PROJECT INFORMATION SYSTEM OF COST AND TIME MANAGEMENT IN PT. CIPTA KENTRIS SARANA PRATAMA

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ABSTRACT

PT. Kentris Cipta Sarana Pratama is a company engaged in the construction field. The company has been working on various projects such as the construction of residential houses, construction of buildings, roads, bridges, irigasi, and others. Site Manager experience problems in evaluating the cost of the project, the construction of warehouses that have problems delay the work, because the reference in project cost control is only based on the budgeted costs and the actual course, so it mengakibatakann Site Manager difficulty in estimating the results of the final cost of the project if appropriate with budgeted or exceed budgeted, because if it is allowed then the long run the company will lose money.

Management information system costs and project time is expected to facilitate the project manager in managing, scheduling, and the search for the critical path of a project.

Based on the test results *black box*and interviews, it can be concluded that the existence of a management information system project costs and time, facilitate the project manager in taking measures in case of irregularities, and can display the critical path of a project. Which is expected to facilitate the monitoring of a project.

Keywords: Project Management, Cost and Time Management, Program Evaluation and Review Technique, Critical Path Method (CPM), Earned Value Management (EVM).

1. PRELIMINARY

PT. Kentris Cipta Sarana Pratama is a company engaged in the construction field is located at Jl. Alkateri 32-A, Braga, Wells Bandung, West Java. The company has been working on various projects such as the construction of residential houses, construction of buildings, roads, bridges, irrigation, etc.

Based on interviews with Site Manager, explains that he is dealing with two projects, namely construction of warehouse storage and pembagunan House Live, but at the time of the construction of storage facilities there are problems with any of the work so that the work others are delayed due to the risk - the risk that existed at the time of execution and scheduling less effective, because it can not determine the critical work. The purpose of the critical job is a job - a job that can not be postponed. Resulting in the withdrawal of the work on other projects.

site Manager also told that he was having problems in evaluating the cost of the project, the construction of warehouses that have problems delay the work, because the reference in project cost control is only based on the budgeted costs and the actual course, so it mengakibatakann Site Manager difficulty in estimating the results of the final cost of the project whether in accordance with budgeted or mlebihi than budgeted, because if it is allowed then the long run the company will lose money as the roof installation activities on Warehouse Storage Development project.

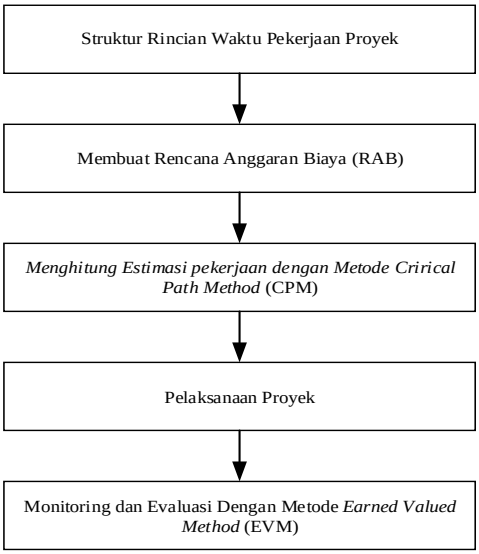
Based on the above issues, PT. Cipta Kentris Sarana Pratama need a system that can help manage the project to perform planning and monitoring. So that these systems can facilitate*site Manager*in doing the scheduling, execution and control of the project. Of the existing problems need a solution solving with a correct method, the following is a method that is expected to be able to meet these objectives is the method of Critical Path Method (CPM) as a method for scheduling a project that can be useful in evaluating the schedule experiencing a delay in order to see how long a job can be completed by the end of the work and determine which activities take precedence and which are done

simultaneously so that the scheduling to be optimal [1]. Earned Value Management (EVM) EVM method is a method that facilitates the control of the project cost estimates and time, as well as to know the cost and time of the end of a project [2].

2. RESEARCH

2.1 Analysis Project Phases

The analysis stage of the project is one step in project management is the basis of goals and objectives as well prepare all the technical and administrative programs to be implemented in the system. [1] then the phases of project management can be seen in the image below:



Picture 1, stages of the project

2.1.1 Structural details Project Work Time

Details of the project work time used to facilitate the planning and scheduling within a project by dividing the work into detail - detail components [2], can be seen in Table 1.

Table 1 time Project

NO	JOB DESCRIPTION	duration (Day)	from	finished
I	**FOUNDATION WORK**			
1.1	cleaning Field	1	07/04/2016	07/04/2016
1.2	Installation Bouplank / Measurement	1	07/04/2016	07/04/2016
1.3	Cement manufacture and Tool Warehouse	1	7/5 // 2016	07/05/2016
1.4	Soil excavation	1	7/6 // 2016	07/06/2016
1.5	Urugan Back Excavation	1	07/06/2016	07/06/2016
1.6	Soil compaction	1	07/07/2016	07/07/2016
1.7	Base Pairs	1	07/07/2016	07/07/2016
II	**CONCRETE WORKS**			
2.1	Preparation of Concrete	6	07/08/2016	07/13/2016
III	**WALL WORK**			
3.1	Couples Brick Wall	17	07/14/2016	07/30/2016
3.2	Door frame	2	07/31/2016	08/01/2016
IV	**KAP WORK AND ROOF**			
4.1	The hood and roof framework jobs	9	02/08/2016	10/08/2016
4.2	roof installation	3	11/08/2016	08/13/2016
V	**Work ceiling**			
5.1	order Ceiling	4	14/08/2016	17/08/2016
5.2	installing ceiling	6	08/18/2016	23/08/2016
VI	**Plastering WORK AND acian**			
6.1	plaster walls	14	08/24/2016	09/06/2016
6.2	acian	2	07/09/2016	09/08/2016
VII	**FLOOR JOB**			
7.1	Sand backfill	1	09/09/2016	09/09/2016
7.2	pair Floor	12	09/10/2016	21/09/2016
VIII	**WORK DOOR AND WINDOW**			
8.1	Couple Doors	1	09/22/2016	09/22/2016

2.1.2 Make a Budget Plan (RAB)

Here is a budget plan for the construction of warehouse storage, can be seen in Table 2.

Table 2 Budget plan

NO	JOB DESCRIPTION	VOLUME	UNIT	UNIT PRICE (RP.)	TOTAL PRICE (RP.)
I	FOUNDATION WORK				
1	cleaning Field	500	M2	6,750.00	3,375,000.00
2	Installation Bouplank / Measurement	90.00	M	23,868.02	2,148,121.80
3	Cement manufacture and Tool Warehouse	10:00	M2	384,725.40	3,847,254.00
4	Soil excavation	150.00	M3	16,600.00	2,490,000.00
5	Urugan Back Excavation	120.00	M3	7,955.00	954,600.00
6	Soil compaction	12:00	M3	20,750.00	249,000.00
7	Base Pairs	7:00	M3	508,184.60	3,557,292.20
				Subtotal I	**16,621,268.00**
II	CONCRETE WORKS				
1	Preparation of Concrete	7.78	M3	3,023,013.15	23,519,042.31
				Subtotal II	**23,519,042.31**
III	WALL WORK				
1	Couples Brick Wall	1500	M2	53,283.40	79,925,100.00
2	Door frame	2.78	M3	2,786,375.00	7,746,122.50
				Subtotal III	**87,671,222.50**
IV	KAP WORK AND ROOF				
1	The hood and roof framework jobs	2734	M3	17,545.00	47,968,030.00
2	roof installation	612	M2	22,205.00	13,589,460.00
				Subtotal IV	**61,557,490.00**
V	Work ceiling				
1	order Ceiling	482	M2	36,913.93	17,792,514.26
2	installing ceiling	520	M2	64,214.67	33,391,628.40
				Subtotal V	**51,184,142.66**
VI	Plastering WORK AND acian				
1	plaster walls	2978	M2	26,166.30	77,923,241.40
2	acian	2996	M2	4,837.48	14,493,090.08
				Subtotal VI	**92,416,331.48**
VII	FLOOR JOB				
1	Sand backfill	48.75	M3	107,150.00	5,223,562.50
2	pair Floor	513	M2	105,482.22	54,112,378.86
				Subtotal VII	**59,335,941.36**
VIII	WORK DOOR AND WINDOW				
1	Couple Doors	1	bra	521,600.00	521,600.00
				Subtotal VIII	**521,600.00**
				Total I + II + III + IV + V + VI + VII + VIII	**392,827,038.31**
				VAT 10%	**39,282,703.83**

NO	JOB DESCRIPTION	VOLUME	UNIT	UNIT PRICE (RP.)	TOTAL PRICE (RP.)
				Total Cost	432,109,742.14
				be rounded	432,100,000.00

2.2 Analysis scheduling

Scheduling analysis is the analysis of the activity and the work necessary to complete the construction project Storage Facility project aims to optimize the scheduling of the project schedule by finding the critical path of a job by using critical path method (CPM). [1]

2.2.1 Estimated time jobs

At this stage the CPM requires three components, namely all the activities required to complete the project, the duration of which is in use on each - each job and dependencies between activities

Table 3, Activities of the Development Project Warehouse Storage

No.	Description of activities	Event Codes	predecessor or activity	duration (Day)
1	Foundation work	1	-	4
2	Concrete works	2	1	6
3	Wall work	3	2	19
4	The hood and roof job	4	3	12
5	ceiling Work	5	4	10
6	Plastering job and Acian	6	5	16
7	Floor job	7	6	13
8	Works Door and Window	8	7	1

2.2.2 advanced computation

To perform advanced calculations on required CPM value of Early Start (ES) and Early Finish (EF).

1. *Early Start* (ICE)

ES is the earliest start time of an activity the following formula:

$$ES = ES + Length$$

2. *Early Finish*(EF)

EF adaalah start time following the end of an activity of the formula:

$$EF = ES + duration$$

Here Recap of advanced computation and Early Start Early Finish:

Table 4 Advanced Calculation Recap

Event Codes	activity		Time (D) in days	The first	
	i-node	j-node		Start (ES)	Finish (EF)
1	-	**2**	4	0	4
2	**1**	**3**	6	4	10
3	**2**	**4**	19	10	29
4	**3**	**5**	12	29	41
5	**4**	**6**	10	41	51
6	**5**	**7**	16	51	67
7	**6**	**7**	13	67	80
8	**7**	-	1	80	81

2.2.3 Countdown

To do a countdown on a CPM takes seek value Latest Start (LS) and Hot Finish (LF).

1. Latest Start (LS)

LS is the most recent time began to work without slowing down the overall project activities Latest Finish (LF).

$$LS = LF - Duration$$

2. *Latest Finish* (LF)

LF is the most recently completed period of employment, LF following formula:

$$LF = LF - Duration$$

Table 5, Backward calculations Recap

Event Codes	activity		Time (D) in days	The last	
	i-node	j-node		Start (LS)	Finish (LF)
1	-	**2**	4	0	4
2	**1**	**3**	6	4	10
3	**2**	**4**	19	10	29
4	**3**	**5**	12	29	41
5	**4**	**6**	10	41	51
6	**5**	**7**	16	51	67
7	**6**	**7**	13	67	80
8	**7**	-	1	80	81

2.2.4 float

float a job that allowed the delay time without affecting the total time of the project. with the formula

$$TF = LF - EF = LS – ES$$

Table 6, Recap Calculation of Total Float

activity		Time (T) in days	The first		The last		Total float (TF)
i-node	j-node		from (ICE)	finished (EF)	from (LS)	finished (LF)	
-	**2**	4	0	4	0	4	**0**
1	**3**	6	4	10	4	10	**0**
2	**4**	19	10	29	10	29	**0**
3	**5**	12	29	41	29	41	**0**
4	**6**	10	41	51	41	51	**0**
5	**7**	16	51	67	51	67	**0**
6	**7**	13	67	80	67	80	**0**
7	-	1	80	81	80	81	**0**

Based on the analysis tables CPM method concluded that activities had a total value of float or TF = 0. 1 piece of track is obtained 1 - 2-3 - 4-5 - 6- 7 - 8. The results showed that if the project is delayed at work previously, there will be a delay on the job thereafter. The addition of the duration of the project has been delayed causing delays in the start time of the project which had been scheduled earlier.

Here is a diagram of the work of the project of making the warehouse ..

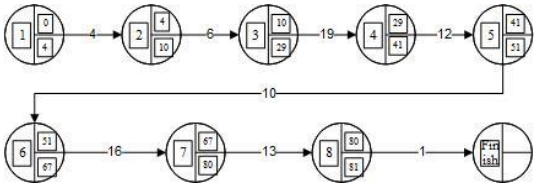


Figure 2 Project Schedule Network Diagram

2.3 Project Monitoring Analysis

EVM is a method that mengistegrasikan relationship between Cost and Time, and can give an idea of the condition of the continuity of the project. [7]

2.3.1 Calculation of the weight percentage of jobs

Job weight calculation used to find the weight of each work, the following formula for calculating the weight of work. [1]

$$\textbf{Bobot} = \left(\frac{\textbf{Biaya pekerjaan}}{\textbf{Nilai proyek}} \right) \boldsymbol{x}\ \mathbf{100}$$

The first job for weight calculation is mobilasi as follows:

cleaning the field

The total price of the job = 392,827,038.31, -

The price of the job = Rp 3,375.000, -

Weight = (392,827,038.31 / 3.375 million) * 100

= 0.86%

Fortunately calculations further work can be seen in the following table:

Table 7 Calculation of weights work

No.	Job description	amount	Weight (%)
I	**FOUNDATION WORK**		
I.1	cleaning Field	3,375,000.00	0.86
I.2	Installation Bouplank / Measurement	2,148,121.80	0:55
I.3	Cement manufacture and Tool Warehouse	3,847,254.00	0.98
I.4	Soil excavation	2,490,000.00	0.63
I.5	Urugan Back Excavation	954,600.00	0:24
I.6	Soil compaction	249,000.00	0:06
I.7	Base Pairs	3,557,292.20	0.91
II	**CONCRETE WORKS**		
II.1	Preparation of Concrete	23,519,042.31	5.99
III	**WALL WORK**		
III.1	Couples Brick Wall	79,925,100.00	20:35
III.2	Door frame	7,746,122.50	1.97
IV	**KAP WORK AND ROOF**		
IV.1	The hood and roof framework jobs	47,968,030.00	12:21
IV.2	roof installation	13,589,460.00	3:46
V	**Work ceiling**		
V.1	order Ceiling	17,792,514.26	4:53
V.2	installing ceiling	33,391,628.40	8:50
VI	**Plastering WORK AND acian**		
VI.1	plaster walls	77,923,241.40	19.84
VI.2	acian	14,493,090.08	3.69
VII	**FLOOR JOB**		
VII.1	Sand backfill	5,223,562.50	1:33
VII.2	pair Floor	54,112,378.86	13.78
VIII	**WORK DOOR AND WINDOW**		
VIII.1	Couple Doors	521,600.00	0:13

2.3.2 Analysis Planned Value (PV)

Yan is a cost plan has been approved to be spent on activities that have been planned, following the first week of PV Calculation:

BAC = Rp 392,827,038.31

Weight (progress the plan)= 7:22%

PV = BAC * Weight

= 392,827,038.31 * 0072

= Rp 28,380,789.15

for next week's recap can be seen in the results in Table 8.

Table 8 Recap Planned Value (PV)

No.	Week	Weight (%)	PV (RP.)	
			Weekly	cumulative
1	Number 1	7:22	28,380,789.15	28,380,789.15
2	2nd	7.78	30,565,427.04	58,946,216.19
3	The 3rd	8:38	32,910,335.29	91,856,551.48
4	To 4	8:17	32,081,920.07	123,938,471.56
5	5th	9:13	35,851,747.92	159,790,219.47
6	6th	8.66	34,026,931.90	193,817,151.37
7	7th	9:06	35,605,471.30	229,422,622.67
8	8th	9.92	38,960,271.87	268,382,894.54

2.3.3 Analysis Earned Value (EV)

Earned Value is an estimate of the value of the physical realization of a pekerjaan.berikut a calculated EV first week

BAC = Rp 392,840,681.31

Weight (progress the plan) = 7:22%

EV = BAC * Weight

= 392,827,038.31 * 0072

= Rp 28,380,789.15

for next week's recap can be seen in the results in Table 9.

Table 9 Recap Earned Value (EV)

No.	Week	Weight (%)	EV (RP.)	
			Weekly	cumulative
1	Number 1	7:22	28,380,789.15	28,380,789.15
2	2nd	7.78	30,565,427.04	58,946,216.19
3	The 3rd	8:38	32,910,335.29	91,856,551.48
4	To 4	8:17	32,081,920.07	123,938,471.56
5	5th	9:13	35,851,747.92	159,790,219.47
6	6th	8.66	34,026,931.90	193,817,151.37
7	7th	9:06	35,605,471.30	229,422,622.67
8	8th	6.60	25,938,550.84	255,361,173.50

2.3.4 Analysis Actual Cost (AC)

analysis Actual Cost is the total cost incurred during the project implementation, following the actual cost at weeks 1-8.

Table 10 Recap Actualy Cost (AC)

No.	Weekly	AC (RP.)	
		Weekly	Cumulative
1	Number 1	28,380,789.15	28,380,789.15
2	2nd	30,565,427.04	58,946,216.19
3	The 3rd	32,910,335.29	91,856,551.48
4	To 4	32,081,920.07	123,938,471.56
5	5th	35,851,747.92	159,790,219.47
6	6th	34,026,931.90	193,817,151.37
7	7th	35,605,471.30	229,422,622.67
8	8th	25,938,550.84	255,361,173.50

2.3.5 Scheduling Analysis of Variance (SV)

scheduling Variance is variable to identify the time that has been used, following the calculation of the SV at week 8.

SV calculation in week six:

Earned Value (EV) = Rp. 25,938,550.84

actual Cost (PV) = Rp. 38,960,271.87

scheduling Variance (SV) = EV - PV

= 25,938,550.84 - 38,960,271.87

= Rp.-13,021,721.03

for the next week to dilihat on the results in Table 11 recaps

Table 11 Recap Scheduling Variance (SV)

No.	Weekly	EV (RP.)	PV (RP.)	SV (RP.)
1	Number 1	28,380,789.15	28,380,789.15	-
2	2nd	30,565,427.04	30,565,427.04	-
3	The 3rd	32,910,335.29	32,910,335.29	-
4	To 4	32,081,920.07	32,081,920.07	-
5	5th	35,851,747.92	35,851,747.92	-
6	6th	34,026,931.90	34,026,931.90	-
7	7th	35,605,471.30	35,605,471.30	-
8	8th	25,938,550.84	38,960,271.87	- 13,021,721.03

2.3.6 Cost Analysis of Variance

Variables to identify the costs have been incurred whether larger or smaller than the cost of which has been planned, the following is a calculation of the CV in week 1.

Calculation of CV in the first week:

Earned Value (EV) = RP. 28,380,789.15

actual Cost (AC) = RP. 28,380,789.15

cost Variance (CV) = EV - AC

= 28,380,789.15 -

28,380,789.15

= 0

for the next week to dilihat on the results in Table 12 recaps

Table 12 Recap Cost Variance (CV)

No.	Week	EV (RP.)	AC (RP.)	CV (RP.)
1	Number 1	28,380,789.15	28,380,789.15	-
2	2nd	30,565,427.04	30,565,427.04	-
3	The 3rd	32,910,335.29	32,910,335.29	-
4	To 4	32,081,920.07	32,081,920.07	-
5	5th	35,851,747.92	35,851,747.92	-
6	6th	34,026,931.90	34,026,931.90	-
7	7th	35,605,471.30	35,605,471.30	-
8	8th	25,938,550.84	25,938,550.84	-

2.3.7 *Schudle performanced Index (SPI)*

If the CPI value> = 1 means that the performance of the project both for the costs incurred in accordance with the planned budget, the following is a calculation of the SPI week -8

The calculation of the SPI in the first week:

Earned Value (EV) = Rp 25,938,550.84

Planned Value (PV) = Rp 38,960,271.87

SPI = EV / PV

= 25,938,550.84 /

= 38,960,271.87

= 0.67

for the next week to dilihat the recap results in table 13.

Table 13 Recap Schedule Performance Index (SPI)

No.	Week	EV (RP.)	PV (RP.)	SPI
1	Number 1	28,380,789.15	28,380,789.15	1:00
2	2nd	30,565,427.04	30,565,427.04	1:00
3	The 3rd	32,910,335.29	32,910,335.29	1:00
4	To 4	32,081,920.07	32,081,920.07	1:00
5	5th	35,851,747.92	35,851,747.92	1:00
6	6th	34,026,931.90	34,026,931.90	1:00
7	7th	35,605,471.30	35,605,471.30	1:00
8	8th	25,938,550.84	38,960,271.87	0.67

2.3.8 Cost Analysis Performace Index (CPI)

If the value of the CPI <1 means that the performance royek performance is not good, because in terms of the cost exceeded the budget that had been planned, the following is a calculation of the CPI at weeks -1,

The calculation of the CPI in the first week:

Earned Value (EV) = Rp 28,380,789.15

actual Cost (AC) = Rp 28,380,789.15

CPI = EV / AC

= 28,380,789.15 /

28,380,789.15

= 1

for the next week to dilihat on the results recap on table 14.

Table 14 Recap Cost Performance Index (CPI)

No.	Week	EV (RP.)	AC (RP.)	CPI
1	Number 1	28,380,789.15	28,380,789.15	1:00
2	2nd	30,565,427.04	30,565,427.04	1:00
3	The 3rd	32,910,335.29	32,910,335.29	1:00
4	To 4	32,081,920.07	32,081,920.07	1:00
5	5th	35,851,747.92	35,851,747.92	1:00
6	6th	34,026,931.90	34,026,931.90	1:00
7	7th	35,605,471.30	35,605,471.30	1:00
8	8th	25,938,550.84	25,938,550.84	1:00

2.3.9 Estimate at Completion (EAC)

EAC is the end of the project cost to be incurred, for the next week can be seen in the results in Table 15 recaps

BAC = 392,827,038.31

CPI = 1

EAC = BAC / CPI

= Rp 392,827,038.31 / 1

= Rp 392,827,038.31

for next week's recap can be seen in the results in Table 15.

Table 15 Recap Etimate at Completion (EAC)

No	Week	BAC (RP.)	CPI	EAC (RP.)
1	Number 1	392,827,038.31	1	392,827,038.31
2	2nd	392,827,038.31	1	392,827,038.31
3	The 3rd	392,827,038.31	1	392,827,038.31
4	To 4	392,827,038.31	1	392,827,038.31
5	5th	392,827,038.31	1	392,827,038.31
6	6th	392,827,038.31	1	392,827,038.31

No	Week	BAC (RP.)	CPI	EAC (RP.)
7	7th	392,827,038.31	1	392,827,038.31
8	8th	392,827,038.31	1	392,827,038.31

2.3.10 ***Estimate to Completion (ETC)***

ETC will predict the timing of completion of the project, assuming the tendency of the project goes according to plan or not, for the next week can be seen in the results in Table 15 recaps ETC calculation in the first week:

Original Duration (OD) = 81 days

Schedule Performance Index (SPI) = 0.67

Estimate Time Completion (ETC) = OD / SPI

= 81 / 0.67

= 121.66

for the next week to dilihat on the results in Table 16 recap.

Table 16 Recap Planned Value (PV)

No.	Week	OD	SPI	ETC
1	Number 1	81	1	81.00
2	2nd	81	1	81.00
3	The 3rd	81	1	81.00
4	To 4	81	1	81.00
5	5th	81	1	81.00
6	6th	81	1	81.00
7	7th	81	1	81.00
8	8th	81	0.67	121.66

2.3.11 Results Recap EVM Analysis

Here is a recap of the results of the analysis method of EVM, can be seen in the table below.

Table 17 Recap Planned Value (PV)

Week to	AnalisisVarians		Work analysis		Estimates analysis	
	SV (RP.)	CV	SPI	CPI	ETC (day)	EAC (RP.)
Number 1	- 1,350,793.00	0	0868	1	203.89	426,458,181.46
2nd	1,288,543.00	0	1,934	1	91.48	426,458,181.46
The 3rd	- 11,187,505.09	0	0715	1	247.25	426,458,181.46
To 4	4,303,302.73	0	1,176	1	150.38	426,458,181.46
5th	0	0	1	1	177.00	426,458,181.46
6th	0	0	1	1	177.00	426,458,181.46
7th	0	0	1	1	177.00	426,458,181.46
8th	2,454,815.12	0	1:16	1	153.09	426,458,181.46

From the analysis on rekapitulsai performance of the project construction of residential houses by using Earned Value Management is known that there is a delay workmanship at weeks 1 and 3 where the processing time does not correspond to the planned time but expenses as planned, it can be concluded the work already carried out for 8 weeks is still in good condition because the costs incurred as planned even though the processing time delay / delay and with the controlling performed using Earned Value Management helps Site Manager project knowing that the irregularities .waktu job or costs and can estimate the time and cost.

3 CLOSING

3.1 Conclusion

Based on the results of research and testing has been done to the Management Information System Cost and Time Jobs at PT. Kentris Cipta Sarana Pratama, it can be deduced as follows:

1. Management information system costs and timing of the project, Site Manager can assist in determining which jobs should be taken first.
2. Management information system costs and timing of the project, Site Manager can assist in monitoring the cost of the planned order in accordance with that budgeted.
3. Management information system costs and timing of the project, can assist field staff in conducting pengirman report the progress of the work, so the evaluation process was not hampered.

3.1 Suggestion

Based on test results sisterm, there is a suggestion to add a few things that can complement and Cost Management Information System Project Time in the future, among other things:

1. Adding features to the acceleration of projects that have been delayed.
2. Adding features master data on each - each employment projects.
3. Adding the estimated time feature complete ongoing projects and estimates when new projects can begin.

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