

PROJECT MANAGEMENT INFORMATION SYSTEM AT CV. BINTANG TIMUR

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ABSTRACT

CV. BINTANG TIMUR is a company that usually carries out construction project work. From several projects that have been done previously there are problems caused by several factors that occur, namely factors in terms of scheduling carried out only refers to activities that are in budget planning alone without knowing the interrelationship between jobs, absence of recording and identification at the initial risk and solutions handling is also a factor that can make problems in project implementation and cost control carried out only comparing actual costs and planning costs. Based on these problems, a project management information system is needed at CV. BINTANG TIMUR. The goal is to help in identifying work relationships and identifying jobs that can be put forward by using a method that is the Critical Path Method so that in the future work can be known that cannot be delayed, helps in managing or identifying levels of a risk that can occur in a project work using wrong one method is Expected Monetary Value and then to assist in controlling a project's time and costs by using the Earned Value Management method so that it is easily known for sure the work that has been completed. Based on the results of the test, it was concluded that the making of a project management information system was enough to assist in scheduling by displaying a job in the work table that had information in the form of a critical path which meant the work should not be delayed. displays a table of calculation results based on planning data and from project reports.

Keywords: Project Management, Information Systems, Critical Path Method, Earned Value Management, Expected Monetary Value

1. INTRODUCTION

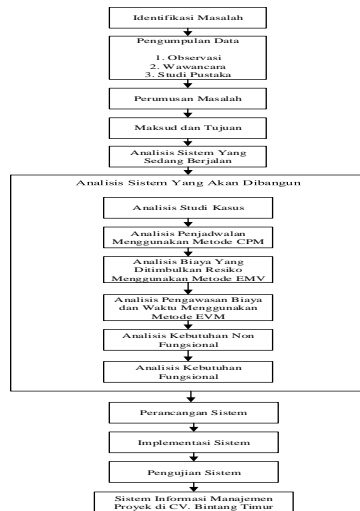
CV. BINTANG TIMUR, having its address at Jl. Raya Plumbon Rt.06 / 02 Ds.Plumbon-Indramayu which was established in 2011, a company engaged in construction. Results from interviews with Mr. Badrawi as Director and Mrs. Wahyuningsih as Deputy Director of CV. BINTANG TIMUR, at this time the problems that occur in the construction of housing projects not according to the time or schedule that had previously been planned, which means the project is experiencing delays in work due to the vice director who is the maker of the budget plan and work schedule that delays occur due to planning the project executive deputy director does not explain or not determine the work that can be prioritized and the work that can be postponed. Therefore, due to the delay in the construction of the project, the residential construction project also experienced a swelling in terms of costs due to the presence of several risks that arise in the construction of residential houses.

Based on the problems that have been discussed CV. BINTANG TIMUR requires a solution to overcome the problems that occur, namely the need for a system that can assist the deputy director and the manager in managing project scheduling so that in the future work can be known that cannot be delayed from related work, can identify a project risk and can control time and costs so that in the future it is easier to find out the work that has been completed. Therefore it will be built a web-based information system for project management which is expected in the future to be able to facilitate in overcoming problems in the project CV. BINTANG TIMUR.

2. RESEARCH CONTENTS

2.1 Research Methodology

The research methodology used in this research is the following descriptive research methodology which is the stages.



Picture 1 Research Methodology

2.2 Theoretical Basis

The theoretical foundation for the writing of the thesis and this final assignment explaining the theory has to do with project management at CV. BINTANG TIMUR.

2.2.1 Information System

Information system is a sub of a system that is related to one another and works together to achieve a goal, namely to manage data into useful information [1].

2.2.2 Sistem Informasi Manajemen

Management information system is a group of interconnected sub-systems to form one unit that interacts and collaborates between parts one with the other to perform data processing functions to receive input data or facts and then process the data that produces output in the form of information that will later be useful for achieve the goal [2].

2.2.2.1 Project

Project is a temporary effort to produce products, services or certain results which means time is limited, there is a beginning and there is an end to the work done and there is a team formed [3]. The project must have a clear start and finish, have sequential activities between the two events, and have a specific goal [4].

2.2.2.2 Manajemen Proyek

Project management is a knowledge, expertise, tool and technique to carry out activities according to project needs [3].

2.2.3 Critical Path Method (CPM)

Critical Path Method (CPM) which is widely known as the critical path is the activity of a project that cannot be delayed which means that more important work must take precedence. The critical path has the longest duration of time to be used as an estimate of the overall project completion time [5].

2.2.4 Expected Monetary Value (EMV)

Expected Monetary Value (EMV) is an analytical method that has a stastic concept to calculate the average expenditure that will occur [6].

2.2.5 Earned Value Management (EVM)

The EVM method or what is commonly called the yield value is a more progressive method of controlling project performance [7].

2.2.6 Context Diagram

Context diagram is the top level of a data flow diagram, which means a diagram that is not detailed from an information system that uses data streams into and out of external entities [9].

2.2.7 Hypert Text Markup Language (HTML)

Hypert Text Markup Language is a hypert text programming language that has functions to build frameworks or web formats [10].

2.3 Project Planning Analysis

This project planning analysis explains the analysis in the form of scheduling and identifies a risk in terms of cost and time on a Residential Housing Construction project.

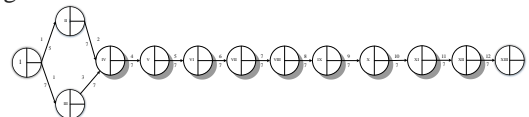
2.3.1 Analysis Of Project Scheduling Uses (Critical Path Method)

Critical Path Method (CPM) is a technique in management that is used to find the fastest path that means determining the work that can be postponed and can take precedence on each activity or project work [5].

Table 1 Project Activities

Type Of Work	Activity Code	Preliminary Wok	Duration (Day)
Preliminary work	1	-	2 Day
Excavation and Land Works	2	1	5 Day
Reinforced Concrete Works	3	1	7 Day
Wall work	4	2,3	7 Day
Roof and Plapond Work	5	4	7 Day
Frame, Door and Accessories Works	6	5	7 Day
Floor job	7	6	7 Day
Electrical Work	8	7	7 Day
Water Installation Work	9	8	7 Day
Safety work	10	9	7 Day
Ceramics and Sanitary Works	11	9	7 Day
Finishing work	12	11	7 Day
Carport and fence work	13	12	7 Day

Based on the relationships between activities in the Rimah Housing Development Project the following can be illustrated in the work network diagram.



Picture 2 Job Network Diagram

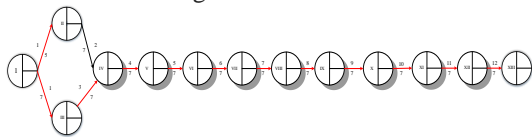
To determine the time, advanced calculations and backward calculations are used using the CPM method [5].

The following is the recapitulation result of the calculation using the CPM method.

Table 2 Recapitulation of Network Calculation Results

Activity Code	Duration (Day)	ES	EF	LS	LF	TF
1	2 Day	0	2	0	2	0
2	5 Day	2	7	4	9	2
3	7 Day	2	9	2	9	0
4	7 Day	9	16	9	16	0
5	7 Day	16	23	16	23	0
6	7 Day	23	30	23	30	0
7	7 Day	30	37	30	37	0
8	7 Day	37	44	37	44	0
9	7 Day	44	51	44	51	0
10	7 Day	51	58	51	58	0
11	7 Day	58	65	58	65	0
12	7 Day	65	72	65	72	0
13	7 Day	72	79	72	79	0

From the table of recapitulation results, it can be seen that work that cannot be postponed and may take precedence is the work that has a total float value equal to 0. The following are the results of calculations that have been changed and made into the work network diagram.



Picture 3 Network Diagram of CPM Analysis Results

2.3.2 Risk Identification Analysis (Expected Monetary Value)

In the risk identification analysis process has several stages including determining the value of consequences and the probability value that occurs at each risk of project execution and control of these risks [6].

2.3.2.1 Risk Identification

The stages in identifying risk begin by identifying a level of risk that aims to identify and list the risks that occur [6].

Table 3 Risk consequences

No.	Types of Risk	Consequences
1	Schedule and Costs that are not according to plan for the house construction work	-18.xxx.xxx
2	The delay in the goods ordered by gypsum plapond and additional materials for the installation of accessory parts	-8xx.xxx
3	There is a workforce accident	-7xx.xxx
4	Weather conditions that do not	-8xx.xxx

	support result in the casting not drying out quickly	
5	Work tool damage	-1.xxx.xxx
6	Errors in measuring and cutting ceramics	-1.xxx.xxx
7	Workers do not enter	-6xx.xxx

2.3.2.2 Determining The Probability Value

The next step of the risk will be assessed by providing a probability value based on the value scale that has been discussed with the company.

Tabel 4 Nilai Probabilitas

Kemungkinan	Sangat Tinggi	85	90	90	100
	Tinggi	60	65	70	80
	Sedang	35	40	45	55
	Rendah	10	15	20	30
Probabilitas					

Dari nilai probabilitas yang sudah ditentukan nilainya dari yang rendah samapi ke yang sangat tinggi beikut ini adalah konsekunsi risiko yang dapat dilihat sebagai berikut.

Table 5 Risk consequences

No.	Types of Risk	Probability (%)
1	Preliminary work	90
2	Excavation and Land Works	60
3	Reinforced Concrete Works	50
4	Wall work	50
5	Roof and Plapond Work	10
6	Frame, Door and Accessories Works	20
7	Floor job	40

After determining the probability value for the next stage, the calculation of each risk is done by using the emv method. The results of the calculation can be seen in the following table.

Table 6 Analysis Result EMV

Activity Code	Consequences (Rp)	Probability (%)	Result EMV (Rp)
1	- 18.xxx.xxx	90	- 16.xxx.xxx
2	- 8xx.xxx	60	- 5xx.xxx
3	- 7xx.xxx	50	- 3xx.xxx
4	- 8xx.xxx	40	-3xx.xxx
5	- 1.xxx.xxx	10	- 1xx.xxx
6	- 1.xxx.xxx	30	- 3xx.xxx
7	- 6xx.xxx	40	- 2xx.xxx
Total			- 18.xxx.xxx

Based on the results of the EMV calculation, conclusions are drawn from the major considerations of each of the risks. So the company must spend that much money if one of the risks occurs during the project. From every risk, risk handling or risk management measures are carried out. Handling or mitigating risks based on the results of discussions

with the company CV. EAST STAR. The recovery or mitigation actions for each of these risks can be seen in the following table.

Table 7 Risk Management Aaction

Activity Code	Risk Management / Handling Measures	Type Of Mitigasi
1	For future projects, use existing workers by increasing working hours and understanding of the projects being carried out	Reducing the possibility of risk events
2	For the future before carrying out the project must communicate with the building shop first and determine the building that is closest to the project location more than one building shop, so that if you experience delays in shipping goods can be done by checking	Withhold risk
3	For the future before or in carrying out the project must do safety security when working on the project and first aid equipment must always be there, so that in the event of a work accident can be immediately addressed	Move the risk to the other side
4	For the future, if you experience weather that does not support the deputy director, you should give direction to the executor so you can divert other work, so that workers do not keep quiet without working.	Avoiding risk
5	In the future before the work takes place the logistics must provide more than 1 rental of new worker equipment and the closest to the project location so that project work can continue	Ignoring risk
6	Take measurements again and the workforce must be careful in making measurements	Reducing the risk
7	Utilizing available HR by doing work that is concurrent, so that work can be done on time	Withhold risk

Based on the identification of the risks that have been carried out, risk management can help the deputy director in identifying the risks that may occur in advance, so that if there is a risk it can be dealt with quickly based on the level of importance and the risk control measures that have been determined, so that future risk handling on the project not too long so that the delay in working on the project can be minimized.

2.4 Analysis Of Project Cost Control (*Earned Value Management*)

The project control analysis contains stages to assist in evaluating the project by controlling project costs and time. Project control uses the Earned Value management method [7].

2.3.1 Job Weight Calculation

To be able to evaluate the project, the first thing to do is to calculate the weight of each job [7].

Table 8 Job Weight Calculation

No	Type Of Aactivity	Weight	The Price of The Job
1	Preliminary work	0,51%	Rp. 5.xxx.xxx
2	Excavation and Land Works	6,05%	Rp. 61.xxx.xxx
3	Reinforced Concrete Works	9,61%	Rp. 97.xxx.xxx
4	Wall work	29,54%	Rp. 298.xxx.xxx
5	Roof and Plapond Work	6,46%	Rp. 65.xxx.xxx
6	Frame, Door and Accessories Works	8,21%	Rp. 82.xxx.xxx
7	Floor job	8,54%	Rp. 86.xxx.xxx
8	Electrical Work	5,95%	Rp. 60.xxx.xxx
9	Water Installation Work	2,67%	Rp. 26.xxx.xxx
10	Safety work	1,47%	Rp. 14.xxx.xxx
11	Ceramics and Sanitary Works	6,84%	Rp. 69.xxx.xxx
12	Finishing work	11,25%	Rp. 113.xxx.xxx
13	Carport and fence work	2,90%	Rp. 29.xxx.xxx
TOTAL		100%	Rp.1.xxx.xxx.xxx

2.3.2 Project Evaluation Analysis

Project evaluation analysis contains calculations to find the value of the Budget Cost Work Schedule (BCWS) or Planned Value (PV), Budget Cost Of Work Performed (BCWP) or Earned Value (EV), Actual Cost Of Work Performed (ACWP) or Actual Cost (AC), Cost Variance (CV), Scheduling Variance (SV), Schedule Performance Index (SPI), Cost Performance Index (CPI), Estimate at Completion (EAC) and Estimate to Complete (ETC) [7].

Table 9 Job Weight Plan

Period	Plan Weight	Total	Job Description
Sunday ke-1	0,51%	6,56%	Preliminary work
	6,05%		Excavation and Land Works
Sunday ke-2	9,61%	29,54%	Reinforced Concrete Works
Sunday ke-3	29,54%	29,54%	Wall work
Sunday ke-4	6,46%	6,46%	Roof and Plapond Work
Sunday ke-5	8,21%	8,21%	Frame, Door and Accessories Works
Sunday ke-6	8,54%	8,54	Floor job
Sunday ke-7	5,95%	5,95%	Electrical Work
Sunday Ke-8	2,67%	2,67%	Water Installation Work

Sunday ke-9	1,47%	1,475	Safety work
Sunday ke-10	6,84%	6,84%	Ceramics and Sanitary Works
Sunday ke-11	11,25%	11,25%	Finishing work
Sunday ke-12	2,90%	2,90%	Carport and fence work

Based on the weight planning table the project work can be calculated the value of the Budget Cost Work Schedule (BCWS) or Planned Value (PV), Budget Cost Of Work Performed (BCWP) or Earned Value (EV), Actual Cost of Work Performed (ACWP) or Actual Cost (AC), Cost Variance (CV), Scheduling Variance (SV), Schedule Performance Index (SPI), Cost Performance Index (CPI), Estimate at Completion (EAC) and Estimate to Complete (ETC) which can be seen in the following table.

Table 10 Recapitulation of Calculations Earned Value Management

Minggu	Analisis Varian		Analisis Kinerja		Analisis Estimasi	
	Waktu SV	Biaya CV	Waktu SPI	Biaya CPI	Waktu ETC	Biaya EAC
Minggu ke-1	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-2	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-3	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-4	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-5	Rp.0	-Rp.18.xxx.xxx	1,00	0,820	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-6	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-7	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-8	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-9	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-10	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-11	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx
Minggu ke-12	Rp.0	Rp.0,00	1,00	1,00	84 Hari	Rp.1.xxx.xx x.xxx

Based on the results of the recapitulation of project performance using an EVM method, it can be summarized as follows:

Total Planning Time is = 84 Days

Total Actual Time which is = 84 Days

$$BAC = Rp. 1.xxx.xxx.xxx$$

$$PV = 1.xxx.xxx.xxx$$

$$AC = 1.xxx.xxx.xxx$$

$$CV = - 18.xxx.xxx$$

$$\text{Estimated remaining time settlement} = 84 - 84 = 0$$

$$\text{days Estimated remaining cost of completion} =$$

$$1.xxx.xxx.xxx - 1.xxx.xxx.xxx = - 18.xxx.xxx.xxx$$

From the analysis on the project of building a residence this residence has the remaining time of 0 days which means that the time a project is carried out in accordance with what has been planned. Due to the risk for the remaining costs of completing this project, which is Rp. -18.xxx.xxx means that the cost of completing the project exceeds the previously planned cost limit.

2.5 Analysis Of User Needs

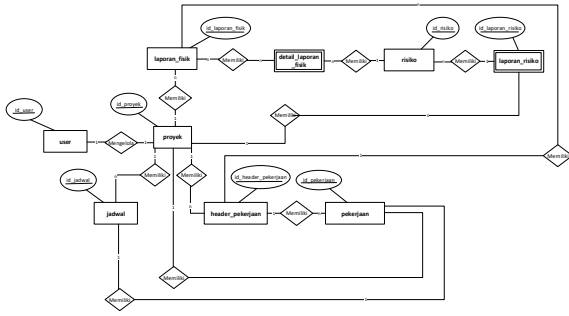
User analysis is meant to find out the various users involved in the software or system. The following are the characteristics of the user the conditions needed.

Table 11 Characteristics of Users Needed

Users	Access Rights	Skill Levels
Deputy Director	<ol style="list-style-type: none"> 1. Manage project data 2. Manage unit price data 3. Manage RAB data 4. Manage scheduling data 5. Manage risk data 6. Manage work data 7. Manage weekly plan data 8. Manage evaluation data 	Understand the use of web-based applications and understand project reports
Implementer	<ol style="list-style-type: none"> 1. View project data 2. Manage weekly reports 3. View evaluation data 	Understand the use of web-based applications and understand the input of project reports
Project Administration	<ol style="list-style-type: none"> 1. Manage user or user data 2. View project data 3. Manage material data 4. View evaluation data 	Understand the use of web-based applications and understand the input of project reports

2.6 Database Analysis

Database analysis is the stage of analysis to describe the desired system in the form of relationships between entities involved in the project management information system at CV. BINTANG TIMUR. [8]



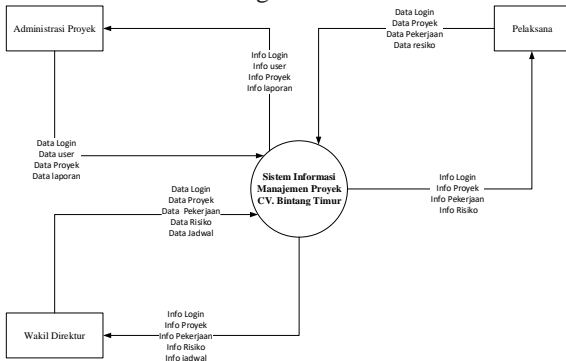
Picture 4 Entity Relationship Diagram

Table 12 Data Dictionary Description ERD

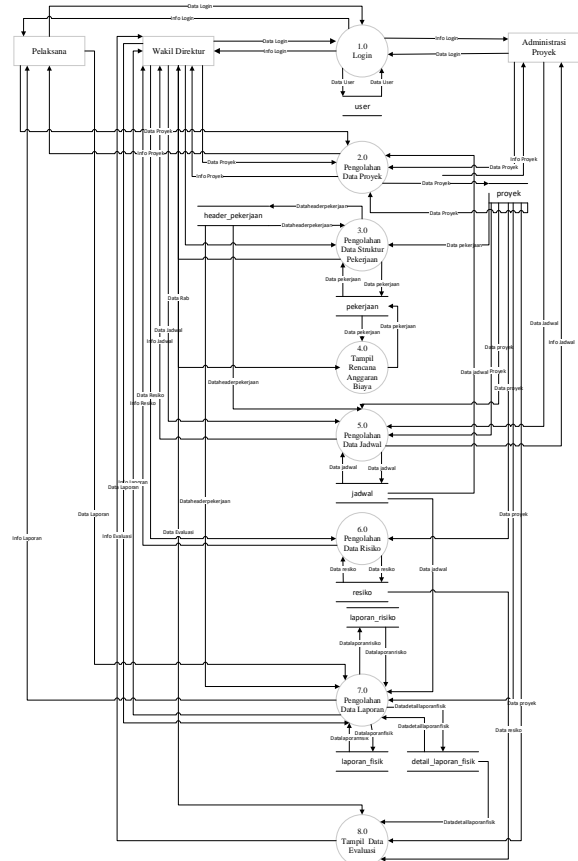
No	Entity Name	Attribute
1	user	id_user, nama_user, username, password, jabatan
2	project	id_proyek, nama_proyek, lokasi_proyek, durasi, tanggal_mulai, tanggal_selesai, nilai_kontrak
3	risk	id_risiko, nama_risiko, probabilitas, konsekuensi, emv, mitigasi, jenis_mitigasi, tanggal
4	work	id_pekerjaan, nama_pekerjaan, harga_satuan, satuan, volume, jumlah_harga, bobot_pekerjaan
5	report_risk	id_laporan_risiko, tanggal
6	report_fisik	id_laporan_fisik, minggu, tanggal_mulai, tanggal_selesai
7	schedule	id_jadwal, kode_pekerjaan, durasi, tanggal_mulai, tanggal_selesai, kode_pekerjaan_pendahulu, es, ef, ls, lf, tf
8	jobheader_file	id_header_pekerjaan, nama_header_pekerjaan
9	detail_report_fisical	id_detail_laporan_fisik, bobot_aktual, biaya_aktual

2.7 Functional Needs Analysis

Analysis of functional requirements is an overview of the process of activities that will be applied to the system and explains the needs that will be needed so that the system can run well and in accordance with existing needs.



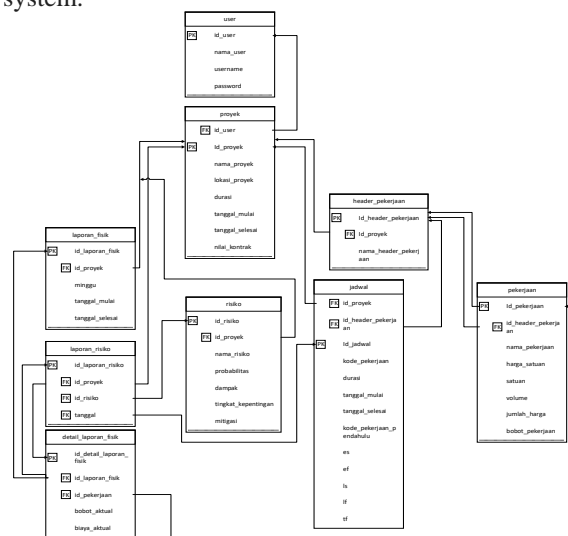
Picture 5 Context Diagram



Picture 6 DFD Level 1 Project Management Information System

2.8 System Design

System Design is a description, rules and planning of several separate systems into a unified whole. This stage includes configuring the software and hardware components of the system.



Picture 7 Relationship Skema

2.9 Testing

System testing is the most important thing that aims to find errors and shortcomings in the software being tested. The test intends to find out that the software created has met the criteria that are in accordance with the design goals or not.

2.9.1 Blackbox Testing

Testing this system by using a method that is the blackbox method is carried out on system functions to determine whether the system functions that have been built have been running as expected or not.

2.9.2 Beta Testing

Beta testing is testing carried out objectively where testing is done directly by conducting interviews and checking the system directly in the office of CV. BINTANG TIMUR.

The answers from each of the speakers who have carried out the test can be concluded that the system built is easy enough to be used by deputy directors, executors and project administrations who have achieved the objectives of the problem where the system can handle project management starting from managing the schedule, identifying risks that result in costs and controlling time and costs in the course of risk even though there is still little of the perfect word due to evaluation for time and cost there are few that still do not match the purpose.

3 CLOSING

Based on the results of the research and the results of tests that have been carried out on the project management information system on the CV. BINTANG TIMUR can be concluded, that the system that has been built can help the deputy director to determine the work that can take precedence by providing a table that shows the critical path or shows the work that can take precedence and the existence of network diagram features from the results of cpm analysis that shows that work can take precedence on the red line and can display the work schedule and manage the identification of risk levels before the project is carried out based on the calculation of output values resulting from the frequency of occurrence of risks and costs, and can help in controlling time and costs even though a little of the word perfect because the output value is still not in accordance with the goal. From the conclusions that have been obtained, there are several suggestions for the future of the system that has been built so that the suggestions are better, including:

1. It is expected that in the future this system will be in terms of form and process that are still not working with what is expected to be developed and refined so that it is closer to the perfect word.
2. It is expected that future research can improve the interface or display of the

system to be better and more secure and to make it even easier to enter or print a report on work data done by installing or exporting directly (file.xls) from Microsoft Excel.

3. It is expected that in the future this system can calculate the direct benefits of each project undertaken.

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