

INFORMATION MANAGEMENT SCHEDULING AND PROJECT RISK SYSTEM USING PERT METHOD IN CV PUTRI PARAHİYANGAN

Tommy Djanuar Susanto¹, Sufa'atin²

^{1,2}Teknik Informatika – Universitas Komputer Indonesia

Jl. Dipatiukur 112-114 Bandung

E-mail : Tomy.djanuar8@gmail.com¹, sufaatin@email.unikom.ac.id²

ABSTRACT

CV Putri Parahiyangan is a limited partnership company engaged in the field of construction services. In project implementation very often what is planned does not go according to plan. Several factors responsible for the field have difficulty determining the time prioritized during project implementation. And the project risks do not include the existence of management, this is required by the person in charge of the field to fix the problems that occur because they do not involve the level of importance and calculate the costs that need to be incurred in relation to the problem. Based on the current problems, a project management information system and project risk are needed in the CV. Putri Parahiyangan. Stages to solve the problem using the method Program Evaluation and Riview Teachque (PERT) Program Evaluation and Riview Teachque (PERT) to determine work not late and Expected Monetary Value (EMV) to calculate the cost of losses incurred from each of these risks. Based on the agreed results, the system built is able to show the work that can be done can take precedence and can display new schedule information and help in managing the risks that arise managing and the costs incurred and the expected results on development projects.

Keywords: Project, Scheduling, Risk, Program Evaluation and Riview Teachque, Expected Monetary Value.

1. PENDAHULUAN

CV Putri Parahiyangan is a company engaged in the field of construction services. The company which was established on March 24, 2003 has carried out various construction projects. CV Putri Parahiyagan usually can work on 2-3 projects for a year. Projects undertaken include road construction. CV. Putri Parahiyangan is a company that is still developing, so the projects handled are the result of the appointment of government agencies without going through a tender.

Based on an interview with Mr. Sumarna, as the person in charge of the field, gave up CV Putri Parahiyangan working on a project. in 2018. CV Putri Parahiyangan is working on a road construction project that is a project to improve the Bendungan-Pangsor Road Section which is provided in the western pagaden district. The contract value is Rp 193,654,000.00 (One Hundred Ninety Three Million Six Hundred Fifty Four Thousand Rupiah). Work time starts on August 16 and finishes December 13, 2018, 120 calendar days. Project implementation based on RAB data aims to schedule continuous work for each step of the work. In implementing projects that are often done what needs to be done is not according to plan. Because what happens in a project that has many components of activity involved, the time determined in one of the activities will be carried out by involving the time required for the next activities that follow. The more activities required are not in accordance with the schedule, the total time needed to complete the project will be even greater.

Based on the Risk Report. Errors in estimated costs, delays in materials that are not good or not in accordance with the needs of time and costs incurred must be issued. The company must enter into an agreement with the supplier before purchasing project materials. Resulting in work that delays a schedule delay that is not according to a predetermined schedule. The impact of these losses gives losses to companies that cause financial losses. Additional time to work on the project will be subject to sanctions in the form of fines every day of delay stated in the project contract.

Based on these problems, a solution is needed to answer the questions that often occur in project work in CV Putri Parahiyangan namely a system that helps the person responsible for the field (Technical) in making project schedules using the PERT method (Program Evaluation and Teaching Review). Then in this system issued it will help the person in charge of the field (Technical) so that the need for project risk management and project risk costs are carried out based on the company's ability

to use the EMV (Expected Monetary Value) method. The system to be built, made online so that it can facilitate projects that can be done directly at the project site, to see the project on schedule as well as at a cost of risk.

sesuai jadwal begitupun dengan biaya resikonya.

The development objectives of the Information Management and scheduling system project at CV Putri Parahiyangan are as follows:

1. Help the person in charge in the field determines the schedule of project implementation.
2. Help the person in charge of the field

2. CONTENTS

2.1 Theoretical basis

The theoretical foundation during the discussion of this thesis will discuss the theories related to PERT (Evaluation and Review of Technique Program) and EMV (Expected Monetary Value). At CV Putri Parahiyangan.

2.1.1 Basic Concepts of Information Systems

Information systems can be defined as a system within an organization that is a combination of people, facilities, technology, important communication lines, processes certain types of routine transactions, signals to management and others for important internal and external events and provides an important information base for smart decisions.

2.1.1 Project management

Project management is all the planning, implementation, control and coordination of a project from the beginning (idea) to the end of the project to guarantee the project on time, on cost, and quality [1].

2.1.2 Network Planning

Network Planning is a tool used to design, schedule and link project progress. Network diagram is a method that is considered capable of presenting basic techniques in determining the sequence and timeframe of activities, which in the later stages can be used to estimate the time needed by the project. overall [7].

2.1.3 Project Duration

Project Duration is the amount of time needed to complete all project work. Explain that the factors that influence in determining the duration of work are the volume of work, the work method (construction method), the state of the field, and the skills of the workforce carrying out project work. Project duration is the amount of time the entire project works [3].

2.1.4 Project Duration Program Evaluation and Review Technique (PERT)

Program Evaluation and Review Technique (PERT) is a calculation method that assumes that the

program is carried out many times, so the actual time will make a beta distribution where the optimistic (optimistic time) and pessimistic duration (pessimistic time) are tails (tail). While the most likely duration (interaction time) is the method of the beta distribution. Then it is assumed as a result of the requested average expected to return (t_e) with the following formula [2]. :

Expected time (t_e)

$$t_e = \frac{(a + 4m + b)}{6} \quad (1)$$

t_e = Expected duration

a = Optimistic Time

m = Realistic time

b = Pessimistic time

By using the concept of t_e , the critical path can be defined. In the christian path applies slack = 0

The amount of uncertainty depends on the magnitude of numbers a and b, formulated as follows:

Activity Deviation :

$$S = \frac{1}{6} (b-a) \quad (2)$$

S = Standard deviation of activities

a = Optimistic Time

b = Pessimistic time

For the variance the activities are formulated as follow [2] :

Variant of Activities :

$$V_{t_e} = S^2 = \left[\frac{1}{6} (b-a) \right]^2 \quad (3)$$

$V(t_e)$ = Variant of Activities

S = Standard deviation of activities

a = Optimistic Time

b = Pessimistic time

To find out the possibility of achieving the target schedule can be done by connecting the expected time (TE) with the target T (d) expressed by the formula [2].:

$$Z = \frac{T_d - T_e}{S} \quad (4)$$

Z = The number is likely to reach the target

$T(d)$ = Initial target

TE = Amount of time of critical activity

S = Standard deviation of activities

2.1.5 Metode Expected Monetary Value (EMV)

Expected Monetary Value (EMV) method is an analytical method that calculates future averages that may or may not occur. A positive EMV value indicates an opportunity, while a negative EMV value indicates a threat or threat that can harm the company. EMV is calculated by multiplying the probability value of each risk multiplied by what is incurred [6].

$$EMV = \text{Probability} * \text{The consequences}$$

(5)

Where:

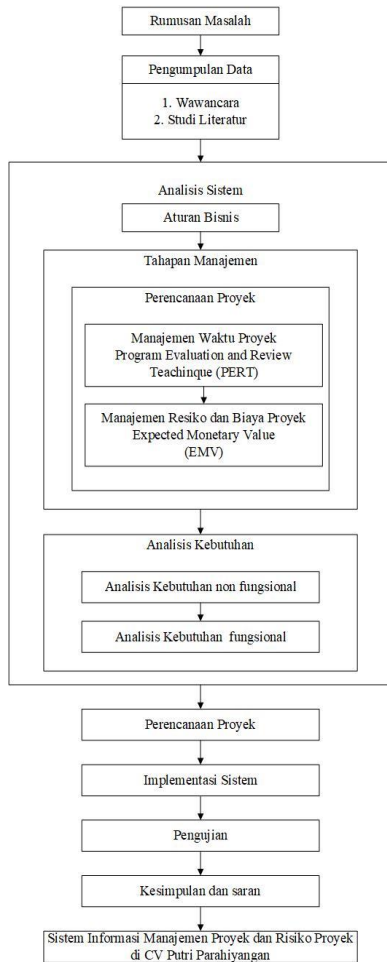
EMV : Expected Monetary Value

Probability : Risk probability value

The consequences : Value of impact risk

2.2 Research methods

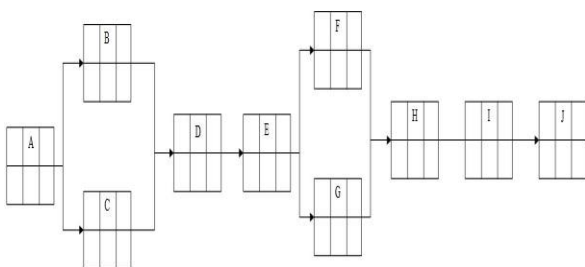
Schematic research methods can be seen in the picture:



Gambar 1. Research Steps

2.2.1 Network Planning

The network for the Improvement of Pangsor Dam Road Section can be seen in the figure:



Gambar 2. Network Planning

2.2.2 Program Evaluation and Review Technique PERT

In PERT the concept of "Probability" is used by giving an estimate of a larger time span of three estimated numbers for activities, optimization time, pessimistic time and the most likely time can be seen in table 1 below:

Tabel 1. Looking for Te and S

Activity	DURATION			te	S
	a	m	b		
A	6	7	8	7	0.33
B	5	7	8	5.5	0.5
C	6	7	9	7.17	0.5
D	3	7	9	6.67	1
E	13	14	15	14	0.33
F	5	7	8	6.83	0.5
G	18	21	22	20.67	0.67
H	13	15	16	14.83	0.5
I	12	14	15	13.83	0.5
J	20	21	22	21	0.33

Information:

a, m, dan b = results of consultations with the person in charge of the field (CV Putri Parahiyangan)

From the estimation results from CV Putri Parahiyangan above, the results obtained from variants and standard deviations can be seen in table 2

Tabel 2. Activity Deviation Standards

No	Aktivitas Pekerjaan	S	V(te)
1	Field Offices & Project Nameplates	0.33	0.11
2	Field Survey Work (Measurement)	0.5	0.25
3	Quality Control	0.5	0.25
4	As Built Drawing	1	1
5	Mobilization and Demobilization	0.33	0.11
6	Liquid Class A Aggregate Base Layer (leveling)	0.5	0.25
7	Liquid Asphalt Enhancer-Patching (Patching) Coating	0.67	0.44
8	Emulsion Asphalt-Adhesive Coating	0.5	0.25
9	Foundation layer / Grader Penetration Macadam tb 5.5 cm	0.5	0.25
10	Laston Lapis Aus (AC-BC)	0.33	0.11
$\sum V(te)$			3.02
S			5.16

Based on the results from the table it is known that the total value of variance ($\sum V(te)$) = 3.02 and standard deviation (s) = 5.16. the likelihood

/ uncertainty of the work in accordance with the deadline is expressed as the value of z.

Z = time limit - time period which is expected) / project standard deviation

$$Z = (120-105)/5.16 = 3$$

The results based on the normal distribution table, the value of z = 3 shows the number "probability" of 0.4987 or 49%, this shows that the probability (probability) of the project completed in the 105-day time target of 49%.

2.2.3 Risk Identification

The risk management process begins with the identification of risks aimed at identifying and listing risks that will emerge. The process of risk identification is done by direct interview with the person in charge in the CV. Putri Parahiyangan. The following identification results can be seen in the table .

Tabel 3 Risk Identification

No	Risk type	Risk Variable
1	Eksternal	Late delivery of goods
2		There was a natural disaster
3		Property damage / damage
4		Changes to regulations
5		Protests from certain organizations
6	Personal	A less skilled workforce
7		Workers who are unable to attend
8	Keselamatan Kerja	Accident
9	Estimasi	Increase in material prices
10		The level of work difficulty that was not predicted beforehand
11		Estimated costs that are not according to plan
12		Rise in fuel prices
13		Repetition of work

2.2.4 Determine Risk Costs

Assessment of the probabilities and consequences obtained by discussing with the director at CV. Putri Parahiyangan interview results can be seen in the following table showing the value of probability and consequences. Table.

Tabel 4 Percentage Probability

Probability	Value	information
Very Low	1-20	It rarely happens, only under certain

		conditions
Low	21-40	Sometimes at certain times
Moderate	41-60	Occur under certain conditions
High	61-81	Often occurs in certain conditions

Use of a risk code to make it easier to set the stage. Probability values are obtained from interviews or discussions with the director, where the probability is obtained from his experience while handling projects in the company.

Tabel 5 Probability

No	Risk Description	Probability(%)
1	Late delivery of goods	30
2	There was a natural disaster	20
3	Property damage / damage	15
4	Changes to regulations	15
5	Protests from certain organizations	65
6	A less skilled workforce	15
7	Workers who are unable to attend	15
8	Accident	15
9	Increase in material prices	45
10	The level of work difficulty that was not predicted beforehand	15
11	Estimated costs that are not according to plan	25
12	Rise in fuel prices	25
13	Repetition of work	15

Consequence value is obtained by interview. The value of this consequence is the cost plan that the company must incur for each risk

Tabel 6 Consequences

No	Risk Description	Consequences i
1	R1	(-2.500.000,00)
2	R2	(-15.000.000,00)
3	R3	(-5.500.000,00)
4	R4	(-2.000.000,00)
5	R5	(-2.500.000,00)
6	R6	(-1.750.000,00)
7	R7	(-2.500.000,00)
8	R8	(-6.500.000,00)
9	R9	(-10.000.000,00)
10	R10	(-5.000.000,00)
11	R11	(-15.000.000,00)

12	R12	(-750.000,00)
13	R13	(-64.551.000,00)

After the probability and consequence values have been obtained, each risk is calculated using EMV

Tabel 7 EMV calculation

No	Risk Code	Consequences	EMV
1	R1	(-2.500.000,00)	Rp.- 750.000,00
2	R2	(-15.000.000,00)	Rp.- 300.000,00
3	R3	(-5.500.000,00)	Rp.- 825.000,00
4	R4	(-2.000.000,00)	Rp.- 300.000,00
5	R5	(-2.500.000,00)	Rp.- 1.625.000,00
6	R6	(-1.750.000,00)	Rp.- 262.500,00
7	R7	(-2.500.000,00)	Rp.- 375.000,00
8	R8	(-6.500.000,00)	Rp.- 975.000,00
9	R9	(-10.000.000,00)	Rp.-4.5000,00
10	R10	(-5.000.000,00)	Rp.- 750.000,00
11	R11	(-15.000.000,00)	Rp.- 3.750.000,00
12	R12	(-750.000,00)	Rp. - 187.000,00
13	R13	(64.551.000,00)	Rp.- 9.682.650,00

Based on the results of calculations in table 7, it can be estimated the value of each risk. Therefore, the company must spend such amount if one of the expenses appears when the project is running. The costs used to remove these risks are required from the company's backup costs that must be incurred by the company must allocate funds to save if one of the problems occurs.

2.2.4 Determine Risk Costs

The interview conducted was to discuss any Risk Management of the project that was carried out. The following are the results of interviews and discussions with Ms. Fitri Hendayani as Director in CV. Putri Parahiyangan.

Tabel 8 Risk Management

No	Variabel Risiko	Penanganan
1	Late delivery of goods	Enter into an agreement with the supplier if there is a delay then the supplier is willing to fulfill the sanctions of the agreement made.

2	There was a natural disaster	Make an agreement there
3	Property damage / damage	Conduct discussions with certain communities or organizations
4	Changes to regulations	Give direction to prioritize safety at work
5	Protests from certain organizations	Setting up unexpected costs to add to costs.
6	A less skilled workforce	Enter into price agreements with suppliers.
7	Workers who are unable to attend	Keep working because it has entered into a contract and improve supporting tools and labor
8	Accident	Continue to work by prioritizing safety and pursuing delays with labor / work hours
9	Increase in material prices	Check every work that has been completed.
10	The level of work difficulty that was not predicted beforehand	Conduct research and analysis when there is an increase in fuel prices
11	Estimated costs that are not according to plan	Conduct research and coaching of the workforce
12	Rise in fuel prices	Improve supervision and responsibility
13	Repetition of work	Increase the work hours of existing workers to catch up on delays.

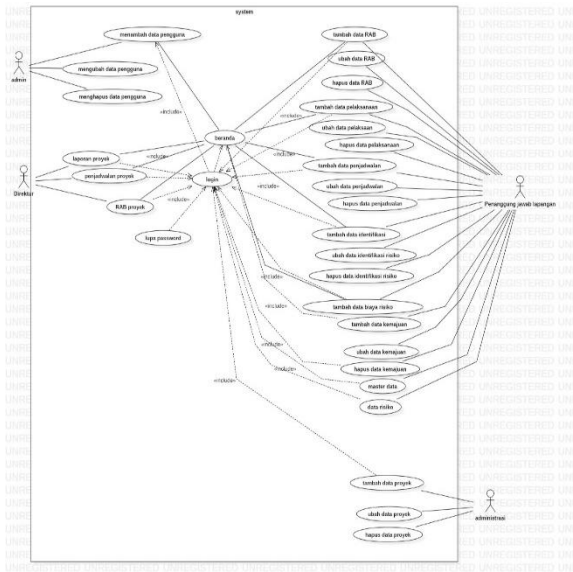
2.3 A System Analysis and Design

The analysis is performed on all components of the system that is being used and needed in the construction of an information system.

2.3.1 Use Case Diagram

Use Case Diagrams illustrate interaction modeling for the behavior of the system to be built. The following is a case diagram used by the Project Time and Risk Management Information System in CV. Putri Parahiyangan in the picture

and Risk Management Information System in CV. Putri Parahiyangan in the picture as follows:



Gambar 3. Use case Diagram

Use Case Diagrams illustrate interaction modeling for the behavior of the system to be built. The following is a case diagram used by the Project Time and Risk Management Information System in CV. Putri Parahiyangan in the picture

Tabel 9. Access rights

No	Position	Access rights
1	Admin	Manage guard data (Add, change, delete) Manage Project data (add, change, delete)
2	Direktur	See Schedule data Looking at RAB Manage project evaluation data (view, proofread) Risk management
3	Penanggung jawab lapangan	Make RAB Manage scheduling data (add, change, delete) Manage Progress (add, change, delete)
4	Penanggung jawab Administrasi	Create project data (add, edit, delete)

2.3.2 Use cae Scenario

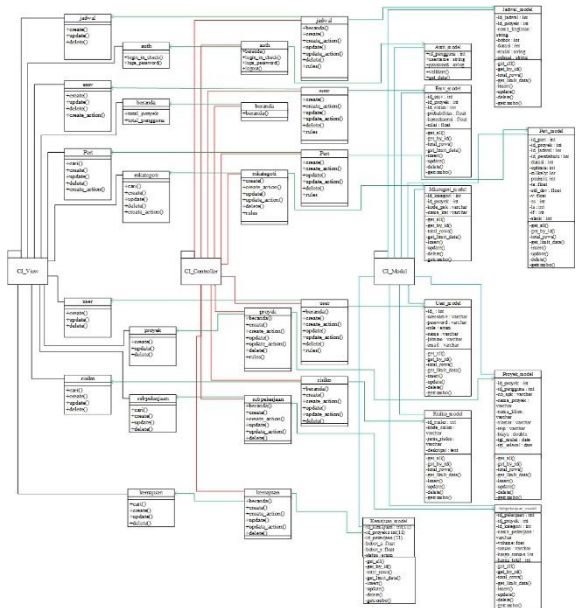
Use the Scenario case to see how to use a system where each scenario illustrates from the standpoint of actors acting with the system in various ways. Use case scenarios. The Project Time

Use Case Name	Login
Related Requirements	SKPL-F-01
Goal in Context	Pengguna mencoba masuk ke halaman utama sistem
Preconditions	Menampilkan halaman login, aktor belum melakukan login
Successful Condition	Pengguna dapat masuk ke halaman beranda
Failed End Condition	Pengguna tidak dapat login
Actors	Direktur, Penanggung jawab Lapangan, Admin
Trigger	Pengguna membuka web sistem
Main Flow	Step Action
	1 Pengguna membuka web sistem
	2 Sistem menampilkan halaman login
	3 Pengguna memasukkan username dan password
	4 Pengguna menekan tombol login
	5 Sistem melakukan validasi
	6 Sistem menampilkan halaman beranda
Extensions	Step Branching Action
	5.1 Jika username dan password salah, maka sistem akan menampilkan pesan kesalahan.

Gambar 4. Use case Scenario

2.3.3 Diagram Class

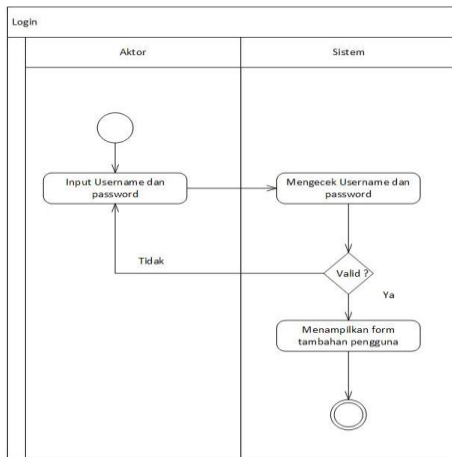
Class Diagram illustrates the system in terms of class-defining system diagrams. The following is a diagram of a project scheduling and risk management information system in CV. Putri Parahiyangan.



Gambar 5. Class Diagram

2.3.4 Activity Diagram

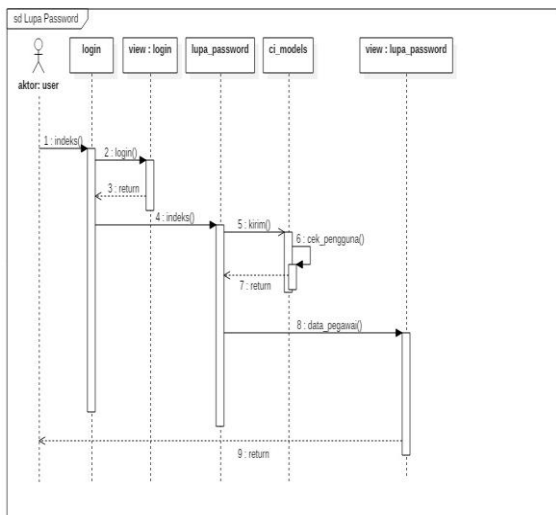
Activity diagram Work flow diagram (work flow) or the activity of a system



Gambar 6. Activity Diagram

2.3.5 Sequence Diagram

Sequence diagram can be seen in the picture below



Gambar 7. Sequence Diagram

2.3.5 Interface Design

Interface design is made to display programs on the system that will be used by users to facilitate with sistem yang akan di bangun [5].

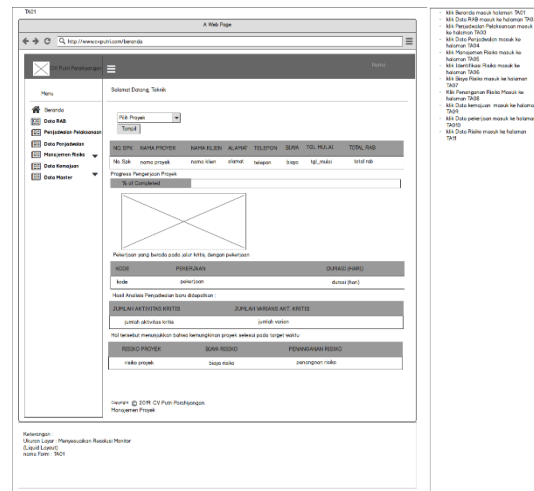
Berikut adalah contoh perancangan antarmuka

2.4 System Implementation and Testing

Implementation of the system is the result of the application of system analysis and design.

2.4.1 Interface Implementation

The interface implementation is a display from the interface on the system being built. The interface implementation can be seen in.



NO	PEKERJAAN	MAMA PERBELAJAN	TANGGAL MULAI	TANGGAL SELESAI	DURASI	ACTIONS
1	Pertambangan Rusa Jalar-Bendungan/Pengro	0-700k Aca	2019-03-16	2019-08-22	6	?
2	Pertambangan Rusa Jalar-Bendungan/Pengro	Konstruksi Laporan & Papan Nama Proyek	2019-01-01	2019-07-10	7	?
3	Pertambangan Rusa Jalar-Bendungan/Pengro	0-Praktek (Sistem, Laporan, Pengukuran)	2019-03-01	2019-08-09	7	?
4	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Managemen Mutu (Quality Control)	2019-03-16	2019-08-13	7	?
5	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Dokumen Rekrutan 4014 (K&R&C Drawing)	2019-03-16	2019-08-22	7	?
6	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Studi dan dan Cermat hasil	2019-03-16	2019-08-22	14	?
7	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Laporan Perencanaan Anggaran (K&R&C)	2019-03-22	2019-08-29	7	?
8	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Laporan Rancangan Penyelidikan Aktual (Can Pre-Prod)	2019-03-22	2019-08-29	21	?
9	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Laporan Penelitian Aktual (Evaluasi)	2019-03-17	2019-08-29	15	?
10	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Laporan Perencanaan Perencanaan (K&R&C)	2019-03-22	2019-08-29	14	?
11	Pertambangan Rusa Jalar-Bendungan/Pengro	0- Laporan Aktual (K&R&C)	2019-03-02	2019-08-10	21	?

Gambar 7. display technique
Gambar 8. Implementasi Antarmuka Teknik

2.4.2 System Testing

System testing is the most important thing which aims to find errors or deficiencies in the system being tested. Testing intends to find out the system that has been made to meet performance in accordance with the design goals [4].

1. Functional Testing

Black box testing is approved on the functional testing requirements of the software / information system built.

2. End User Testing

Testing is focused on user acceptance (end users) using Beta testing

3. closing

In this section, explaining the conclusions that contain the results obtained after the analysis, design, and implementation of the design of software that was built and has been developed and suggestions that will provide notes for previous software development.

3.1 Conclusion

Based on the results obtained in this thesis research, the following conclusions can be drawn:

1. The information system is built to help the person in charge of the field (Engineering) in carrying out project scheduling to determine the focus of work and pathways of the fastest and fastest so that it knows which work can be postponed and cannot be delayed to minimize the occurrence of delays
2. The information system that is built can help the person in charge of the field (Engineering) in recording risks so that risks that have a negative impact can be dealt with immediately.

3.2 Suggestion

Based on the results of tests that have been carried out on the project management information system and project risks in the CV. Putri Parahiyangan, obtained suggestions that can be taken into consideration, the system that has been built plus the interface for work data per job category to make it easier to read job structure data
Based on the results of tests that have been carried out on the project management information system and project risks in the CV. Putri Parahiyangan, obtained suggestions that can be taken into consideration, the system that has been built plus the interface for work data per job category to make it easier to read job structure data

BIBLIOGRAPHY

- [1] W. I. Evianto, *Manajemen Proyek*, Yogyakarta: CV Andi Offset, 2002.
- [2] A. Hayun, ""Perencanaan dan pengendalian Proyek dengan metode PERT dan CPM," Journal The winner , vol. 6 , no. 155-174, 2005.
- [3] L. d. F. Maharany, "Analisis Optimasi Percepatan Durasi Proyek dengan Metode Last Cost Analysis," *Ultitas*, vol. 14, no. 1, pp. 113-130, 2006.
- [4] V. Williams, "Testing for Performance in the Systems Development Life Cycle," 2005.
- [5] G. T. M. Maryadi Aris Munandar, "SISTEM INFORMASI MANAJEMEN PROYEK PADA PT. EXCELLENT INFOTAMA KREASINDO," no. 1, pp. 1-10.
- [6] G. C. S. P. L. M, *Pengantar Evaluasi Proyek*, Jakarta: Gramedia Pustaka Utama, 2007.
- [7] G. T. Mardiani, "SISTEM MONITORING DATA ASET DAN INVENTARIS," *Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)*, vol. Vol. 2.
- [8] G. T. M. S. M. Ilham Nurroni, "SISTEM INFORMASI MANAJEMEN PROYEK CV. BAHARI UTAMA," no. 1, pp. 1-8.
- [9] H. Sitohang, "IMPLEMENTASI HOME AUTOMATION BERBASIS WEB PADA KONTROL DAN SERVER RASPBERRY PI," *e-Proceeding of Applied*, vol. vol 1, p. 756, 2015.
- [10] Simarmata, *Rekayasa Perangkat Lunak*, Yogyakarta: Andi, 2010.