	4	2	7

After getting value Severity (severity), Occurrence (occurrence), and Detection (detection), the calculated value of risk priority number (RPN) by multiplying the value of Severity (severity), Occurrence (occurrence), and Detection (detection).

$$\text{RPN} = \text{Severity} \times \text{Occurrence} \times \text{Detection}$$

RPN = the value of the priority level of risk

Severity = the value of severity

Occurrence = the value of the incidence rate

Detection = value detection rate

Here is a table of calculation results of the NDP on the work of mobilization and demobilization using FMEA method in Table 7.

Table 7 Calculation Result RPN

Code Risk	Risk	Severity	occurrence	Detection	RPN
	Mobilization and Demobilization				
R1	Weather	3	7	3	63
R2	Material prices suddenly rise	7	6	4	168
R3	Traffic conditions	5	5	4	100
R4	extortion	3	4	6	72
R5	Delay materials	7	4	5	140
R6	Damage to the work tool	7	4	6	168
R7	Material damage	7	4	6	168
R8	The loss of material	7	4	4	112
R9	Work accident	4	2	7	56
R10	Labor pain	4	2	7	56

3. Determining the Critical Value

After obtaining the value of the RPN of each risk, we then calculated the critical value. The critical value is used to determine the risk included into the category of high or low. Including high-risk category if the value is greater RPN equal to the critical value (the value of the RPN \geq critical value). If the value of the RPN is smaller than the critical value, the risk included in the low category. The critical value can be calculated by:

$$\text{Critical Value} = \frac{\text{total RPN}}{\text{jumlah daftar risiko}}$$

Then obtained the critical value of the project PDR.PL.128 / Rehabilitation / Maintenance Channel Tepi Jalan Pasir Impun RW.10 Ds. Cikadut for work mobilization and demobilization.

$$\begin{aligned} \text{critical value} &= \\ &= \frac{63 + 168 + 100 + 72 + 140 + 168 + 168 + 112 + 56 + 56}{10} \\ &= 110.3 \approx 110 \end{aligned}$$

Critical values obtained for the work of mobilization and demobilization is 110 which means that if the value of the RPN on every risk worth above 110 or equal to 110, then belong to the high risk. Categories of risk can be seen in Table 8.

Table 8 Risk Category

Code Risk	Risk	RPN (Risk priority Number)	Category
	Mobilization and Demobilization		
R1	Weather	63	Low
R2	Material prices suddenly rise	168	High
R3	Traffic conditions	100	Low
R4	extortion	72	Low
R5	Delay materials	140	High
R6	Damage to the work tool	168	High
R7	Material damage	168	High
R8	The loss of material	112	High
R9	Work accident	56	Low
R10	Labor pain	56	Low

From the data obtained risk category then the Project Manager can determine which risks should be addressed immediately.

4. handling Risk

From the results of a series of risk analysis has been carried out and then used as a reference in order to mitigate risk. Risk management actions obtained from the coordination with the Project Manager at CV. AGRO GEMILANG. The action handler to each - each risk can be seen in Table 9.

Table 9 handling Risk

Code Risk	Risk	RPN	Category	Risk Management Measures
	Mobilization and Demobilization			
R7	Material damage	168	High	New buying defective materials
R6	Damage to the work tool	168	High	Fixing work tools or buy new tools work
R2	Material prices suddenly rise	168	High	Enter into agreements with suppliers of materials
R5	Delay materials	140	High	Coordinating with material suppliers
R8	The loss of material	112	High	Increasing supervision of the material at the project site
R3	Traffic conditions	100	Low	Setting a good traffic
R4	extortion	72	Low	Appealed to the local authorities
R1	Weather	63	Low	Adding manpower or more hours
R9	Work accident	56	Low	Provide guidance concerning safety
R10	Labor pain	56	Low	Conducting overtime to existing workers or add labor

Based on the results of risk analysis using FMEA, the results of the risk analysis is used to assist the Project Manager in identifying in advance the risks that may occur, so that if risks occur can be dealt with quickly by importance of risk that can be seen from the priority value risk (RPN) highest and risk management actions have been determined.

2.2.3 Risk Analysis Using the Expected Monetary Value

Methods Expected Monetary Value (EMV) is used to calculate the cost of risk if the risk occurs [7]. If the value is positive EMV then it is an opportunity and if the value is negative EMV means a threat that may cause harm to the company. How to get value EMV is as follows

EMV = Probability x Consequence

EMV = money expected if the risk occurs

Probability = risk probability value

Consequences = the value of the impact caused by risk

The determination of the probability and kosekuensi obtained from interviews with Mr. Supriyanto as Project Manager at CV. AGRO GEMILANG. A probability value is determined based on the interview with the Project Manager of the incident on the course and consequences based on the company's financial condition and the value of the project budget. EMV Calculation Results are shown in Table 10.

Table 10 EMV Calculation Results

Risk Codes	Risk	probability (%)	consequence (USD)	EMV (Rp)
R1	Weather	60	-2,000,000	-1.200.000
R2	Price material who arrived - arrived rise	40	-3,000,000	-1.200.000
R3	Labor accidents	30	-1,000,000	-300 000
R4	Extortion (exactions)	20	-300 000	-60 000
R5	Traffic conditions	30	-500 000	-150 000
R6	material delays	30	-500 000	-150 000
Total (USD)				-3.060.000

EMV obtained total value of Rp. -3.060.000 The minus value means to show the threat of loss to the company in terms of cost. On the system to be built that value can be entered by the Project Manager in project budget planning to allocate it to work there so if there is a risk on a job no longer need to wear the company's cash funds for the Project Manager already has its own allocation of the cost of risk.

2.2.4 Budget Plan

Making the budget plan is needed so that the project goes according to planned costs. RAB CV. AGRO GEMILANG calculation. calculated by multiplying the volume of work at a unit price. The total price of the RAB will be added to the value of the cost of risk derived from calculations using EMV. For details of the calculation of the RAB at each job description can be seen in Table 11.

Table 11 Budget Plan

No .	Job description	Volume	Unit	Total (Rp)
DIVISION 1 - GENERAL				
1.2	Mobilization and Demobilization	1:00	Ls	395,004.33
1.3	Traffic control	1:00	Ls	3,745,798.48
DIVISION 2 - DRAINAGE				
2.1 (2)	Excavation for Drainage Ditches and Waterways with Labor	50.60	M3	4,172,527.61
2.2 (1)	Pair with Stone Mortar	50.60	M3	38,301,493.41
DIVISION 3 - JOBS LAND				
3.2 (2a)	Source excavation heap of options	2:30	M3	393,554.72
TOTAL				47,519,999.68
VAT 10%				4,751,999.97
TOTAL				52,271,999.65
ROUNDING				52,270,000.00

Total price of the RAB will be added to the value of the cost of risk derived from calculations using EMV, so the Project Manager has the allocation of costs if there is a risk in the implementation of the project. Here is a recapitulation of latest RAB after plus the value of the cost of risk can be seen in Table 12.

Table 12 New RAB Recapitulation

No .	Job description	Volume	Unit	Total (Rp)
DIVISION 1 - GENERAL				
1.2	Mobilization and Demobilization	1:00	Ls	395,004.33
1.3	Traffic control	1:00	Ls	3,745,798.48
DIVISION 2 - DRAINAGE				
2.1 (2)	Excavation for Drainage Ditches and Waterways with Labor	50.60	M3	4,172,527.61
2.2 (1)	Pair with Stone Mortar	50.60	M3	38,301,493.41
DIVISION 3 - JOBS LAND				
3.2 (2a)	Source excavation heap of options	2:30	M3	393,554.72
COST OF RISK				3,060,000.00

No	Job description	Volume	Unit	Total (Rp)
	TOTAL			50,579,999.68
	VAT 10%			5,057,999.97
	TOTAL			55,637,999.65

Based on the new RAB recapitulation data in Table 12, shows that the amount of the previous budget of Rp. 47.519.999.68 added the cost of risk amounted to Rp. 3.060.000.00 to Rp. 50.579.999.68 (excluding VAT 10%). The new RAB value will be used as a CMS contract value of the project.

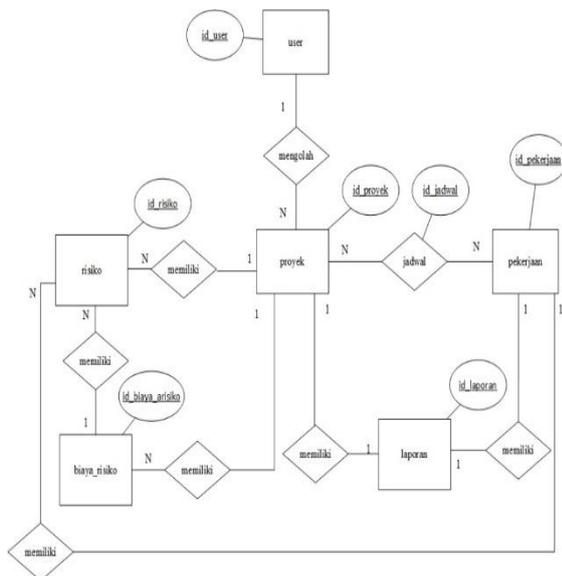
2.3 User analysis

Analysis users are users who will use the system. Terdapat two user permissions are:

1. *Project Manager*: Managing the risk management, see the project evaluation data, view and manage the jobs data, manage the data rab, Managing schedule data
2. *site Manager*: See the project data, manage the weekly reports, view data evaluation.

2.4 Analysis Database

Analysis of the database using Entity Relationship Diagram (ERD). Describing the relationship between the database[8],



Picture 2 ERD

Table 13 explanation ERD

No	Nama Entitas	Atribut
1	user	<u>id_user</u> , username, password, jabatan
2	proyek	<u>id_proyek</u> , nama_proyek, pemilik_proyek, no_spk, nilai_kontrak, tgl_mulai, tgl_selesai, durasi

3	pekerjaan	<u>id_pekerjaan</u> , nama_pekerjaan, volume, satuan, harga_satuan, ket
4	risiko	<u>id_risiko</u> , nama_risiko, nilai_keparahan, keparahan, nilai_kejadian, kejadian, nilai_deteksi, deteksi, rpn, mitigasi
5	biaya_risiko	<u>id_biaya_risiko</u> , nama_risiko, probabilitas, konsekuensi, emv
6	jadwal	<u>id_jadwal</u> , tgl_mulai_jadwal, tgl_selesai_jadwal, durasi_jadwal, ket_jadwal
7	laporan	<u>id_laporan</u> , minggu, kendala_laporan, penanganan_laporan, pengeluaran_laporan, ket_laporan

2.5 Diagram Context

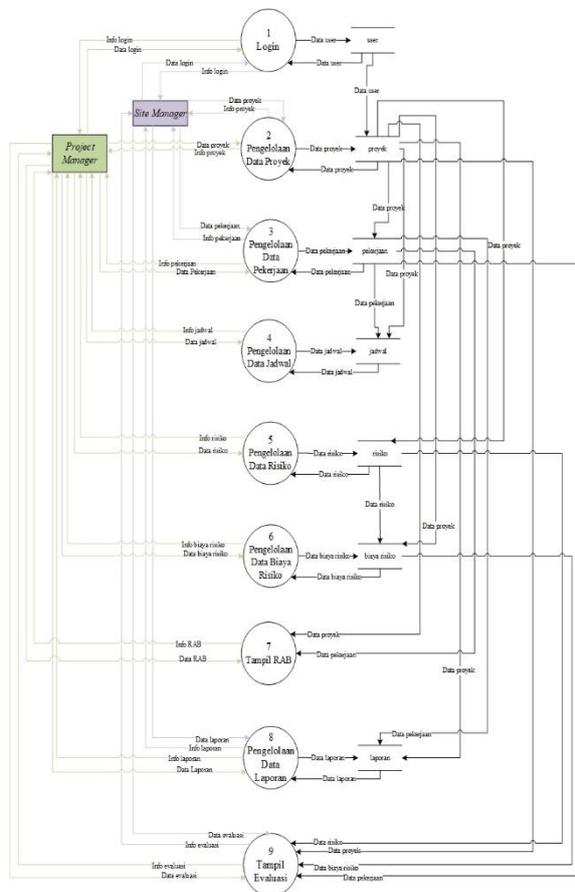
Context diagram illustrates the flow of data on the system.



Picture 3 Diagram Context

2.6 Data Flow Diagrams(DFD)

DFD is a tool to show the flow of processes on a system. DFD consists of a data store, process, flow of data, and the entity [9],



Picture 4 DFD

2.7 Testing

Testing the system evaluation process to find mistakes and shortcomings pada the system under test [10].

2.7.1 Blackbox testing

Based on the results of black box testing has been done on the Project Risk Management Information System at CV. AGRO GEMILANG, it can be concluded that the application is built already tested system to eject the output as expected. The shape of the error display is quite easy to understand in providing direction to the user to enter the correct data. This system has produced outcomes.

2.7.2 Beta testing

Based on the answers of the interview with the Project Manager and Site Manager at CV. AGRO GEMILANG then the system can help the Project Manager because the system makes it easy to determine the level of interest risk, facilitate the calculation of the cost of risk, a feature evaluation can determine on a budget plan that has been included

with the cost of risk, know the name of the risk, the value of the priority risks, and costs of every risk and can help Site Manager system because it can determine the list of existing projects, work on each project, the schedule of any job, be able to manage a project report.

3. CLOSING

Based on the results of research and testing has been done on the Project Risk Management Information System at CV. AGRO GEMILANG, can be obtained conclusion, namely, information systems project risk management can assist the Project Manager in determining the level of importance of risk by determining the priority value risk, so as to determine high or low level of risk of loss and risk management information system project can assist the Project Manager in determine the cost of the risk that the company did not experience losses caused by risks that occur due to a budget plan has been added to the cost of risk.

The suggestion from this study that, in future studies are expected to use the method of Probability Impact Matrix (PIM) for PIM method only has two parameters: probability and impact, while the FMEA method has three parameters. So knowing which method is more effective in qualitative risk analysis.

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