MANAGEMENT PROJECT INFORMATION SYSTEM
CV. LESTARI

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ABSTRACT

CV. LESARI is an experienced construction company, they doing a lot of construction projects. However, when the project runs its faces some obstacles in the process such as the schedule and the cost is not according to plan, one example is the Project Development of Archives / Assets BAPPEDA Sumedang. When Project Development of Archives / Assets BAPPEDA Sumedang execute the timeline is not in accordance with the planning, this occurs because of a calculation error cost estimates and time of the project and the lack of effective human resource handle as well as the absence of risk management.

Based on the problems, the company required scheduling analysis using Critical Path Method, analysis of the estimated project time and cost using the method of Earned Value Management (EVM) as well as the need of risk management to manage risks that may occur using methods Earn Monetary Value (EMV).

Based on the analysis of scheduling has been done, the Project Development of Archives / Assets BAPPEDA Sumedang has an acceleration in the execution schedule of the project, the acceleration is accompanied by the costs were greater than planned, although the cost is higher, but at the time of completion of the project costs equal to contract value. Risks that may occur when the project running can be identified and quantified how much it costs to be incurred.

Keywords *: Project Management, Information System, Critical Path Method, Earned Value Management, Expected Monetary Value.*

1. INTRUDUCTION

CV. LESTARI is one of the leading provider of construction services. CV. LESTARI founded on 05 November 2013 and located on Jl. Arief Rachman Hakim No.47 A, Sumedang. Each year the company usually handles 2 to 3 projects. The projects included road construction, building construction, strengthening of roads, bridges, fencing, and other construction projects. This company is a construction company that is still developing so that the projects undertaken are the result of direct appointment and also construction bidding from other project provider, the company is used to handle projects appointed by the government such as Bappeda Sumedang, Education Office, Agriculture Department, and other services.

2 - 3 of the projects the company handle happen at the same time, making the project manager difficult to realize the project, because the project monitoring and supervising process that can not be done on a daily basis due to the limited number of field staff, the supervision also sometimes becomes difficult because the project is located in remote area. Companies have to add new employees to supervise each construction project, these new supervisors sometimes work out of schedule, thus disrupting the schedule and lead to unpunctuality, this unpunctuality leads to cost increase which do not suitable to the plan, this cause the company to be diminished.

During the planning this company has never had a standard daily work schedule, in practice the company uses only the shortest estimates based on previous projects, this is very ineffective because the schedule always misses the expected target, the missed target causes the company to issue additional work schedules as a result, the company should incur additional costs and additional of a monitoring schedule that was not on plan.

Risks occurring during the project also often occur in the field, such as delayed delivery of material to the project site, these delays interfere with the work schedule that has been made, weather factors also affect the implementation of the project, these risks will be arranged into risk management in order to make better project management for the company.

From the explanation that has been described, these problems can be overcome with Project Management Information System, this system will facilitate the work of the company in making the schedule by using Critical Path Method

(CPM) which will clarify the daily work to be done and can see which job Which can be accelerated, using the Earned Value Management (EVM) method for monitoring and supervising. Supervision will be made online due to occasional project sites, this monitoring will see how the project works, whether it is on schedule, and using Expected Monetary Value (EMV) to calculate the amount of costs incurred for the risks incurred during the project.

2. RESEARCH RESULT

2.1 Scheduling Analysis

Scheduling is one of the elements of planning outcomes that can provide information on project schedules and progress in terms of resource performance as well as project duration and progress of time for project completion. This research use Critical Path Method (CPM) for scheduling.

2.1.1 Critical Path method Analysis

The Critical Path Method (CPM) is a method of planning project scheduling based on a network diagram containing the activity trajectories during the project implementation.

No	Kegiatan	Kode Kegiatan	Kegiatan Pendahulu	Waktu (D)
1	Pek. Persiapan	A	-	3
	LANTAI 1			
2	Pek. Pondasi	B	A	13
3	Pek. Dinding	C	B	18
4	Pek. Kusen	D	B	3
5	Pek. Plat Lantai	E	B	4
6	Pek. Lantai dan Plafond	F	C,D,E	12
7	Pek. Instalasi Listrik	G	F	6
8	Pek. Cat dan Laburan	H	G	7
	LANTAI 2			
9	Pek. Dinding	I	H	18
10	Pek. Kusen	J	H	3
11	Pek. Atap	K	I,J	10
12	Pek. Lantai dan Plafond	L	K	12
13	Pek. Instalasi Listrik	M	L	6
14	Pek. Cat dan Laburan	N	M	7
15	Pek. Tangga	O	N	8

Figure 1. Construction Project Activities Data

Based on the series of activities in the construction project of BAPPEDA Archive/Asset Warehouse in figure 1 results network diagram work as in figure 2 network diagram.

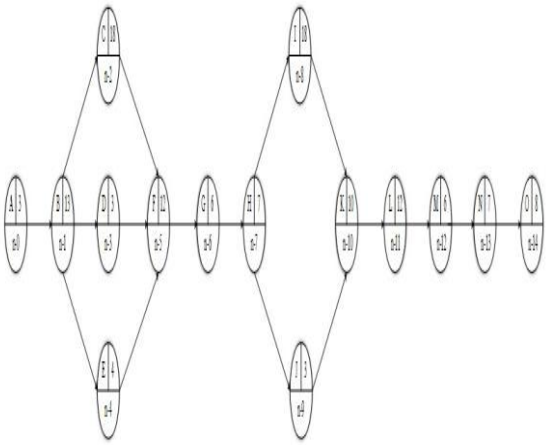


Figure 2. Network Diagram

The calculation to determine the settling time in the CPM method consists of two stages, namely forward and backward calculation. Here is an explanation of each stage.

1. Forward calculation

Forward calculation is done from the beginning of the network moving towards the end of the network by performing calculations.

a. ES (Early Start)

ES_{0-1} : 0

ES_{1-2} : 0 + 3 = 3

ES_{1-3} : 0 + 3 = 3

ES_{1-4} : 0 + 3 = 3

ES_{2-5} : 3 + 13 = 16

ES_{3-5} : 3 + 13 = 16

ES_{4-5} : 3 + 13 = 16

ES_{5-6} : 16 + 18 = 34

ES_{6-7} : 34 + 12 = 46

ES_{7-8} : 46 + 6 = 52

ES_{7-9} : 46 + 6 = 52

ES_{8-10} : 52 + 7 = 59

ES_{9-10} : 52 + 7 = 59

ES_{10-11} : 59 + 18 = 77

ES_{11-12} : 68 + 8 = 76

ES_{12-13} : 77 + 10 = 87

ES_{13-14} : 99 + 6 = 105

ES_{14-15} : 105 + 7 = 112

b. EF (Early Finish)

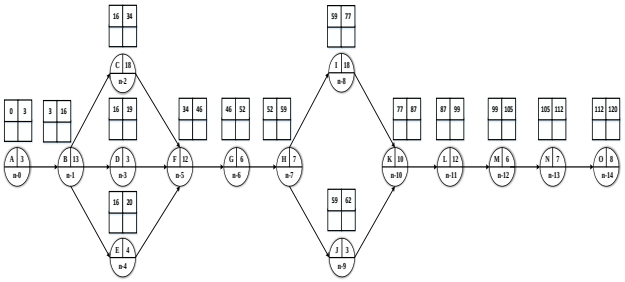
EF_{0-1}	:	ES_{0-1}	+	D_{0-1}	=	0	+	3	=	3
EF_{1-2}	:	ES_{1-2}	+	D_{1-2}	=	3	+	13	=	16
EF_{1-3}	:	ES_{1-3}	+	D_{1-3}	=	3	+	13	=	16
EF_{1-4}	:	ES_{1-4}	+	D_{1-4}	=	3	+	13	=	16
EF_{2-5}	:	ES_{2-5}	+	D_{2-5}	=	16	+	18	=	34
EF_{3-5}	:	ES_{3-5}	+	D_{3-5}	=	16	+	3	=	19
EF_{4-5}	:	ES_{4-5}	+	D_{4-5}	=	16	+	4	=	20
EF_{5-6}	:	ES_{5-6}	+	D_{5-6}	=	34	+	12	=	46
EF_{6-7}	:	ES_{6-7}	+	D_{6-7}	=	46	+	6	=	52
EF_{7-8}	:	ES_{7-8}	+	D_{7-8}	=	52	+	7	=	59
EF_{7-9}	:	ES_{7-9}	+	D_{7-9}	=	52	+	7	=	59
EF_{8-10}	:	ES_{8-10}	+	D_{8-10}	=	59	+	18	=	77
EF_{9-10}	:	ES_{9-10}	+	D_{9-10}	=	59	+	3	=	62
EF_{10-11}	:	ES_{10-11}	+	D_{10-11}	=	77	+	10	=	87
EF_{11-12}	:	ES_{11-12}	+	D_{11-12}	=	76	+	12	=	88
EF_{12-13}	:	ES_{12-13}	+	D_{12-13}	=	87	+	6	=	93
EF_{13-14}	:	ES_{13-14}	+	D_{13-14}	=	105	+	7	=	112
EF_{14-15}		ES_{14-15}	+	D_{14-15}	=	112	+	8	=	120

No	Kode Kegiatan	Kegiatan		Durasi (dalam hari)	Paling Awal	
		i-node	j-node		Mulai (ES)	Selesai (EF)
1	A	0	1	3	0	3
2	B	1	2	13	3	16
3	C	2	5	18	16	34
4	D	3	5	3	16	19
5	E	4	5	4	16	20
6	F	5	6	12	34	46
7	G	6	7	6	46	52
8	H	7	8	7	52	59
9	I	8	10	18	59	77
10	J	9	10	3	59	62
11	K	10	11	10	77	87
12	L	11	12	12	76	88
13	M	12	13	6	87	93
14	N	13	14	7	105	112
15	O	14	15	8	112	120

Figure 1. ES and EF Calculation

From figure .3 the calculations of ES and EF produce forward calculation diagram as shown in figure 4.

Figure 2. Forward Calculation Network Diagram



2. *Backward Calculation*

The backward calculation is used to calculate the slowest start time (LS) and the slowest completion time (LF) by performing the following calculations

a. Late Finish (LF)

LF_{14-15}						120
LF_{13-14}	:	120	-	8	=	112
LF_{12-13}	:	112	-	7	=	105
LF_{11-12}	:	105	-	6	=	99
LF_{10-11}	:	99	-	12	=	87
LF_{9-10}	:	87	-	10	=	77
LF_{8-10}	:	87	-	10	=	77
LF_{7-9}	:	77	-	3	=	74
LF_{7-8}	:	77	-	18	=	59
LF_{6-7}	:	59	-	7	=	52
LF_{5-6}	:	52	-	6	=	46
LF_{4-5}	:	46	-	12	=	34
LF_{3-5}	:	46	-	12	=	34
LF_{2-5}	:	46	-	12	=	34
LF_{1-4}	:	34	-	4	=	30
LF_{1-3}	:	34	-	3	=	31
LF_{1-2}	:	34	-	18	=	16
LF_{0-1}	:	16	-	13	=	3

b. Late Start (LS)

LS_{14-15}	:	LF_{14-15}	-	D_{14-15}	=	120	-	8	=	112
LS_{13-14}	:	LF_{13-14}	-	D_{13-14}	=	112	-	7	=	105
LS_{12-13}	:	LF_{12-13}	-	D_{12-13}	=	105	-	6	=	99
LS_{11-12}	:	LF_{11-12}	-	D_{11-12}	=	99	-	12	=	87
LS_{10-11}	:	LF_{10-11}	-	D_{10-11}	=	87	-	10	=	77
LS_{9-10}	:	LF_{9-10}	-	D_{9-10}	=	77	-	3	=	74
LS_{8-10}	:	LF_{8-10}	-	D_{8-10}	=	77	-	18	=	59
LS_{7-9}	:	LF_{7-9}	-	D_{7-9}	=	74	-	7	=	67
LS_{7-8}	:	LF_{7-8}	-	D_{7-8}	=	59	-	7	=	52
LS_{6-7}	:	LF_{6-7}	-	D_{6-7}	=	52	-	6	=	46
LS_{5-6}	:	LF_{5-6}	-	D_{5-6}	=	46	-	12	=	34
LS_{4-5}	:	LF_{4-5}	-	D_{4-5}	=	34	-	4	=	30
LS_{3-5}	:	LF_{3-5}	-	D_{3-5}	=	34	-	3	=	31
LS_{2-5}	:	LF_{2-5}	-	D_{2-5}	=	34	-	18	=	16
LS_{1-4}	:	LF_{1-4}	-	D_{1-4}	=	30	-	13	=	17
LS_{1-3}	:	LF_{1-3}	-	D_{1-3}	=	31	-	13	=	18
LS_{1-2}	:	LF_{1-2}	-	D_{1-2}	=	16	-	13	=	3
LS_{0-1}	:	LF_{0-1}	-	D_{0-1}	=	3	-	3	=	0

As seen in Figure 5. LS and LF calculation

Figure 3. Calculation LS dan LF

No	Kode Kegiatan	Kegiatan		Durasi (dalam hari)	Paling Akhir	
		i-node	j-node		Mulai (LS)	Selesai (LF)
1	A	0	1	3	0	3
2	B	1	2	13	3	16
3	C	2	5	18	16	34
4	D	3	5	3	31	34
5	E	4	5	4	30	34
6	F	5	6	12	34	46
7	G	6	7	6	46	52
8	H	7	8	7	52	59
9	I	8	10	18	59	77
10	J	9	10	3	74	77
11	K	10	11	10	77	87
12	L	11	12	12	87	99
13	M	12	13	6	99	105
14	N	13	14	7	105	112
15	O	14	15	8	112	120

From Figure 5 The calculations of LS and LF produce a forward calculation diagram as shown in Figure 6.

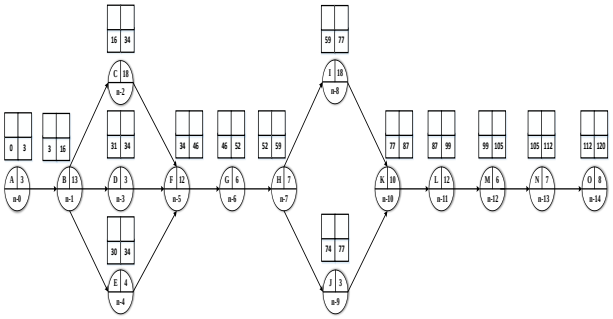


Figure 8. Network Critical Path Methode

1. *Total Float Calculation*

Slack or float is the amount of time delays allowed without affecting the total time of project execution. Total Float (TF) is the amount of time allowed an activity may be delayed, by the following formula

TF = LF- EF

As seen on figure 7. Calculation TF

No	Kode Kegiatan	Kegiatan		Durasi (dalam hari)	Paling Awal		Paling Akhir		Total Float (TF)
		i-node	j-node		Mulai (ES)	Selesai (EF)	Mulai (LS)	Selesai (LF)	
1	A	0	1	3	0	3	0	3	0
2	B	1	2	13	3	16	3	16	0
3	C	2	5	18	16	34	16	34	0
4	D	3	5	3	16	19	31	34	15
5	E	4	5	4	16	20	30	34	14
6	F	5	6	12	34	46	34	46	0
7	G	6	7	6	46	52	46	52	0
8	H	7	8	7	52	59	52	59	0
9	I	8	10	18	59	77	59	77	0
10	J	9	10	3	59	62	74	77	15
11	K	10	11	10	77	87	77	87	0
12	L	11	12	12	76	88	87	99	11
13	M	12	13	6	87	93	99	105	12
14	N	13	14	7	105	112	105	112	0
15	O	14	15	8	112	120	112	120	0

Figure 7. TF Calculation

Based on figure 7 it is concluded that paths allowed to have float or delay are paths in activity D with a maximum allowed delay of 15 days, E with a maximum allowed delay of 14 days and J with a maximum allowed delay of 15 days.

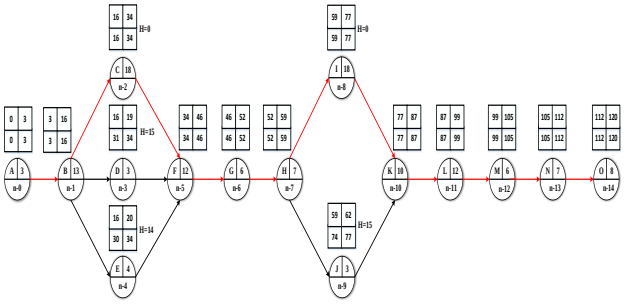


Figure 6 Backward Calculation Network Diagram

2.2 Cost Control Analysis

Cost control analysis is how to display the cost progress information and project schedule. This indicator controls and informs the position of project progress within a certain period during the project using the Earn Value Management (EVM) method.

2.2.1 Analisis Earn Value Management (EVM)

EVM calculations use planning weights and then use actual weights taken from the realization of work then calculated the actual weight, and actual costs incurred during the realization of those works.

The weight of planning, actual weight and actual costs that occur during the project can be seen in the figure 9 and 10 Results Calculation Earn Value Management

NO	URAIAN PEKERJAAN	BOBOT (%)	BULAN KE I				BULAN KE II			
			MINGGU KE :				MINGGU KE :			
			1	2	3	4	5	6	7	8
1	PEK. PERSIAPAN	1.21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21
	LANTAI 1									
2	PEK. PONDASI	16.76		8.38	16.76	16.76	16.76	16.76	16.76	16.76
3	PEK. DINDING	18.81				9.41	18.81	18.81	18.81	18.81
4	PEK. KUSEN	1.76					1,76	1,76	1,76	1,76
5	PEK. PLAT LANTAI	8.57						4.28	8.57	8.57
6	PEK. LANTAI DAN PLAFOND	4.69								4,69
7	PEK. INSTALASI LISTRIK	0.65								
8	PEK. CAT DAN LABURAN	2.20								
	LANTAI 2									
9	PEK. DINDING	12.76								
10	PEK. KUSEN	2.12								
11	PEK. ATAP	13.49								
12	PEK. LANTAI DAN PLAFOND	6.39								
13	PEK. INSTALASI LISTRIK	1.04								
14	PEK. CAT DAN LABURAN	2.72								
15	PEK. TANGGA	6.83								
	TOTAL BOBOT	100	1.21	9.59	17.97	27.38	38.54	42.82	47.11	51.80

Figure 9. calculation result Earn Value Management (EVM)

NO	URAIAN PEKERJAAN	BOBOT (%)	BULAN KE III				BULAN KE IV			
			MINGGU KE :				MINGGU KE :			
			9	10	11	12	13	14	15	16
1	PEK. PERSIAPAN	1.21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21
	LANTAI 1									
2	PEK. PONDASI	16.76	16.76	16.76	16.76	16.76	16.76	16.76	16.76	16.76
3	PEK. DINDING	18.81	18.81	18.81	18.81	18.81	18.81	18.81	18.81	18.81
4	PEK. KUSEN	1.76	1,76	1,76	1,76	1,76	1,76	1,76	1,76	1,76
5	PEK. PLAT LANTAI	8.57	8.57	8.57	8.57	8.57	8.57	8.57	8.57	8.57
6	PEK. LANTAI DAN PLAFOND	4.69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69
7	PEK. INSTALASI LISTRIK	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
8	PEK. CAT DAN LABURAN	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
	LANTAI 2									
9	PEK. DINDING	12.76		6,38	12.76	12.76	12.76	12.76	12.76	12.76
10	PEK. KUSEN	2.12			2.12	2.12	2.12	2.12	2.12	2.12
11	PEK. ATAP	13.49				6.75	13.49	13.49	13.49	13.49
12	PEK. LANTAI DAN PLAFOND	6.39						6.39	6.39	6.39
13	PEK. INSTALASI LISTRIK	1.04							1.04	1.04
14	PEK. CAT DAN LABURAN	2.72							2.72	2.72
15	PEK. TANGGA	6.83							4.79	6.83
	TOTAL BOBOT	100	54.65	61.03	69.53	76.28	83.02	89.25	97.96	100

Figure 10. Calculation Result Earn Value Management (Next)

From Figure 9 and Figure 10 there are several variables that must be calculated in EVM: planned value (PV), earned value (EV), schedule variant (SV), cost variance (CV), schedule performance index (SPI), cost performance index (CPI), estimate actual cost (EAC) and estimate time to complete (ETC).

1. Calculation Planned Value (PV)

The calculation of the planned value is to identify the percentage of plan weight per week and the cost to be incurred; planned value is obtained from the planned weight percentage of each week multiplied by budget actual cost (BAC), bac is the agreed contract value of Rp. 174.740.961,70.

Perhitungan PV pada mingguke 1 :
PV = (%progress rencana) x BAC
= 1.21 x 174.740.961,70
= 2.114.365,64

Perhitungan PV pada mingguke 2 :
PV = (%progress rencana) x BAC
= 9.59 x 174.740.961,70
= 16.757.658,23

Perhitungan PV pada mingguke 3 :
PV = (%progress rencana) x BAC
= 17.97 x 174.740.961,70
= 31.400.950,82

Perhitungan PV pada mingguke 4 :
PV = (%progress rencana) x BAC
= 27.38 x 174.740.961,70
= 47.844.075,31

2. Calculation Earned Value (EV)

The calculation of earned value is to identify the actual weight percentage of each week and the cost to be incurred, earned value is obtained from the actual weight percentage each week which is done multiplied by actual cost budget (BAC).

Perhitungan EV pada mingguke 1 :
EV = (%progress aktual) x BAC
= 1.21 x 174.740.961,70
= 2.114.365,64

Perhitungan EV pada mingguke 2 :
EV = (%progress aktual) x BAC
= 8.48 x 174.740.961,70
= 14.818.033,55

Perhitungan EV pada mingguke 3 :
EV = (%progress aktual) x BAC
= 17.97 x 174.740.961,70
= 31.400.950,82

Perhitungan EV pada mingguke 4 :
EV = (%progress aktual) x BAC
= 30.74 x 174.740.961,70
= 53.715.371,63

3. Analisa Varian Cost (CV) and Analisa Varian Schedule (SV)

Cost variant analysis is to identify the cost to be spent whether the time will be in accordance with the contract, more efficient or even more than the predetermined contract value, cv is calculated from the amount of ev - ac. Analysis of the variant of the schedule or schedule variant (SV) is to identify whether the time will work in accordance with the schedule, faster or even late from the schedule that has been determined, sv calculations obtained from ev - pv.

Perhitungan CV dan SV mingguke 1:
CV = EV - AC
= 2.114.365,64 - 2.106.200,00
= 8.165,64
SV = EV – PV
= 2.114.365,64 - 2.114.365,64
= 0

Perhitungan CV dan SV mingguke 2:
CV = EV - AC
= 14.818.033,55 – 14.810.310,80
= 7.722,7
SV = EV – PV
= 14.818.033,55 - 16.757.658,23
= - 1.939.624,68

Perhitungan CV dan SV mingguke 3:
CV = EV – AC
= 31.400.950,82 – 31.393.806,20
= 7.144,62
SV = EV – PV
= 31.400.950,82 - 31.400.950,82
= 0

Perhitungan CV dan SV mingguke 4:
CV = EV – AC
= 53.715.371,63 – 53.712.600,18
= 2.771,45
SV = EV – PV
= 53.715.371,63 - 47.844.075,31
= 5.871.296,32

4. Analisa Indeks performance

The performance index analysis consists of two parts: the cost performance index (CPI) and the schedule performance index (SPI). Cpi shows the weight of the value obtained against the cost incurred, cpi obtained from ev / ac, spi shows how much work can be completed against the planned work, spi obtained from ev / pv.

Perhitungan CPI dan SPI mingguke 1:
CPI = EV/AC
= 2.114.365,64 / 2.106.200,00
= 1
SPI = EV/PV
= 2.114.365,64 / 2.114.365,64
= 1

Perhitungan CPI dan SPI mingguke 2:
CPI = EV/AC
= 14.818.033,55 / 14.810.310,80
= 1
SPI = EV/PV
= 14.818.033,55 / 16.757.658,23
= 0,88

Perhitungan CPI dan SPI mingguke 3:
CPI = EV/AC
= 31.400.950,82 / 31.393.806,20
= 1
SPI = EV/PV
= 31.400.950,82 / 31.400.950,82
= 1

Perhitungan CPI dan SPI mingguke 4:
CPI = EV/AC
= 53.715.371,63 / 53.712.600,18
= 1
SPI = EV/PV
= 53.715.371.63 / 47.844.075,31
= 1,12

5. Analisa Estimasi Biaya (EAC) dan Waktu Penyelesaian Proyek (ETC)

Eac calculation is how to calculate the estimated cost based on bac / contract value divided by cost performance (cpi), calculation etc obtained from agreed contract time divided by schedule performance (spi).

Perhitungan EAC dan ETC mingguke 1:
EAC = BAC/CPI
= 174.740.961,70 / 1
= 174.740.961,70
ETC = OTE/SPI
= 120 / 1
= 120

Perhitungan EAC dan ETC mingguke 2:
EAC = BAC/CPI
= 174.740.961,70 / 1
= 174.740.961,70
ETC = OTE/SPI
= 120 / 0,88
= 135,71

Perhitungan EAC dan ETC mingguke 3:
EAC = BAC/CPI
= 174.740.961,70 / 1
= 174.740.961,70
ETC = OTE/SPI
= 120 / 1
= 120

Perhitungan EAC dan ETC mingguke 4:
EAC = BAC/CPI
= 174.740.961,70 / 1
= 174.740.961,70
ETC = OTE/SPI
= 120 / 1.12
= 106.88

6. Result Recap Analisa Metode EVM

The following is the recap of the analysis of Earn Value Management (EVM) method as shown in Figure 11. Result of Recap EVM Analysis.

Minggu	Analisa Varian		Analisa Indeks Kerja		Analisa Estimasi	
	Waktu	Biaya	Waktu	Biaya	Waktu	Biaya
	SV (Rp)	CV (Rp)	SPI (Rp)	CPI (Rp)	ETC (Hari)	EAC (Rp)
1	0	8.165,64	1	1	120	174.740.961,70
2	- 1,939,624.68	7.722,7	0.88	1	135.71	174.740.961,70
3	0	7,144.62	1	1	120	174.740.961,70
4	5,871,296.32	2,771.45	1.12	1	106.88	174.740.961,70
5	0	256.44	1	1	120	174.740.961,70
6	2,603,640.33	429.21	1.03	1	115.96	174.740.961,70
7	0	513.06	1	1	120	174.740.961,70
8	0	62.16	1	1	120	174.740.961,70
9	0	5,501.37	1	1	120	174.740.961,70
10	- 2,026,995.13	6,870.56	0.98	1	122.33	174.740.961,70
11	- 0.03	13,845.07	1	1	120	174.740.961,70
12	1,992,046.95	12,041.74	1.01	1	118.23	174.740.961,70
13	0	10,761.80	1	1	120	174.740.961,70
14	279,585.56	9,491.26	1	1	120	174.740.961,70
15	- 961.075.31	2,164.04	0.99	1	120.68	174.740.961,70
16	0	0	1	1	120	174.740.961,70

Gambar 11. Result Recap Analisa EVM

From the result of recap analysis on the calculation up to 16 weeks can be concluded the project is running as planned because the average time of completion (ETC) is 120 days, according to the duration of the project is 120 days and the cost incurred Rp 174.740.961,70, Total budget (BAC) of Rp 174,740,961.70, SPI value> 1 shows project acceleration compared to planned schedule, CPI value = 1 indicates cost incurred equal to planned cost.

2.3 Analisis Manajemen Project Risk

Project risk management is an important activity when undertaking a project. This project risk management serves to identify possible risks that occur when the project takes place and reduce the possibility of risk occurring. The following are the steps to identify risks and their handling using the Expected Monetary Value (EMV) method.

1. Risk Identification

Risk identification is how to create a list of risks that usually occur when the project. This identification process is done by interviewing with Project Manager and Executor. The results of risk identification analysis that has been done can be seen in Figure 13 Risk Identification.

Kode Resiko	Deskripsi Resiko
1	Perkiraan jadwal yang tidak sesuai perencanaan
2	Pekerja lapangan yang sakit sehingga mempengaruhi jadwal proyek
3	Kecelakaan kerja
4	Pengiriman barang terlambat
5	Terjadinya hujan / banjir / bencana alam
6	Kerusakan alat proyek (mobil, dumptruck, pompa air, beton molen)
7	Hilangnya bahan baku proyek dan alat proyek

Figure 13. Risk Identification

2. Risk assessment

Risk assessment is conducted to ensure the objectivity of risk variables by assessing importance, analyzing risk categories and assessing the risk portion by providing specific criteria. The risk analysis is based on the probability of the event and the consequences to be performed, the probability value is determined by the frequency of occurrence, whereas the value of the consequence is determined based on the cost or other compensation to be incurred, the value of this consequence is the most predicted number against a risk, by the following formula.

EMV = Probabilitas x Konsekuensi (Probability x Consequence)

Where :
EMV : Expected Monetary Value
Probability : Risk occurrence frequenc
Consequence : Cost or other incurred compensation

Here is the table of calculation of assessment as shown in Figure 14 Calculation of risk values

Kode Resiko	Probabilitas (%)	Konsekuensi (Rp.)	EMV
1	50	5.000.000	2.500.000
2	25	3.000.000	750.000
3	10	2.000.000	200.000
4	30	1.000.000	300.000
5	15	1.000.000	150.000
6	5	2.250.000	112.500
7	5	2.500.000	125.000
Total			4.137.500

Figure 14. Risk Value Calculation

Figures 4.137.500 indicate that there is a threat when the project takes place, the company must spend as much as 4,427,500 to handle possible risks.

3. Risk management

From the result of risk assessment that has been done before, then do risk mitigation or risk handling action. As shown in Figure 15. Risk Handling.

Kode Resiko	Deskripsi Resiko	Penanganan Resiko
1	Perkiraan jadwal yang tidak sesuai perencanaan	Mempercepat pekerjaan yang tertunda dengan cara menambah pekerja
2	Pekerja lapangan yang sakit sehingga mempengaruhi jadwal proyek	Memanfaatkan tenaga kerja yang ada, seperti mandor yang ikut menggantikan tugas pegawai, atau menambah pegawai baru
3	Kecelakaan Kerja	Selalu menggunakan alat keselamatan kerja dan tanda rambu-rambu sedang ada pekerjaan konstruksi
4	Pengiriman barang terlambat	Komunikasi dengan suplier barang dan membuat perjanjian jika terjadi keterlambatan barang, supplier bersedia mencari kebutuhan barang proyek dari pihak lain
5	Terjadinya hujan / banjir / bencana alam	Bila memungkinkan tetap menjalankan proyek sesuai jadwal.
6	Kerusakan alat proyek (mobil, dumptruck, pompa air, beton molen)	Mencari alat proyek yang baru dengan sementara meminjam kepada perusahaan lain atau menyewa ke perusahaan rental alat berat/konstruksi
7	Hilangnya bahan baku proyek dan alat proyek	Menitipkan kepada warga sekitar yang dapat dipercaya atau menyewa keamanan bila perlu

Figure 15. Risk management

3. Closing

The results of the research that has been done, can be concluded that the application of Project Management Information System at CV. LESTARI can assist managers in monitoring ongoing projects. The system can help managers estimate project completion time, The system can assist managers in estimating project completion costs, and can store risk and handling data along with costs that must be incurred when risk occurs.

There are several suggestions that can be made for the development of this project management information system application :

1. *For further development the system can be applied in mobile for easy access.*
2. *Adding weather monitoring to make it easier in integration for risk management.*

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