

# PROJECT RISK MANAGEMENT INFORMATION SYSTEM IN PT. PULO DAMAR ABADI

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## ABSTRACT

PT. PULO DAMAR ABADI is a company engaged in the implementation of the project, contractors, trade (goods or services), and mechanical and electrical. The Company has a risk that problems in the planning Responsible Mechanical difficulties in identifying and determining the level of interest risk. The next problem is Responsible Mechanical difficulties in monitoring the risk of resulting in a mismatch between realization and project planning. The solution for risk planning methods probability Impact Matrix (PIM) for the identification of the importance of risk and methods Expected Monetary Value (EMV) for the identification of risk costs. The solution of the risk monitoring using Earned Value Management (EVM) to control project costs and time. Judging from the results of the exposure problems above, it takes the risk manajamen information system in PT. PULO DAMAR ABADI which can help in Charge of Engineering in the planning of risk and risk oversight. From the results of research and testing can be concluded that this project risk management system can help in Charge of Engineering in identifying the level of interest risk and expense calculation of risk based planning process risks. The project risk management system can also assist in the oversight of risk based functional evaluation results of the project. From the results of research and testing can be concluded that this project risk management system can help in Charge of Engineering in identifying the level of interest risk and expense calculation of risk based planning process risks. The project risk management system can also assist in the oversight of risk based functional evaluation results of the project. From the results of research and testing can be concluded that this project risk management system can help in Charge of Engineering in identifying the level of interest risk and expense calculation of risk based planning process risks. The project risk management system can also assist in the oversight of risk based functional evaluation results of the project.

**Keywords:** project risk management, risk planning, risk supervision, Probability Impact Matrix, Expected Monetary Value, Earned Value Management.

## 1. INTRODUCTION

### 1.1. Background

PT. PULO DAMAR ABADI is a company founded by a group of young dynamic and have the determination to grow and prosper in the world of business and construction with a view of economic development, construction, and rising world tenologi electricity in Indonesia. The company was founded on June 24, 2014. The company is engaged in the implementation of the project, contractors, trade (goods or services), and mechanical and electrical.

Based on an interview with Mr. Andris Apriyandi as Responsible Mechanical PT. PULO DAMAR ABADI stated that today Responsible Mechanical aware of any risks that arise from reports provided by Power Mechanical Engineering Responsible but difficult to determine the level of importance of the risk occurring because companies have not had a plan for project risks. Based on the data recap project risk, it can be seen that the Responsible Mechanical just know the risks that have occurred but did not know the importance level of that risk is if there is a similar risk should be addressed immediately or not.

Based on the interview with Mr. Andris Apriyandi as Responsible Mechanical PT. PULO DAMAR ABADI states that when the implementation of ongoing projects and reported there was a risk of the Person in Charge of Engineering will take action against the risks reported in advance without seeing another risk if the impact is greater or smaller. Error in determining risks that must be addressed due to the difficulty in monitoring any risks that could hinder the completion of the project because there is additional cost. Based on data from the Project Activity Report on the project and the construction of substations withdrawal SKTM PLN wall karawang area, showing where the budget plan projects planned Rp. 137 900 904, while the costs incurred in excess of the cost of the planned where the costs incurred in the implementation of the project is Rp. 150 368 933. Incompatibility planned costs with the costs occur because of Responsible Mechanical prefer to exercise control over the risk of delays in material whereas when performing the

control of risk of additional work that resulted in additional costs of the project.

Based on an interview with Mr. Andris Apriyandi as a responsible engineering PT. PULO DAMAR ABADI stated that the company has done a risk control process when the risk of the above occur, such as using corporate cash to cope with additional costs that are not according to plan. The use of cash can be viewed based on data from the financial statements of the project, which at the date of October 10, 2016 used cash of Rp. 13 million to cope with increased costs. However, these control measures would be detrimental to the company if the risk is the same with every project.

Based on the problems occur, it can be concluded that the core issue is with the difficulties that occur in the project monitoring and risk mitigation that has not been regulated properly by the company. Corresponding problems it will build a web-based system that can be accessed wherever the user is located and it is hoped the system would overcome the problems that exist in PT. PULO DAMAR ABADI set forth in the form of research thesis with the title "Project Risk Management Information System in PT. PULO DAMAR ABADI".

## 1.2. Research methodology

The method used in the research project risk management information system uses descriptive research methodology. Kualitati descriptive approach method is a method of data processing by analyzing the factors relating to the object of research by presenting the data in more depth the research object. [1]

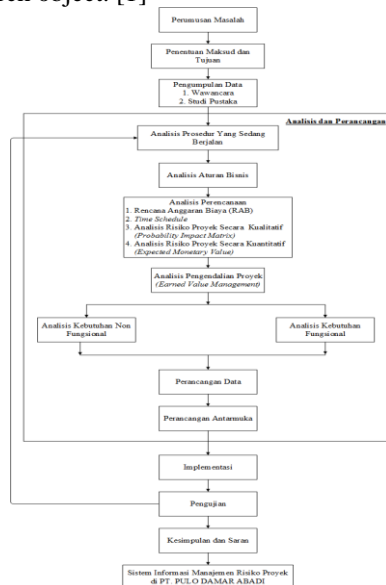


Figure 1. Research methodology

## 2. RESEARCH RESULT

### 2.1 Case study

The case study is the subject of this study is the Civil Development project activities in the Area Substation PLN Hubung Summarecon Emerald Karawang, where the timing of the project for 45

days starting on January 8, 2018 s / d February 21, 2018 with an estimated cost of Rp. 312 136 000 (including VAT 10%).

### 2.2 Theoretical basis

#### 2.2.1 Information Systems

Information Systems (IS) is a set of elements interconnected or components that can collect (input), manipulate (process), store and disseminate (output) data, information and react as feedback to meet and achieve certain goals, such as increasing profits or improve service. [2]

#### 2.2.2 management

Management is a process undertaken to achieve a goal of an organization to work in a team. In an application to have subject and object management. The subjects are people who set up while the object is arranged. [3]

#### 2.2.3 Project management

Project management is a combination of the application of the knowledge, tools and techniques to manage the project in order to meet the specified requirements, which usually include, but are not limited to: the scope, quality, schedule, budget and risks. wherein the stage or the project management process is Initiating and Planning, Executing, Monitoring and Controlling, Closing. [4]

#### 2.2.4 Project Risk Management

The project includes the risk management process of conducting risk management planning, identification, analysis, response planning, and risk management on the project. The goal of project risk management is to increase the probability and impact of positive events that occur, as well as reduce the likelihood and impact of negative events in the execution of the project. [5]

##### 2.2.4.1 Probability Impact Matrix Method

Probability Impact Matrix (PIM) is a method used to analyze risk based on the opportunities and impact of those risks. Stages in the PIM method such as risk identification, determine the value of the likelihood and impact of risks, memnentukan the importance of risk and risk management. [5]

### 1. identification of risk

This process aims to create a list of risks that have occurred and disrupt the implementation of projects in the company.

Table 1. Risk Identification Results

Risk Codes	Risk
R1	schedule delays
R2	Cost is not in accordance with the plan
R3	Extra work
R4	material delays
R5	Loss of working tools
R6	Damage to the work tool
R7	Unfavorable weather conditions
R8	Protest particular organization
R9	Material price increase
R10	Labor less familiar with the concept of construction
R11	Labor pain
R12	Work accident

### 2. Determining Likelihood and Impact Risk

Based on identification of risk at an earlier stage, then the next is to determine the value of the possible emergence of risks and impact of those risks. criteria to determine the value of probability and risk impact can be seen in the table below. [5]

**Table 2.**Parameter Value Impact

Impact	Very low 1	Low 2	moderate 3	High 4	Very high 5
Impact on cost	The increase in costs was not significant	The increase in the cost of <5%	Cost increases of 5-10%	The increase in cost of 10-20%	The increase in the cost of >20%
Opportunity costs of impacts and threats	Cost reductions were not significant	Reduced costs <1%	1-3% cost reduction	Cost reduction of 3-5%	Cost reduction > 5%
Its impact on the schedule	Delay is not important	Delay <1 month	Delay 1-3 months	Delay 3-6 months	Delay > 6 months
Opportunities schedule impacts and threats	No significant improvement	Improvements <1 month	Repair 1-2 months	Repair 2-3 months	Repairs > 3 months

**Table 3.**Parameter Value Probability

probability	Value	Information
Very low	1	Rarely, only in certain circumstances
Low	2	Sometimes occurs in certain conditions
Moderate	3	Occur under certain conditions
High	4	Often occur under certain conditions
Very high	5	Always occur under certain conditions

Based on the decision of the Responsible Engineering at PT. PULO DAMAR ABADI, then the value obtained likelihood and impact of risks as below.

**Table 4.**Possible Value and Impact Results

Risk Codes	Risk	probability	Impact
R1	schedule delays	3	3
R2	Cost is not in accordance with the plan	2	2
R3	Extra work	2	3
R4	material delays	2	2
R5	Loss of working tools	2	2
R6	Damage to the work tool	2	2
R7	Unfavorable weather conditions	2	2
R8	Protest particular organization	1	1
R9	Material price increase	2	2
R10	Labor less familiar with the concept of construction	2	1
R11	Labor pain	1	2
R12	Work accident	1	2

### 3. Determining the Importance of Risk

Having obtained the results of probability and risk impact, then determine the value of the interest level of risk using a risk matrix. [5]

**Table 5.**Qualitative Risk Analysis Matrix

probability Rating	Very high	5	5	10	15	20	25
	High	4	4	8	12	16	20
	moderate	3	3	6	9	12	15
	Low	2	2	4	6	8	10

	Very low	1	1	2	3	4	5
		1	2	3	4	5	
		Very low	Low	moderate	High	Very high	
		Impact Rating					

Information:

- 13-25 = High Risk, required immediate treatment
- 06-12 = Moderate Risk, required the attention of top-level management
- 01-05 = Low Risk, required routine procedure

The calculation of the probability and risk impact and the results of calculation of the degree of importance of each - each risk is as follows.

$$\text{risk Score} = \text{Probability} \times \text{Impact}$$

Information:

- risk Score* = Interest rate risk
- probability* = The probability of risk
- Impact* = The risk impact

The following is the calculation of the importance level of risk that can be seen in the table below.

**Table 6.**Interest rate Risk Calculation Results

Risk Codes	Risk	probability	Impact	Importance
R1	schedule delays	3	3	9
R2	Cost is not in accordance with the plan	2	2	4
R3	Extra work	2	3	6
R4	material delays	2	2	4
R5	Loss of working tools	2	2	4
R6	Damage to the work tool	2	2	4
R7	Unfavorable weather conditions	2	2	4
R8	Protest particular organization	1	1	1
R9	Material price increase	2	2	4
R10	Labor less familiar with the concept of construction	2	1	2
R11	Labor pain	1	2	2
R12	Work accident	1	2	2

### 4. handling Risk

The result of the interest risk assessment has been done before is a reference to handling the follow-up of risk mitigation or risk control. Measures of risk obtained from the coordination with the director and the person in charge of engineering at PT. PULO DAMAR ABADI. Here are the results of risk management.

**Table 7.**handling Risk

Risk Codes	Risk	Risk level	Risk control	Person in charge
R1	schedule delays	moderate	Adding manpower or more hours to pursue schedule delays	Undertaking engineering
R2	Cost is not in accordance with the plan	Low	Reducing unnecessary costs	Undertaking engineering

R3	Extra work	moderate	Adding manpower to pursue schedule delays	Undertaking engineering
R4	material delays	Low	Undertaking engineering divert to another job in order to keep the project running	Undertaking engineering
R5	Loss of working tools	Low	Undertaking technique using corporate cash to buy work tools are missing on the approval of the director	Undertaking engineering
R6	Damage to the work tool	Low	The party responsible for communicating with power engineering technique is a working tool that is damaged can be repaired or buy a new work tools using corporate cash with the approval of the director	Undertaking engineering
R7	Unfavorable weather conditions	Low	Adding manpower or more hours to pursue schedule delays	Undertaking engineering
R8	Protest particular organization	Low	The party responsible for technical communication with the organization or the community that the project work will not damage the surrounding environment	Undertaking engineering
R9	Material price increase	Low	Responsible Mechanical reduce unnecessary costs	Undertaking engineering
R10	Labor less familiar with the concept of construction	Low	The party responsible for engineering and technical personnel to provide direction to the work force before the start of a project	Undertaking engineering
R11	Labor pain	Low	Adding labor to replace workers who are sick so no telambat schedule and according to plan	Undertaking engineering
R12	Work accident	Low	Adding labor to replace workers injured at work so as not telambat schedule and	Undertaking engineering

			according to plan	
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Based on the results of Probability Impact Matrix method it is known the name of the risk of what is happening, what is the importance of the risk occurring, and the handling of the risk.

#### 2.2.4.2 Expected Monetary Value Method

Quantitative risk analysis is an analysis performed to determine the risk estimates, especially in terms of cost of risk. The calculation of the estimated cost of risk requires the value of the probability of occurrence of each risk and the cost of the consequences of each proyek.tahapan the Expected Monetary Value yaitu method of risk identification and calculation of the cost of risk. [5]

##### 1. Risk identification

The following is the identification of the risk of any data recap adverse project in terms of costs that can be seen in the table below.

**Table 8.**Risk identification

Risk Codes	Risk
R1	Extra work
R2	Loss of working tools
R3	Damage to the work tool
R4	Unfavorable weather conditions
R5	Material price increase
R6	Labor pain
R7	Kece6akaan work

##### 2. Expected Monetary Value Calculation Method

EMV is calculated by multiplying the probability of each risk value multiplied by the possibility of money being spent when the risk occurs. The formula for the calculation of the cost of risk can be seen as below. [5]

$$\text{EMV} = \text{Probability} \times \text{Consequence}$$

Information :

EMV = *Expected Monetary Value*

probability = Value risk probability

consequence = The value of the impact of risk

EMV calculation results can be seen in the table below.

**Table 9.**EMV Calculation Results

Risk Codes	Risk	probability (%)	consequence (USD)	EMV (USD)
R1	Extra work	70	-15,000,000	-10.5 million
R2	Loss of working tools	30	-1,000,000	-300 000
R3	Damage to the work tool	30	-1,000,000	-300 000
R4	Unfavorable weather conditions	70	-300 000	-210 000
R5	Material price increase	30	-2.5 million	-750 000
R6	Labor pain	30	-500 000	-150 000
R7	Work accident	30	-1,000,000	-300 000
<b>Total (USD)</b>				-12.51 million

Based on the calculation above, the obtained value EMV risk costs Rp. -12.51 million. The minus value means to show the threat of loss to the company in terms of cost. The risk cost values will be allocated for the project so that it can handle maslaah in terms of cost.

### 2.2.5 Project control

Stages in project control analysis using Earned Value Management that includes weight calculation work, the calculation of planned value, earned value calculations, analysis of actual cost, the analysis of variance, analysis of work index, and analysis of the estimated costs. [6]

#### 2.2.5.1 Weight Calculation Jobs

The weight of the work is calculated based on the unit price of work in accordance with the value of the contract and do not include VAT at 10%. [6]

**Table 10.**Weight Calculation Jobs

No.	Type of work	Work Price (USD)	Weight (%)
1	Pek. Preparation	16,287,824	5.74
2	Pek. Land & Foundations	18,123,264	6.39
3	Pek. Concrete Structures	155 812 616	54.91
4	Pek. Wall & Wall Paper	23,665,584	8.34
5	Pek. Doors & Louvere	22,246,784	7.84
6	Pek. Painting	21,650,888	7.63
7	Pek. electrical	24,318,232	8.57
8	Pek. marble Substation	283 760	0.10
9	Handover of Works To PLN	1362048	0.48
Total		283 760 000	100.00

#### 2.2.5.2 Analysis of Project Evaluation

In this stage a calculation to find the value of PV (Planned Value) EV (Earned Value), AC (Actual Cost), CV (Cost Variance), SV (Schedule Variance), CPI (Cost Performance Index), SPI (Schedule Performance Index), EAC (Estimate at Completion) and ETC (Estimate to Completion) which can be seen in the table below. [5]

**Table 11.**Analysis Results Recap

Days to	variant analysis		performance analysis		Estimates analysis	
	CV (USD)	SV (USD)	CPI	SPI	ETC (USD)	EAC (USD)
1	0	0	1	1	279 673 856	283 760 000
2	0	0	1	1	279 673 856	283 760 000
3	0	0	1	1	279 702 232	283 760 000
4	0	0	1	1	279 702 232	283 760 000
5	0	0	1	1	281 149 408	283 760 000
6	0	0	1	1	281 149 408	283 760 000
7	0	0	1	1	281 177 784	283 760 000
8	0	0	1	1	281 177 784	283 760 000
9	0	- 1,730,936	1	0.33	282 908 720	283 760 000
10	-300 000	1730936	0.94	1.67	297 283 881	301 897 033

Based on the results of the analysis of the calculation results recap of day 1 to day 10 of the table 11, it can be concluded as below.

**Table 12.**Conclusion Project Control

Project	Remaining Cost Estimate (ETC)	Final Cost Project Completion (EAC)	Information
Civil construction Hubung PLN substation in Emerald Summarecon Karawang	Rp. 282 397 952	Rp. 283 760 000	1. On the 9th day of risk of the code [R7] that unfavorable weather conditions 2. On the 10th day of treatment done to address the risks [R7] that perform additional hours of work, but it resulted in additional handling fee of Rp 300,000

### 2.1 Software Requirements Analysis

Software minimum specifications required by the user in an application that is built so that it can work optimally are as follows.

**Table 13.**Analysis Software

No.	Component	Specifications are available	The minimum specifications required
1	Operating system	Windows 7 Ultimate	Windows XP SP2
2	web Browser	Google Chrome	Mozilla Firefox / Google Chrome
3	web Server	-	WAMPserver32 3.1.3
4	database Server	-	MySQL 7.5.21

### 2.2 Hardware Requirements Analysis

Software minimum specifications required by the user in an application that is built so that it can work optimally are as follows.

**Table 14.**Hardware Analysis

No.	Component	Specifications are available	The minimum specifications required
1	processor	Intel Core i3 2.0 GHz	Intel Dual Core 1.60 GHz
2	RAM	4 GB DDR3	512 MB
3	VGA	512 MB	512 MB
4	Hard Drive	500 GB	256 GB
5	monitor	14 "	14 "
6	keyboard	Standard	Standard USB port
7	Mouse	Optical USB Mouse	Optical USB Mouse
8	printer	Canon PIXMA E410	Black and color catridges
9	Connection	Speeds above 1 Mbps	Speeds above 1 Mbps

### 2.3 User analysis

User analysis needed to support systems built according to the needs of the system. Here are the results from the analysis of the required system.

**Table 15.**User analysis

No .	office	Access rights	Level of education	Skill level
1	director	1. See project report 2. Project budget data 3. Seeing the project schedule data	Min. Diploma	Minimal able to operate a computer and can use the web browser

2	Responsible Engineering	1. Managing the risk management 2. See project evaluation data 3. Seeing the job data	Min. Diploma	Minimal able to operate a computer and can use the web browser
3	power Engineering	1. Manage the project budget data 2. Managing the project schedule data 3. Managing the project report data	Min. Diploma	Minimal able to operate a computer and can use the web browser
4	Administration section	1. Managing client data 2. Manage project data 3. Budget data 4. Managing user data 5. Managing master data	Min. Diploma	Minimal able to operate a computer and can use the web browser

## 2.4 Analysis Database

Analysis of the data base is a stage that is used to describe the relationships among the data on project risk management information system. Analysis of the database on the Project Risk Management Information System in PT. PULO DAMAR ABADI will be built using Entity Relationship Diagram (ERD). [7]

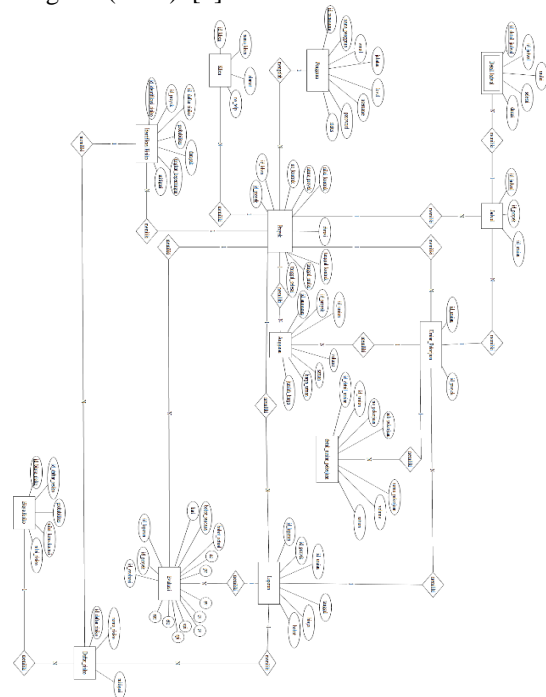


Figure 2.Entity Relationship Diagram

## 2.5 Functional Needs Analysis

Analysis of functional requirements describe the process of activities to be implemented within the system and explain the necessary requirements for the system to run smoothly and according to need. Analysis conducted modeled in structural analysis that will be discussed in the form of data flow Diagram.

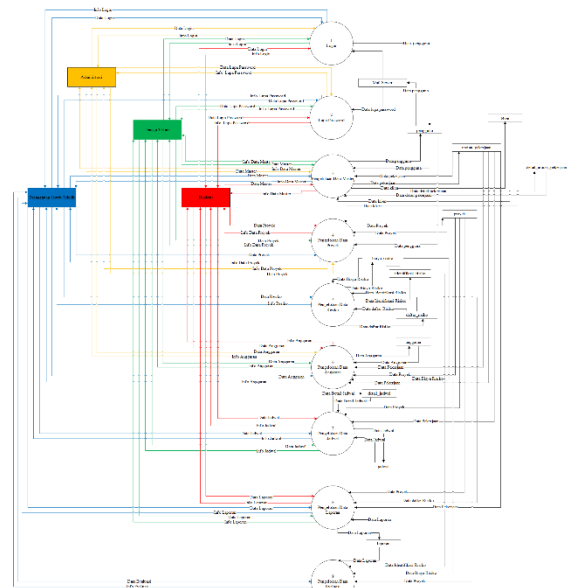


Figure 3.Data Flow Diagrams level 1

## 2.6 System planning

The design was identified as the application system that will have the techniques and principles for the objectives to be achieved, able to provide a system that is easy to use at the time of use as well as adequate from the desired goal. The design is described in the form of a collection of measures which present the information structure, the structure of the program, display characteristics, and details of the procedure.

### 2.6.1 Relationship diagram

Relationship diagrams describe logical relationships between data in the database is complete, including the names and descriptions of all the attributes, record, and limit values for all applications that use the database. [8] Relationship diagrams of Project Risk Management Information System in PT. PULO DAMAR ABADI can be seen in the picture below.

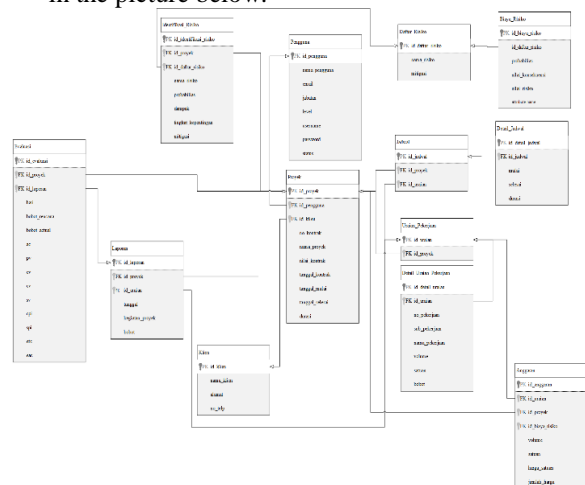


Figure 4.Relationship diagram

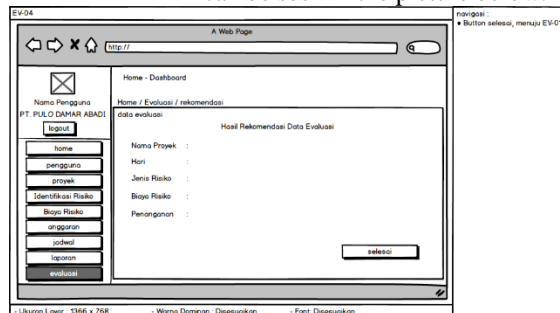
### 2.6.2 designing Interfaces

The design of the interface is made to describe the look of the program that will be used by the user to interact with the system to be built. The design



is based on the interface display both input and output to be generated when the application is implemented.

The design of the interface in the Project Risk Management Information System in PT. PULO DAMAR ABADI can be seen in the picture below.



**Figure 5.**Interface Evaluation Results

## 2.7 examination

System testing was conducted to determine the performance of the system have been made if it meets the requirements at the design stage. Testing the system in this study menggunakan pengujian Blackbox and beta testing (End Users).

### 2.7.1 Blackbox testing

Pengujirhan Black-Box approach is a method of testing in which test data derived from the functional requirements are determined without regard to the structure of the final program. [9]

**Table 16.**Testing Add Data Identification

Cases and Test Results (Data True)			
Data Input	Which are expected	Observation	Conclusion
example input Name of risk: Extra work	Risk identification data Load and save data to the database and then displays the message "Data has been saved".	Identification data can be saved to the database and displays the message "Data has been saved".	[√] received [ ] rejected
Cases and Test Results (Data Empty)			
Data Input	Which are expected	Observation	Conclusion
example input Name of risk:  (Blank risk name column)	The message "Please Fill In This Field."	The message "Please Fill In This Field."	[√] received [ ] rejected

Based on the results of black box testing has been done on the project risk management information system in PT. PULO DAMAR ABADI, has concluded that the system can help the person in charge of engineering in the planning of risk and assist in the oversight of risk.

### 2.7.2 Beta testing

Beta testing is testing conducted objectively where tested directly into the field that the company concerned in the testing requirements of the original purpose of risk management information system development project by PT. PULO DAMAR ABADI. [10]

Based on the answers of the interview with the Administration, Director, Power Engineering, and Responsible Engineering at PT. PULO DAMAR ABADI, that the system has concluded that the

system can help penannggung responsible techniques in risk planning, assisting technicians in the budget, schedule and report on the project, helping the administration in processing user data, client and project data, as well as assisting director in monitoring the implementation of the project.

## 3. CLOSING

### 3.1 Conclusion

Based on the results of research and tests performed on the project risk management information system in PT. PULO DAMAR ABADI, it was concluded as follows:

1. Project risk management information system can generate the interest level of risk and its handling by the planning process so that the risk of helping Responsible Techniques in risk identification risk.
2. Project risk management information system can know the risks that occur based on a functional view evaluation results thus helping Responsible Techniques in risk supervision.

### 3.2 Suggestion

There are suggestions that can be done to add things - things that can complement information systems project risk management going forward. These suggestions are as follows:

1. Project risk management information system can be added workforce management features that help in Charge of Engineering in determining labor on every project.
2. Project risk management information system can be added features to help accelerate project execution Responsible Mechanical aware of the work to be accelerated.
3. Project risk management information system can be added to the project's financial management features making it easier for administration in providing financial information to the Director.

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