PROJECT MANAGEMENT INFORMATION SYSTEM AT CV. DEFA PUTRA

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ABSTRACT

CV. DEFA PUTRA is a company engaged in construction service. From several previous tenant there are problems that are cause by several factors, such as scheduling that is carried out only refers to activities in the budget plan without knowing the relationship between work and critical work, the absence of risk recording and identification at the beginning and the handling solution is also one of the factors that can create problems in project implementation, and cost control only compares the actual costs and cost of the plan without comparing the progress or achievement of the work that already done. Based on existing problems, a project management information system is needed at CV. DEFA PUTRA. The aim is to be able to assist in identifying linkages between jobs and identifying critical jobs by using the Critical Path Method so that any work that cannot be delayed is known, to assist in managing and identifying risks before the project is implemented using Probability Impact Matrix, and assist in controlling project costs and time using Earned Value Management so that it can be easily known with certainty that the work has been completed 100%. Based on the test results it can be concluded that this project management information system has helped in scheduling by displaying work that is on the critical path to make it easier to know what jobs cannot be delayed, assist in identifying risks by showing the impact, possibilities, level of risk and how to handle it, and assist in controlling project costs and time by displaying tables of calculation results based on project plan data and project report data that have been previously inputted.

Keyword: Project Management, Information System, Critical Path Method, Earned Value Management, Probabbility Impact Matrix

1. INTRODUCTION

CV. DEFA PUTRA is a provider of construction services in the city of Serang.

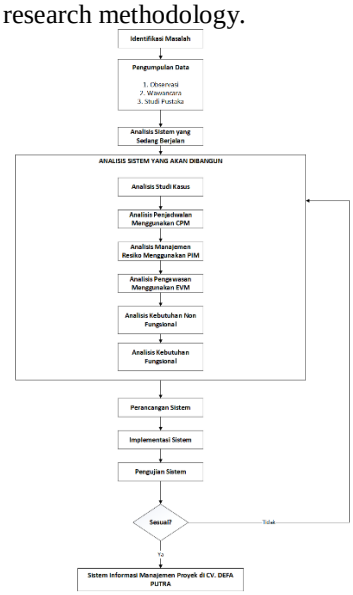
Based on the interview with Mr. Fahmi Apriansyah Company as Responsible Technical CV. DEFA PUTRA, scheduling is done only refers to activities that are on a budget plan by undetected linkages between work and critical work so that this can cause delays if the job is on the critical path delays and will result in excess costs caused by the delay of execution project for 2 days because of rain and absence of one worker so that technical managers need to add workers to the overall project timeline is not more than planned. But apart from that, the absence of registration and identification of risk at the beginning as well as the handling solutions has also become one of the factors that makes the delay in the handling of these problems. In addition, cost control is done simply comparing the actual costs and plan costs without comparing progress or achievement of the work already done, it makes it difficult to know the status of the work already completed 100% with the status of unfinished work 100%. Problems like this will certainly cause a discrepancy between the actual budget which has been issued with a planned budget, as well as the processing time will be growing and causing delays in the completion of project work. this makes it difficult to know the status of the work already completed 100% with the status of unfinished work 100%. Problems like this will certainly cause a discrepancy between the actual budget which has been issued with a planned budget, as well as the processing time will be growing and causing delays in the completion of project work. this makes it difficult to know the status of the work already completed 100% with the status of unfinished work 100%. Problems like this will certainly cause a discrepancy between the actual budget which has been issued with a planned budget, as well as the processing time will be growing and causing delays in the completion of project work.

Based on these problems, solutions are needed to address the issues raised in the CV. DEFA PUTRA, namely the need for a system that can petrify technical manager in scheduling so it can be a critical job and attachment between jobs, can identify risks before projects are carried out, and can control the time and cost to make it easier to know the work that has been completed. The system will be built to be accessible wherever the user is located. Thus it will be built a web-based information system for project management which is expected to help the problems in the project CV. DEFA PUTRA.

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

Analysis of project planning and scheduling analysis contains risk identification at Moderate Rehabilitation Project Office Buildings SMPN 1 Waringinkurung.

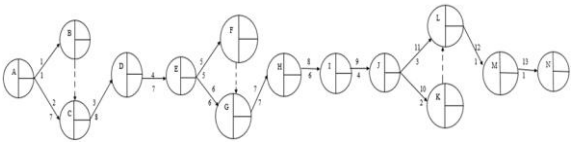
2.2.1 Analysis of Project Scheduling (Critical Path Method)

CPM (Critical Path Method) is a management technique that can be used to find the fastest track on every activity or project work [1],

Table 1 Project activities

activity	Event Codes	predecessor activity	Duration (days)
Pek. Nameplate jobs	1	-	1 day
Dismantled Work	2	-	7 days
Pek. Plastering	3	2	8 days
Pek. acian	4	3	7 days
Pek. Door frame	5	4	5 days
Pek. Windows frame	6	4	6 days
Pek. Sawhorse	7	5.6	7 days
Pek. Roof truss	8	7	6 days
Pek. ceiling	9	8	4 days
ceiling Painting	10	9	2 days
Painting walls	11	9	3 days
Fitting Sockets, switches and lights	12	11	1 day
Cleaning	13	12	1 day

Based on a series of activities in the project Moderate Rehabilitation Office building SMPN 1 Waringinkurung, the following can be illustrated in the diagram network.



Picture 2 Diagram Network

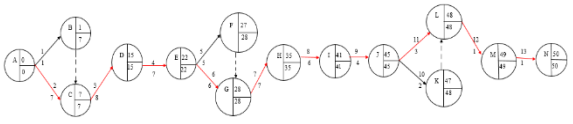
Use advanced calculation and countdown to indicate when the method CPM [1],

Here is a recapitulation of the calculation of the CPM.

Table 2 Calculation Results recapitulation Network

Activities / Events	Duration (days)	IC E	E F	L S	L F	T F	Status
1	1 day	0	1	0	7	6	not Critical
2	7 days	0	7	0	7	0	Critical
3	8 days	7	15	7	15	0	Critical
4	7 days	15	22	15	22	0	Critical
5	5 days	22	27	22	28	1	not Critical
6	6 days	22	28	22	28	0	Critical
7	7 days	28	35	28	35	0	Critical
8	6 days	35	41	35	41	0	Critical
9	4 days	41	45	41	45	0	Critical
10	2 days	45	47	45	48	1	not Critical
11	3 days	45	48	45	48	0	Critical
12	1 day	48	49	48	49	0	Critical
13	1 day	49	50	49	50	0	Critical

Recapitulation of the table, it can be seen for jobs that are on the critical path is a job that has a total value of float equal to 0. Here are the calculations that have been changed into a network diagram.



Picture 3 CPM Network Diagram with Critical Path

2.2.2 Risk Management Analysis (Probability Impact Matrix)

In the process of risk management analysis has several stages to identify risks, determine the value of

probability, impact risks will occur, as well as the handling of such risks[2],

2.2.2.1 Risk identification

The risk management process begins with the identification of risks aimed at identifying and making a list of possible risks [2],

Table 3 Risk identification

No.	Risk	Risk Codes
1	**Risk Tools and Materials**	
1.1	Lost tools or materials	R1
1.2	damage tool	R2
1.3	Delay Delivery of materials	R3
2	**External Risks**	
2.1	Unexpected ground conditions	R4
2.2	The weather was very bad	R5
2.3	Security problems at the project site	R6
2.4	Material price increase	R7
3	**Labor Risk**	
3.1	workers sick	R8
3.2	Technical implementation was unable to attend	R9
3.3	Labor accidents	R10
4	**Operational risk**	
4.1	rework	R11

2.2.2.2 Determining the Value Likelihood and Impact

Furthermore, the risk will be assessed to provide the scale value using a Boston Square Matrix [2].

Table 4 Boston Square Matrix

Possibility						
	Very high	5	10	15	20	25
	High	4	8	12	16	20
	moderate	3	6	9	12	15
	Low	2	4	6	8	10
	Very Low	1	2	3	4	5
		Very low	Low	moderate	High	Very high
		Impact				

Criteria for the impact assessment and the measurement of probability can be seen in the following table.

Table 5 Due Assessment Criteria / Impact

Value	appraisal	Result / Impact
1	Very low (Slight)	No significant impact is felt, does not affect the duration of the work.
2	Low (Minor)	Necessary treatment on the spot, the delay duration of the work need to increase the duration of the work.
3	Medium (Significant)	Need to be addressed by the Technical Executive, delay significant duration.
4	High (Severe)	Adangan significant time delays, productivity decreases.
5	Very High (Major)	Error impact on other processes, need handling by personnel in charge of Technical, and the addition of a significant duration of the work.

Table 6 measurement Probability

Value	Parameter	Possibility
1	Very Low (Slight)	Occurs rarely, only in certain circumstances.
2	Low (Minor)	Sometimes occur in certain circumstances.
3	Medium (Significant)	Can occur in certain circumstances.
4	High (Severe)	Occur in certain circumstances.
5	Very High (Major)	Often occurs in certain conditions.

Boston matrix based on the assessment of any chance of risk and the impact made on the scale is 1 to 25 as described in the following table[2],

Table 7 Scale Level of Risk

Scale	value Risk
1-5	Low
6-14	moderate
15-25	High

The determination of the likelihood and impact of risk based decisions Responsible Technical CV. DEFA PUTRA appropriate to the risks common in the previous building rehabilitation projects.

Table 8 Results and Impact Analysis and Possible Values

No.	Risk	Risk Codes	Possibility	Impact
1	**Risk Tools and Materials**			
1.1	Lost tools or materials	R1	2	2
1.2	damage tool	R2	2	2
1.3	Delay Delivery of materials	R3	4	4
2	**External Risks**			
2.1	Unexpected ground conditions	R4	2	2
2.2	The weather was very bad	R5	3	3
2.3	Security problems at the project site	R6	3	3
2.4	Material price increase	R7	5	5
3	**Labor Risk**			
3.1	workers sick	R8	2	2
3.2	Technical implementation was unable to attend	R9	2	3

3.3	Labor accidents	R10	4	4
4	**Operational risk**			
4.1	rework	R11	5	5

2.2.2.3 Interests MenentukanTingkat Risk

Once the value of the probability and impact of risk is determined, then the risk of interest rate calculation is done using Probability Impact Matrix [2].

Table 9 Interest rate Risk Calculation Results

No.	Risk Codes	Possibility	Impact	Importance of Risk
1	R1	2	2	4
2	R2	2	2	4
3	R3	4	4	16
4	R4	2	2	4
5	R5	3	3	9
6	R6	3	3	9
7	R7	5	5	25
8	R8	2	2	4
9	R9	2	3	6
10	R10	4	4	16
11	R11	5	5	25

Based on the results of the calculation of the importance level of risk, then the risk will be created matrix. Risk matrix is a matrix to find the scale of low medium and high risk.

Table 10 Risk Matrix Generated from Calculation

No.	Risk	Risk Codes	Importance	Risk level
1	**Risk Tools and Materials**			
1.1	Lost tools or materials	R1	4	Low
1.2	damage tool	R2	4	Low
1.3	Delay Delivery of materials	R3	16	High
2	**External Risks**			
2.1	Unexpected ground conditions	R4	4	Low
2.2	The weather was very bad	R5	9	moderate
2.3	Security problems at the project site	R6	9	moderate
2.4	Material price increase	R7	25	High
3	**Labor Risk**			
3.1	workers sick	R8	4	Low
3.2	Technical implementation was unable to attend	R9	6	moderate
3.3	Labor accidents	R10	16	High
4	**Operational risk**			
4.1	rework	R11	25	High

1.1.1.4handling Risk

Based on the results of risk assessment of importance, then it will do the handling of risk mitigation or risk control measures by undertaking Technical.

Table 11 Risk control

Risk Codes	Risk level	Risk Management Measures
R1	Low	Looking for a rental place other device with a comparison price can not exceed the budget.
R2	Low	Returns immediately leased goods to be replaced with a functioning goods
R3	High	Doing good communication with suppliers.
R4	Low	Conducting research proper ground.
R5	moderate	Following an accurate weather report, including the weather on the implementation of the project.
R6	moderate	Perform security protection when the project
R7	High	Doing agreement price to the supplier.
R8	Low	Replace with other workers.
R9	moderate	Technical Implementation Expert pick one that has been trusted to take his place and always in coordination with the Technical Implementation in what would be done.
R10	High	Directing the workers to prioritize safety.
R11	High	Always double-check the work that has been done.

By identifying the project planning, technical managers can help in preparing the handling of the risks in fear will arise when projects are being implemented so that it can quickly deal with problems that occur in the implementation of the project.

2.3 Analysis of Project Cost Control (Earned Value Management)

Contains project control analysis stage to assist in evaluating the project to control costs and project time. Control project using Earned Value Management[3].

2.3.1 Weight Calculation Jobs

To be able to evaluate the project, the first thing to do is to calculate the weight of each job [3].

Table 12 Weight Calculation Jobs

No.	Name of activity	Work Price (USD)	Weight (%)
1	Pek. Nameplate jobs	200,000.00	0.25
2	Dismantled Work	3,200,000.00	3.96
3	Pek. Plastering	1,343,366.64	1.66
4	Pek. acian	1,343,366.64	1.66
5	Pek. Door frame	6,842,149.90	8,46

6	Pek. Windows frame	3,238,199.58	4.00
7	Pek. Sawhorse	2,123,525.80	2,63
8	Pek. Roof truss	14,631,628.49	18.10
9	Pek. ceiling	18,892,005.46	23,36
10	ceiling Painting	9,107,754.53	11.26
11	Painting walls	14,713,900.27	18,19
12	Fitting Sockets, switches and lights	4,983,600.00	6.16
13	Cleaning	250,000.00	0.31
TOTAL		**80,869,447.31**	**100**

2.3.2 Analysis of Project Evaluation

Analysis of project evaluation contains a calculation to find the value of Planned Value (PV), Earned Value (EV), Actual Cost (AC), Cost Variance (CV), Scheduling Variance (SV), Schedule Performance Index (SPI), Cost Performance Index (CPI), Estimate at Completion (EAC) and the Estimate to Complete (ETC) [3].

Table 13 Weight Plan Works

Period	weights Plan	Total	Job description
Week 1	0.25%	4.21%	Pek. Nameplate jobs
	3.96%		Pek. Dismantled
Week 2	0.83%	0.83%	Pek. Plastering
Week 3	0.83%	1.66%	Pek. Plastering
	0.83%		Pek. acian
Week 4	0.83%	13.29%	Pek. acian
	8.46%		Pek. Door frame
	4.00%		Pek. Windows frame
Week 5	2.63%	2.63%	Pek. Sawhorse
Week 6	18.10%	29.78%	Pek. Roof truss
	11.68%		Pek. ceiling
Week 7	11.68%	47.29%	Pek. ceiling
	11.26%		ceiling Painting
	18.19%		Painting walls
	6.16%		Fitting Sockets, switches and lights
Week 8	0.31%	0.31%	Cleaning

Table 14 Weights Project Implementation Progress

Period	weights Plan	percentage of Implementation	weights Implementation	Job description
Week 1	4.21%	100%	4.21%	Nameplate jobs
				Dismantled
Week 2	0.83%	100%	0.83%	stucco wall
Week 3	1.66%	100%	1.66%	stucco wall
				acian
Week 4	13.29 %	100%	13.29%	acian
				Door frame
				Windows frame
Week 5	2.63%	100%	2.63%	Sawhorse
Week 6	29.78 %	100%	29.78%	Roof truss
				ceiling
Week 7	47.29 %	100%	47.29%	ceiling
				ceiling Painting
				Painting walls
				Fitting Sockets, switches and lights
Week 8	0.31%	100%	0.31%	Cleaning

From the table plan weight work and the weight of the progress of the project can be calculated the value of Planned Value (PV), Earned Value (EV), Actual Cost (AC), Cost Variance (CV), Scheduling Variance (SV), Schedule Performance Index (SPI), cost Performance Index (CPI), Estimate at Completion (EAC) and the Estimate to Complete (ETC), which can be seen in the following table.

Table 15 Recapitulation in Calculating Earned Value Management

Period	variant analysis		performance analysis		Estimates analysis	
	SV time	Cost CV	SPI time	Cost CPI	time ETC	Cost EAC
Week 1	Rp. 0	Rp. 0,00	1.00	1.00	50 days	Rp. 80,869,447.31
Week 2	Rp. 0	Rp. 21651.82	1.00	1.03	50 days	Rp. 78,262,485.39
Week 3	Rp. 0	Rp43.366,64	1.00	1.03	50 days	Rp. 78,258,815.11
Week 4	Rp. 0	Rp. 252,032.80	1.00	1.02	50 days	Rp. 78,973,828.72
Week 5	Rp. 0	Rp. 23525.80	1.00	1.01	50 days	Rp. 79,973,522.97
Week 6	Rp. 0	−Rp. 522,368.78	1.00	0.97	50 days	Rp. 82,623,925.32
Week 7	Rp. 0	Rp. 1257.53	1.00	1.00	50 days	Rp. 80,866,788.68
Week 8	Rp. 0	Rp. 0,00	1.00	1.00	50 days	Rp. 80,869,447.31

Based on the recapitulation of project performance using EVM, it was concluded as follows:

Total Time Plan = 50 days

Total Time Actual = 50 days
BAC = 80,869,447.31
PV = 80,869,447.31
air conditioning = 81,050,000.00
CV = - 180,534.19
Estimated time remaining
completion time = 50-50 = 0 days
Estimated time remaining
settlement costs = 80,869,447.31 to 81,050,000.00 = -180,534.19

In the rehabilitation project being SMPN 1 Waringinkurung office buildings have remaining time for 0 days, this means that the overall project timeline according to planned. For the remainder of the project's completion cost is Rp - 180,534.19, meaning that the cost of completion of the project exceeds the cost that has been planned. This cost overrun occurred on the sixth week of the project.

2.4 Analysis of User Needs

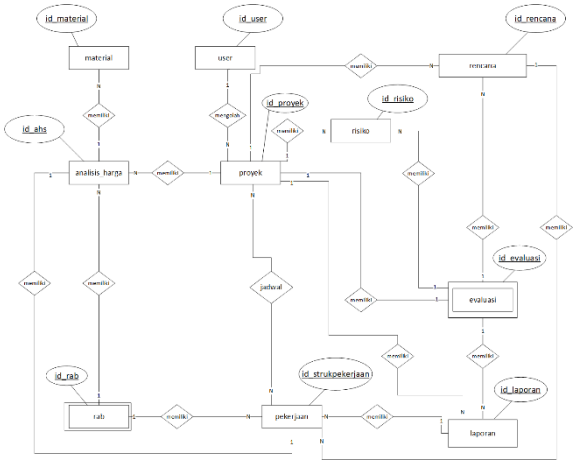
Analysis required users are users who will use the system. Here is an analysis of user needs.

Table 16 User Analysis Required

users	Access rights	Skill level
Responsible Technical	a. Manage project data b. Managing the unit price data c. Manage data RAB d. Managing scheduling data e. Managing risk data f. Managing jobs data g. Manage your data weekly plan h. Manage the data evaluation	Understanding the use of web-based applications and understand the Project Report
Technical Implementation	a. View project data b. Manage weekly report c. Looking at the data evaluation	Understanding the use of web-based applications and understand the input of project reports.
Implementing Administration and Finance	a. View project data b. Managing material data c. Looking at the data evaluation	Understanding the use of web-based applications and understand the input of project reports.

2.5 Analysis Database

Analysis of the database is the analysis stage to describe the desired system in the form of relations between the entities involved in the project management information system in CV. DEFA PUTRA.



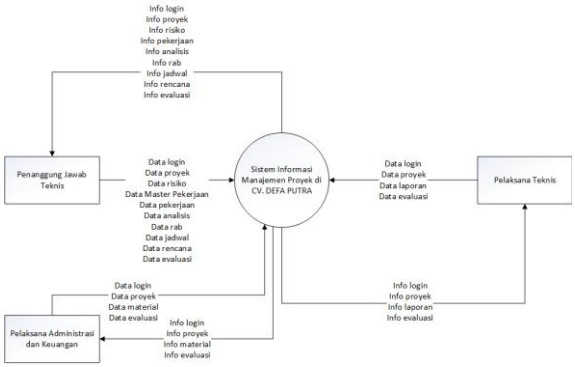
Picture 4 Entity Relational Diagram

Table 17 Description Attributes Entities In ERD

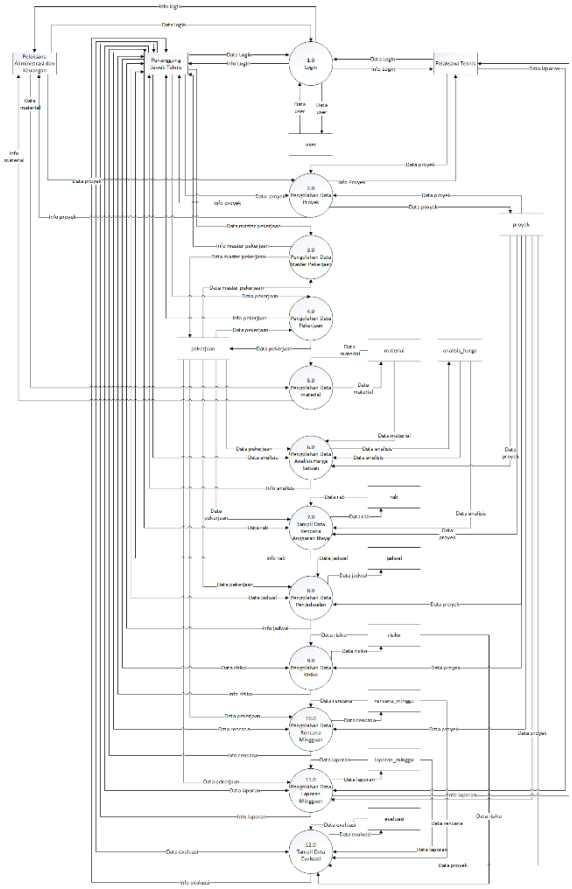
No	Nama Entitas	Atribut
1	user	id_user, *user*name, nama, password, user_level, status
2	proyek	id_proyek, klien_proyek, no_kontrak, nama_proyek, nilai_kontrak, tanggal_kontrak, tanggal_mulai, tanggal_selesai, durasi, deskripsi, durasi, status
3	pekerjaan	id_strukpekerjaan, no_kerjaan, sub_pekerjaan, nama_pekerjaan, volume, satuan, ket
4	material	id_material, nama_material, satuan, harga
5	analisis_harga	id_ahs, nama_analisa, volume, satuan, keterangan, total
6	rab	id_rab, harga_satuan, jumlah_harga
7	jadwal	mulai, selesai, durasi, es, ef, ls, lf, tf
8	risiko	id_risiko, nama_risiko, tingkat, nilai_dampak, dampak, nilai_kemungkinan, kemungkinan, level, mitigasi
9	rencana	id_rencana, minggu, bobot,_rencana, pv
10	laporan	id_laporan, minggu, bobot_aktual, ev
11	evaluasi	id_biaya, minggu, bobot_realisasi, biaya_aktual, pv, ev, sv, cv, spi, cpi, etc, eac

2.6 Functional Needs Analysis

Analysis of functional requirements describe the process of the activities to be implemented in the system and explain the necessary requirements for the system to run smoothly and according to need.



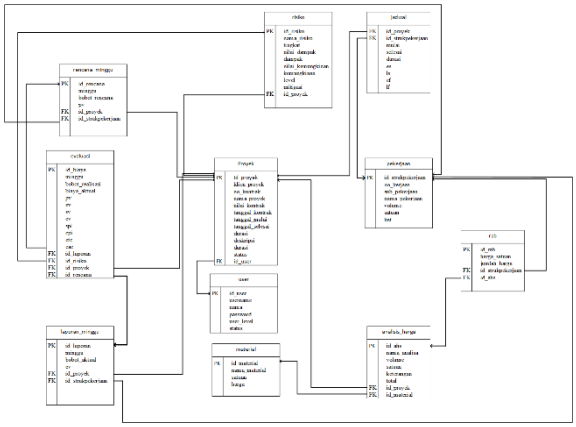
Picture 5 Diagram Context



Picture 6 DFD Level 1

2.7 System planning

Design System is the depiction, planning, and making a sketch or arrangement of several separate systems into a cohesive whole. This stage includes configuring the software components and hardware of a system.



Picture 7 Relation Scheme

2.8 examination

Testing of the system is the cornerstone that aims to find errors - errors and deficiencies - deficiencies in the software being tested. The test aims to determine the software that made it meets the criteria in accordance with the design objectives or not.

2.8.1 Blackbox testing

Testing the system using blackbox method performed on the system functions to determine whether the function has been run as expected or not.

2.8.2 Beta testing

Beta testing is testing conducted by directly into the field to determine user satisfaction to the system are made. Beta testing is done with data collection techniques, ie through the interview. Interviews were conducted against Mr. Fahmi Apriansyah as Responsible Technical, Mr. Ogie Suratman as Technical Executive, and Mrs. Puji Astuti as the Executive Administration and Finance on the project management information system in CV. DEFA PUTRA.

Based on the answers from the speakers, Mr Fahmi Apriansyah as Responsible Technical, Mr. Ogie Suratman as Technical Executive, as well as the mother Puji Astuti as the Executive Administration and Finance to the question posed in beta testing, it can be concluded that the system is easy to use by Responsible Technical, Technical Executive, and the Executive Administration and Finance who has achieved the objectives of the existing problems, which the system can handle project management ranging from managing schedules, identifying risks up to control costs and time course of the project.

3 CLOSING

The results of the study and the results of testing that has been done, it could be concluded that the system can help the technical manager in managing the project schedule and identify the linkages between the work and the critical path, identify risks before the project is implemented based on the calculation of

searching for the level of risk, and has been able to assist in controlling costs and time by comparing the progress or achievement of the work done that is presented in tabular form the results of calculations.

There are some suggestions that can be done for the development of project management information system applications, among others:

1. Future studies are expected to project management information system can display graphics on the evaluation of cost control and time and also to calculate the losses resulting from the risks that occur when the project progresses. Data for calculating the losses can be taken out of the calculation result data Earned Value Management.
2. Future studies are expected to also improve the interface for web browsers as well as the mobile version would be better to enter job data can be imported from Microsoft Excel (.xls).

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