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Project Development Management of Rungkut Tower Apartments with Critical Path Method Approach and Pert

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A B S T R A C T

Project management is a science that is concerned with organizing and managing resources by techniques to the results determined the purpose of this study is to analyze the needs of the time and resources required, determine the critical path of the project, analyzing the timing of completion and cost of the project acceleration. This study uses a CPM (critical path method) and PERT. CPM is used to plan and supervision the project with the network system and time required to complete the project. Results of this research project scheduling with CPM can be completed earlier than conventional scheduling the number of labor costs Rp. 220.370.000. So that project can be completed faster with less cost that the scheduling PT. Tata Bumi Raya.

Keywords: CPM, PERT, Madura, Hotel, Information System.

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1. Introduction

Projects are activities that are take place within a limited time period by allocating certain resources and intended to produce a product or deliverable whose quality criteria have been clearly outlined [1]. PT. Tata Bumi Raya has several obstacles that cause disruption to the project. The obstacles in the implementation of this project according to the field coordinator PT. Tata Bumi Raya includes several things, for example delays in the supply of materials, some workers who do not comply with the project schedule, and planning schedules that are not appropriate, in this case the contractor, namely PT. Tata Bumi Raya does not use schedules or scheduling related to the existence of a critical path, so that activities overlap between one activity and another.

In a project the affirmation of the relationship between activities is needed for planning a project. In estimating time and costs, a project also needs to be optimized, this is usually done to optimize existing resources and minimize risks, but still obtain optimal results. The purpose of this study is to analyze the optimal time and resource needs to complete the project, find out the critical trajectories in the project that need to be considered smooth, analyze the project completion time and project acceleration costs before accelerating completion time.

2. literature review

2.1. Project

Projects in network analysis are a series of activities that aim to produce unique products and are only carried out within a certain period (temporary). Projects can be defined as a series of activities that only occur once [2].

2.2. Project Management

Project management is a science and an art relating to leading and coordinating human and material resources using modern processing techniques to achieve predetermined targets, namely the scope, quality, schedule, and costs, as well as the interests of the stakeholders [3].

2.3. CPM (Critical Path Method)

CPM is a network analysis which seeks to optimize the total project cost through reduction and acceleration of the total project completion time, Levin and Kirkpatrick (1972). With CPM the amount of time needed to complete various stages of a project is considered known with certainty, as well as the resources used with the time needed to complete the project.

Network planning (network work) is a relationship of dependence between the parts of the work described in a network diagram.

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In previsius research explain that in conducting critical path analysis, two two-pass processes are used, consisting of a forward pass and a backward pass. ES and EF are determined during the forward pass, LS and LF are determined during the backward pass[4]. ES (earliest start) is the time before an activity can be started, assuming all predecessors are finished. EF (earliest finish) is the time before an activity can be completed. LS (latest start) is the last time an activity can be started so that it does not delay the completion time of the entire project. LF (latest finish) is the last time an activity can be completed so as not to delay the completion time of the entire project.

Total Float is the difference between the time available to carry out activities and the time required to carry out these activities (D).

Free float for an activity is the time remaining when an activity is carried out at the earliest time, as well as the activities that follow it.

2.4. PERT

PERT or Project Evaluation and Review Technique is a Management Science model for planning and controlling a project (Siswanto, 2007). Method PERT (Project Evaluation and Review Technique) is a method that aims to reduce the occurrence of delays, and production disruptions, as well as coordinate various parts of a work as a whole in order to accelerate the completion of the project.

3. Methods

CPM method to find out the path critical, then the calculation is done using the PERT method with Ms. software tools. Project to calculate the cost of time and resources needed.

4. Result and Discussion

This research was conducted in two stages, viz processing stage using CPM Method and PERT Method. At the estimated stages of the timeframe used to complete each of the project activities for the construction of Rungkut Tower Apartments. Estimated time period must be based on the duration of work activities and the relationship of each activity. The following is an estimated table of activity periods. Shown on table 1.

In the table above it is also explained the estimated timeframe used from each activity from the start of the activity to the end of the activity in the order of the activities guided by the preconditions of the previous activity. Cost budget analysis is a calculation of the total amount of costs required for workers' wages, as well as other costs related to project implementation. But at this time the calculation only calculates the cost of workers. The following are the results of the planned cost of workers whose time has been optimized based on the existing network diagram. Shown on table 2

Table 1 Period of Activity

No	Kegiatan	Durasi (jam)	Mulai	Selesai	Prasyarat
1	A0.G	192	Mon 26/01/15	Thu 26/02/15	
2	A0.LC.T	30	Fri 27/02/15	Wed 04/03/15	1
3	A0.LC.RP	18	Wed 04/03/15	Fri 06/03/15	2
4	A0.PC.T	60	Thu 12/03/15	Mon 23/03/15	2;8
5	A0.PC.RP	36	Mon 23/03/15	Fri 27/03/15	4
6	A0.BB.T	30	Tue 07/04/15	Fri 10/04/15	4;9
7	A0.BB.RP	18	Fri 10/04/15	Tue 14/04/15	6
8	A0.LC.B	24	Mon 09/03/15	Wed 11/03/15	3
9	A0.PC.B	48	Mon 30/03/15	Mon 06/04/15	5
10	A0.BB.B	24	Wed 15/04/15	Fri 17/04/15	7
11	A0.BB.BP	6	Mon 20/04/15	Mon 20/04/15	10
12	A1.K.T	10	Mon 20/04/15	Tue 21/04/15	6;10
13	A1.K.RP	4	Tue 21/04/15	Tue 21/04/15	12
14	A1.PL.T	10	Wed 22/04/15	Thu 23/04/15	12;18
15	A1.PL.RP	4	Fri 24/04/15	Fri 24/04/15	14
16	A1.BB.T	10	Mon 27/04/15	Tue 28/04/15	14;19
17	A1.BB.RP	4	Tue 28/04/15	Wed 29/04/15	16
18	A1.K.B	8	Tue 21/04/15	Wed 22/04/15	13
19	A1.PL.B	8	Fri 24/04/15	Mon 27/04/15	15
20	A1.BB.B	8	Wed 29/04/15	Thu 30/04/15	17
21	A1.K.BP	2	Wed 22/04/15	Wed 22/04/15	18
22	A1.PL.BP	2	Mon 27/04/15	Mon 27/04/15	19
23	A1.BB.BP	2	Thu 30/04/15	Thu 30/04/15	20
24	A2.K.T	10	Thu 30/04/15	Fri 01/05/15	16;20
25	A2.K.RP	4	Fri 01/05/15	Fri 01/05/15	24

Table 2 Worker cost plan

No	Kegiatan	jenis pekerja	Mulai	Selesai	jumlah pekerja	biaya (Rp)	total biaya
		mandor			1	70000	70000
	gedung A	kepala pekerja			1	60000	60000
1	A0.G	operator	Mon 26/01/15	Thu 26/02/15	1	1440000	1440000
2	A0.LC.T	pekerja biasa	Fri 27/02/15	Wed 04/03/15	15	300000	4500000
3	A0.LC.RP	pekerja biasa	Wed 04/03/15	Fri 06/03/15	15	300000	4500000
4	waktu longgar						
5	A0.PC.RP	pekerja biasa	Mon 23/03/15	Fri 27/03/15	15	200000	3000000
6	waktu longgar						
7	A0.BB.RP	pekerja biasa	Fri 10/04/15	Tue 14/04/15	15	150000	2250000
8	A0.LC.B	pekerja biasa	Mon 09/03/15	Wed 11/03/15	10	150000	1500000
9	A0.PC.B	pekerja biasa	Mon 30/03/15	Mon 06/04/15	10	300000	3000000
10	A0.BB.B	pekerja biasa	Wed 15/04/15	Fri 17/04/15	10	150000	1500000
11	A0.BB.BP	pekerja biasa	Mon 20/04/15	Mon 20/04/15	15	50000	750000
12	A1.K.T	pekerja biasa	Mon 20/04/15	Tue 21/04/15	15	50000	750000
13	A1.K.RP	pekerja biasa	Tue 21/04/15	Tue 21/04/15	15	50000	750000
14	waktu longgar						
15	waktu longgar						
16	waktu longgar						
17	A1.BB.RP	pekerja biasa	Tue 28/04/15	Wed 29/04/15	15	50000	750000
18	A1.K.B	pekerja biasa	Tue 21/04/15	Wed 22/04/15	10	50000	500000
19	waktu longgar						
20	A1.BB.B	pekerja biasa	Wed 29/04/15	Thu 30/04/15	10	50000	500000
21	A1.K.BP	pekerja biasa	Wed 22/04/15	Wed 22/04/15	15	50000	750000
22	A1.PL.BP	pekerja biasa	Mon 27/04/15	Mon 27/04/15	15	50000	750000
23	A1.BB.BP	pekerja biasa	Thu 30/04/15	Thu 30/04/15	15	50000	750000
24	waktu longgar						
25	A2.K.RP	pekerja biasa	Fri 01/05/15	Fri 01/05/15	15	50000	750000

The table above is the cost of construction workers in the tower management building, but this does not include the optimization of loose time.

The following is a comparison of the research results schedule with the schedule from PT. Tata Bumi Raya:

In the table above we get the different calculation of labor costs, between scheduling using CPM in research and scheduling from PT. Tata Bumi Raya in the Rungkut tower apartment development project, the following details:

a. PT. Tata Bumi Raya

The total labor cost is Rp. 228,820,000

The project was completed on 16 October 2015

b. Research using CPM

Total labor costs using

CPM method of Rp. 147,070,000

The total cost of workers in the optimization of Rp. 73,300,000

The total labor cost is Rp. 147,070,000 + Rp. 73,300,000 = Rp 20,370,000

The project was completed on 16 October 2015

Table 3. Ordinary Schedule Activity on PT Tata Bumi Raya

No	Kegiatan	jenis pekerja	Mulai	Selesai	jumlah pekerja	biaya (Rp)	total biaya
		mandor			1	70000	70000
	gedung A	kepala pekerja			1	60000	60000
1	A0.G	operator	Mon 26/01/15	Thu 26/02/15	1	1440000	1440000
2	A0.LC.T	pekerja biasa	Fri 27/02/15	Wed 04/03/15	15	300000	4500000
3	A0.LC.RP	pekerja biasa	Wed 04/03/15	Fri 06/03/15	15	300000	4500000
4	A0.PC.T	pekerja biasa	Thu 12/03/15	Mon 23/03/15	15	550000	8250000
5	A0.PC.RP	pekerja biasa	Mon 23/03/15	Fri 27/03/15	15	200000	3000000
6	A0.BB.T	pekerja biasa	Tue 07/04/15	Fri 10/04/15	15	150000	2250000
7	A0.BB.RP	pekerja biasa	Fri 10/04/15	Tue 14/04/15	15	150000	2250000
8	A0.LC.B	pekerja biasa	Mon 09/03/15	Wed 11/03/15	10	150000	1500000
9	A0.PC.B	pekerja biasa	Mon 30/03/15	Mon 06/04/15	10	300000	3000000
10	A0.BB.B	pekerja biasa	Wed 15/04/15	Fri 17/04/15	10	150000	1500000
11	A0.BB.BP	pekerja biasa	Mon 20/04/15	Mon 20/04/15	15	50000	750000
12	A1.K.T	pekerja biasa	Mon 20/04/15	Tue 21/04/15	15	50000	750000
13	A1.K.RP	pekerja biasa	Tue 21/04/15	Tue 21/04/15	15	50000	750000
14	A1.PL.T	pekerja biasa	Wed 22/04/15	Thu 23/04/15	15	50000	750000
15	A1.PL.RP	pekerja biasa	Fri 24/04/15	Fri 24/04/15	15	50000	750000

Table 3. Schedule Activity on PT Tata Bumi Raya after implementing CPM

No	Kegiatan	jenis pekerja	Mulai	Selesai	jumlah pekerja	biaya (Rp)	total biaya
		mandor			1	70000	70000
	gedung A	kepala pekerja			1	60000	60000
1	A0.G	operator	Mon 26/01/15	Thu 26/02/15	1	1440000	1440000
2	A0.LC.T	pekerja biasa	Fri 27/02/15	Wed 04/03/15	15	300000	4500000
3	A0.LC.RP	pekerja biasa	Wed 04/03/15	Fri 06/03/15	15	300000	4500000
4	waktu longgar						
5	A0.PC.RP	pekerja biasa	Mon 23/03/15	Fri 27/03/15	15	200000	3000000
6	waktu longgar						
7	A0.BB.RP	pekerja biasa	Fri 10/04/15	Tue 14/04/15	15	150000	2250000
8	A0.LC.B	pekerja biasa	Mon 09/03/15	Wed 11/03/15	10	150000	1500000
9	A0.PC.B	pekerja biasa	Mon 30/03/15	Mon 06/04/15	10	300000	3000000
10	A0.BB.B	pekerja biasa	Wed 15/04/15	Fri 17/04/15	10	150000	1500000
11	A0.BB.BP	pekerja biasa	Mon 20/04/15	Mon 20/04/15	15	50000	750000
12	A1.K.T	pekerja biasa	Mon 20/04/15	Tue 21/04/15	15	50000	750000
13	A1.K.RP	pekerja biasa	Tue 21/04/15	Tue 21/04/15	15	50000	750000
14	waktu longgar						
15	waktu longgar						

4. Conclusion

1. From the network diagram above of 203 activities overall in the tower rungkut apartment development project there are 100 activities that enter the critical path and 103 activities that do not enter the critical path.
2. Optimizing the time included in loose time by adding overtime hours for 4 working hours per day with a maximum of 6 workers per day. From the results of optimization of loose time using funds of Rp. 109,950,000
3. From the estimated project costs the results obtained are:
   a. The total amount of labor costs in scheduling PT. Tata Bumi Raya in the amount of Rp. 228.82 million, the Project was completed on October 16, 2015
   b. The total amount of labor costs by scheduling using CPM is Rp. 147,070,000 + Rp. 73,300,000 = Rp 220,370,000, the Project was completed on October 16, 2015.

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