SYSTEM INFORMATION OF HUMAN RESOURCES MANAGENENT ON CONSTRUCTION PROJECTS IN CV. MEGALOMAN

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ABSTRAK

CV. MEGALOMAN was founded by Mr. Zamzam Zamaludin. The Company is engaged in freight services, General Trading and Construction. Moving goods services include coal hauling & furniture. CV. MEGALOMAN is located at Jl. Adipati Kertamanah no. 46 Baleendah, Kab. Bandung

Based on the existing problems then needed human resource management information system on construction project in cv megaloman. Aims to get the right worker recommendations for project scheduling. One of the company's problems is the fluctuation (increase or decrease of sharp labor demand) on project scheduling and to minimize the fluctuation of the project schedule. Scheduling method uses PDM (Presedence Diagram Methode), RPWM Method (Position Weight Methode) to assist weighting on noncritical path, and Burgess Method is used to equit the human resources needed for the project.

Based on the results of tests that have been done can be concluded that this system has assisted the company in conducting project scheduling and equity of human resources so that its use more effective and efficient it is proven project scheduling results 20 days faster than the initial schedule takes 163 days to 143 days for complete the project and the number of workers required is less than the number of initial worker needs 50 workers to 40 workers.

Keywords: *Management Information System, Human Resources On Construction, Fluctation, Reasource Leveling, Presedence Diagram Methode, Position Weight Method, Burgess.*

1. INTRODUCTION

CV. MEGALOMAN was founded by Mr. Zamzam Zamaludin, a new company that has been established for 1 year now has 3 parts of the field within the company namely freight services, general trading and construction. Moving goods transportation services include coal & furniture transportation services, general trading into salt and aci distributor while in the field of construction of building construction such as houses, shop, shop building materials (matrial) and so on.

Based on the interview with Mr. Zamzam Zamaludin as Director of CV. Megaloman, he expressed that his company is still having problems in doing manpower planning or human resources (Human Resources). Of all the projects that have been completed the human resource planning of the company is still unstable or experiencing fluctuations (increase or decrease to the needs of labor is sharp), thus affecting the success of the project undertaken. Mr. Zamzam also added this situation resulted in the productivity of the company in the field of construction he compared with other construction companies in 1 year can work 3 to 4 projects that weigh the same as his company while CV. MEGALOMAN can only complete 2 projects only so that the company does not have competitiveness and profit is less significant.

Labor fluctuations greatly affect the success of the project because with the fluctation in the implementation of the project vulnerable to experience delay in the work. If there is a large number of fluctuations automatically must have a lot of labor while the company may not continue to be able to meet the amount of labor required according to the number of fluctuations that occur. If there is insufficient labor available for the workforce, the project will experience delays and the company will experience losses in terms of time and cost. One of the factors causing the occurrence of such fluctuations is the Human Resources manpower planning conducted by the company using only theoretical calculations, by

calculating the average needs of the total number of workers calculated from the total scope of work of the project expressed in hours of people divided by the project period.

Based on the above background can be concluded that the problem is the existence of human resource fluctuations in the workforce so that to minimize the occurrence of such fluctation is to make the distribution of Human Resources on the project manpower planning. For that will be built software that can make the distribution of Human Resources conducted in the process of Human Resources planning. The first step is to get the project stages in detail with the coding of the project activity using the WBS (Work Breakdown Structure), the two are scheduling using the PDM (Presedence Diagram Method) and RPWM (Position Weight Method) method to help weight the noncritical path and last equity (Resource Leveling) Human Resources using Burgess method.

The goal to be achieved in building this project management system is to help the company to minimize the fluctuation of the project workforce through equalization of labor in Human Resource Scheduling.

2. CONTENST PART

2.1. Research Methodology

The methodology used in this research is descriptive method. Descriptive method is a method in examining the status of a group of people, an object, a set of conditions, a system of thought, or a class of events in the present [3].

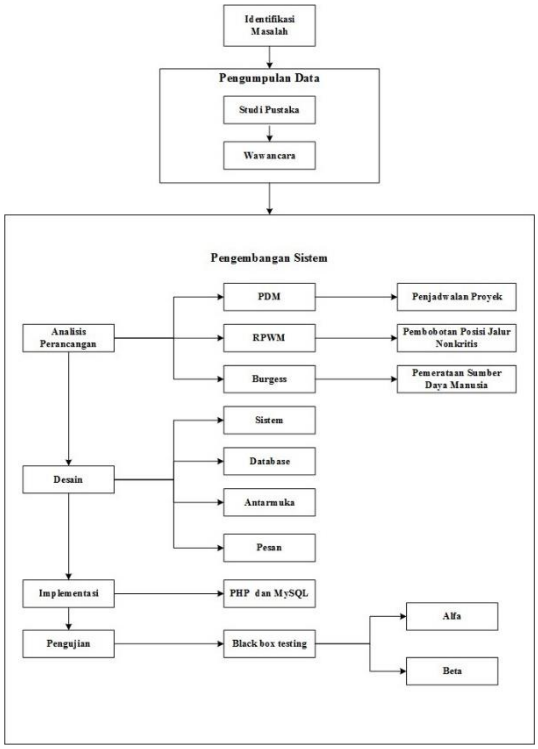


Figure 2.1 Research Methodology

2.2. Understanding Project Management

Project Management is the application of science, skills and skills, the best technical means and with limited resources, to achieve the goals and objectives that have been determined in order to obtain optimal results in terms of cost performance, quality and time, and safety. The definition of management in project planning and control is to plan, organize, lead and control the company's resources to achieve company goals.

2.3. Creat a Work Breakdown Structure

Work Breakdown Structure (WBS) is used for the coding of project activities based on the job level, following WBS in this study. Example code format:

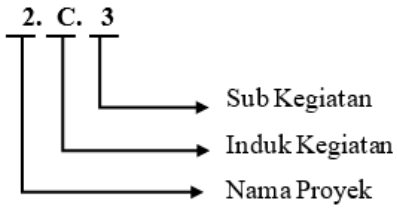


Figure 2.2 Encoding Pengkodean

Description of the encoding:

Table 1 Project Encoding Description

Code	Information
Number 1	Used for naming projects, example number 2 is used by Mr. H. Rahman's house project because the 2nd project the company is working on
Alphabet	Used for naming the parent of the project activity / work
Number 2	Used for sub naming of project activities / work

The following is an encoding compiled based on WBS:

Table 2 WBS Project

Project House Mr. H. Rahman		
No	Name of activity	WBS
1	Preparatory work	2.A
2	Field Cleaning	2.A.1
3	Installation of Bouwplank	2.A.2
4	Cement and Tool Warehouse	2.A.3
5	Excavation Works	2.B
6	Land soil as deep as 1 meter	2.B.1
7	Hoard Back Land Stakes	2.B.2
8	Batu Pond Foundation Work	2.C
9	spray sand under the foundation	2.C.1
10	Pairs of Empty Stone Foundation	2.C.2
Etc . .		

2.4. Determining Relationship Relationships or Overleaving

Data *predecessor* dan hubungan keterkaitan antar aktivitas proyek pembangunan rumah ditunjukkan pada Tabel 3 Data tersebut diperoleh dari pertimbangan kontraktor, mandor dan tukang yang ada di CV. MEGALOMAN.

Table 3 Hubungan Keterkaitan antar kegiatan

No	*WBS*	*Predecessor*	*Overlapping*
A	2.A		
1	2.A.1		
2	2.A.2	2.A.1	FS
3	2.A.3	2.A.1	SS
B	2.B		
4	2.B.1	2.A.1	FS
5	2.B.2	2.B.1	FF
C	2.C		
6	2.C.1	2.B.2	FS
7	2.C.2	2.C.3	FF
8	2.C.3	2.B.1, 2.B.2	FS, FS
D	2.D		
9	2.D.1	2.C.3	FS
10	2.D.2	2.D.1	FF
11	2.D.3	2.C.3	FS
12	2.D.4	2.D.3	FS
13	2.D.5	2.D.4	
14	2.D.6	2.D.4	FS
15	2.D.7	2.D.6	FS
16	2.D.8	2.D.7	FS
17	2.D.9	2.D.8	FS
18	2.D.10	2.D.9	FS
19	2.D.11	2.D.3	FS
20	2.D.12	2.D.11, 2.D.13	FS, FF
21	2.D.13	2.D.11	FS
	2.E		
22	2.E.1	2.D.9	FF
23	2.E.2	2.E.1	FS
24	2.E.3	2.E.2	FS
25	2.E.4	2.E.3	FS
26	2.E.5	2.E.4	FS
27	2.E.6	2.E.5	FS
28	2.E.7	2.E.6	FS
29	2.E.8	2.E.7	FS
F	2.F		
30	2.F..1	2.E.4	FS
31	2.F.2	2.F.1	FS
32	2.F.3	2.F.2	FS
	2.G		

No	*WBS*	*Predecessor*	*Overlapping*
33	2.G.1	2.D.12	FS
34	2.G.2	2.D.11	FS
35	2.G.3	2.G.1	FS
36	2.G.4	2.G.3, 2.G.2	FS, FF
	2.H		
37	2.H.1	2.G.3	SS
38	2.H.2	2.H.1	FS
39	2.H.3	2.H.2	SS
	2.I		
40	2.I.1	2.D.13	FS
41	2.I.2	2.I.1	FS
42	2.I.3	2.I.1	SS
43	2.I.4	2.I.1	SS
J	2.J		
44	2.J.1	2.I.1	FF
45	2.J.2	2.J.1, 2.I.1	FS, FS
46	2.J.3	2.G.3	FS
	2.K		
47	2.K.1	2.H.1	FS
48	2.K.2	2.H.1	FS
49	2.K.3	2.K.2	FS
50	2.K.4	2.H.1	FS
51	2.K.5	2.H.1	FS
52	2.K.6	2.H.1	FS
53	2.K.7	2.H.1	FS
54	2.K.8	2.H.1	FS
55	2.K.9	2.K.7, 2.K.8	FS, FS
	2.L		
56	2.L.1	2.J.2	FS
57	2.L.2	2.K.6, 2.K.7, 2.K.8	FS, FS, FS
58	2.L.3	2.L.2	
59	2.L.4	2.L.3	SS

2.5. Project Time Needs

In this study re-analyzed the timing of the implementation of the house development project Pak H. Rahman. The house construction project is a project in fiscal year 2016-2017 in Baleendah Kab. Bandung. Project development with realization of project completion for 163 days. The project started on January 2, 2017 to June 13, 2017. The timing of the house construction project runs every Monday to Sunday at 08.00 - 16.00 and rest periods from 12:00 to 13:00. Table 4 shows the provision of time spent on home building projects determined by project managers derived from theoretical calculations by calculating the average needs of the total number of workers calculated from the total project scope expressed in hours divided by the project time frame.

Table 4 Project Time Needs

Activities	Durasi	*Predecessor*	*Overlapping*
2.A			
2.A.1	4 hari	-	
2.A.2	2 hari	2.A.1	FS
2.A.3	4 hari	2.A.1	SS
2.B			
2.B.1	7 hari	2.A.1	FS
2.B.2	2 hari	2.B.1	FF
2.C			
2.C.1	1 hari	2.B.2	FS
2.C.2	3 hari	2.C.3	FF
2.C.3	10 hari	2.B.1, 2.B.2	FS, FS
2.D			
2.D.1	5 hari	2.C.3	FS
2.D.2	3 hari	2.D.1	FF
2.D.3	7 hari	2.D.1	SS
2.D.4	5 hari	2.D.3	FS
2.D.5	8 hari	2.D.4	SS
2.D.6	3 hari	2.D.4	FS
2.D.7	8 hari	2.D.6	FS

Activities	Durasi	*Predecessor*	*Overlapping*
2.D.8	10 hari	2.D.7	FS
2.D.9	4 hari	2.D.8	FS
2.D.10	4 hari	2.D.9	FS
2.D.11	34 hari	2.D.3	FS
2.D.12	5 hari	2.D.11	FS
2.D.13	7 hari	2.D.11	FS
2.E			
2.E.1	2 hari	2.D.9	FF
2.E.2	4 hari	2.E.1, 2.D.10	FS, FF
2.E.3	7 hari	2.E.2	FS
2.E.4	3 hari	2.E.3	FS
2.E.5	14 hari	2.E.4	FS
2.E.6	2 hari	2.E.5	FS
2.E.7	4 hari	2.E.6	FS
2.E.8	1 hari	2.E.7	FS
2.F			
2.F.1	12 hari	2.E.4	FS
2.F.2	17 hari	2.F.1	FS
2.F.3	2 hari	2.F.2	FS
2.G			
2.G.1	9 hari	2.D.12	FS
2.G.2	40 hari	2.D.11	FS
2.G.3	12 hari	2.G.1	FS
2.G.4	6 hari	2.G.3, 2.G.2	FS, FF
2.H			
2.H.1	1 hari	2.G.3	SS
2.H.2	29 hari	2.H.1	FS
2.H.3	4 hari	2.H.2	SS
2.I			
2.I.1	44 hari	2.D.13	FS
2.I.2	1 hari	2.I.1	FF
2.I.3	5 hari	2.I.1	SS
2.I.4	2 hari	2.I.1	SS
2.J			
2.J.1	1 hari	2.I.1	FF
2.J.2	8 hari	2.J.1, 2.I.1	FS, FS
2.J.3	6 hari	2.G.3	FS
2.K			
2.K.1	1 hari	2.H.1	FS
2.K.2	2 hari	2.H.1	FS
2.K.3	1 hari	2.K.2	FS
2.K.4	1 hari	2.H.1	FS
2.K.5	1 hari	2.H.1	FS
2.K.6	1 hari	2.H.1	FS
2.K.7	1 hari	2.H.1	FS
2.K.8	1 hari	2.H.1	FS
2.K.9	1 hari	2.K.7, 2.K.8	FS, FS
2.L			
2.L.1	22 hari	2.J.2	FS
2.L.2	1 hari	2.K.6, 2.K.7, 2.K.8	FS, FS, FS
2.L.3	4 hari	2.L.2	SS
2.L.4	2 hari	2.L.3	SS

2.6. Determination of Critical Trajectory

To avoid the delay in the completion of project time due to project work which is not done systematically, this case study proposed Precedence Diagram Method (PDM) method. In Precedence Diagram Method (PDM) method, forward analysis and backward analysis) to determine the critical path. The critical path is obtained from the forward calculation with the EF-ES formula and on the LF-LS countdown.

2.7. Calculations Forward and Backward

Forward Analysis by determining the value (ES, EF, LS, LF). The forward count starts from the beginning of the project to the end of the project from left to right. In this calculation, the following rules apply:

1. Notation (i) for the previous activity and notation (j) for the activity being performed.
2. The initial time is considered zero.

3. The forward count aims to determine the value of Early Start (ES), Early Finish (EF) and project completion period.
4. If there is more than one joining activity, the largest ES number is taken.
5. The ES number of an activity is selected from the largest number of four constraints which exists.

*ES(j) = (*select the largest number from*):*
ES(i) + SS(i-j) or
ES(i) + SF(i-j) – D(j) or
EF(i) + FS(i-j) or
EF(i) + FF (i-j) – D(j)

The EF number of an activity is equal to the ES number of the activity plus the duration of the activity.

EF(j) = ES(j) +D(j)

The countdown starts from the end of the running project, from right to left. In this calculation apply the rules as follows:
1. Notation (i) for the activities performed and notation (j) for the prior activity
2. Countdown aims to determine the value of LS (latest start), LF (latest finish) and float time period.
3. The LF number of an activity is selected from the smallest number among the four constraints.

*LF(i) = (*select the largest number from*):*
LF(j) – SS(1-j) or
LS(j) – FS(i-j) or
LF(j) – SF(i-j) + D(i) or
LS(j) – SS(i-j) + D(i)

The LS number of an activity equal to the LF number of such activity is reduced by the duration of the activity.

LS(*i*) =*LF* (*i*) – *D*(*i*)

The following is an example of forward and backward calculations with interrelationships between activities (SS, SF, FS, FF):

a) Activity 1.A.1, (no linkage relationship)
ES 1.A.1 = 0 in can from Start activities
EF 1.A.1 = ES 1.A.1 + duration 1.A.1 = 0 + 4 = 4

b) Activity 1.A.2, (there is relationship relationship FS with activity 1.A.1)
ES 1.A.2 = 4 is obtained from EF 1.A.1 EF 1.A.2 = EF 1.A.1 + duration 1.A.2 = 4 + 2 = 6 (FS)

c) Activity 1.A.3, (there is a connection relationship SS with 1.A.1)
ES 1.A.3 = 0 in can from ES 1.A.1 EF 1.A.3 = ES 1.A.1 + duration 1.A.3 = 0 + 7 = 7 (ss)

d) Activity 2.B.1, (there is a relationship of FS relationship with 1.A.1)
ES 2.B.1 = 4 in can from EF 1.A.1 EF 2.B.1 = EF 1.A.1 + duration 2.B.1 = 4 + 7 = 11 (FS)

e) Activity 2.B.2, (there is relationship of FF linkage with activity 2.B.1)
EF 2.B.2 = 11 in can from EF 2.B.1 ES 2.B.2 = EF 2.B.1 - duration 2.B.2 = 11-2 = 9 (FF)

And the calculation result can be applied in the form of Precedence Diagram Method (PDM) network chart by considering the relationship between the activities (FS, SS, SF and FF), arranged PDM chart as follows:

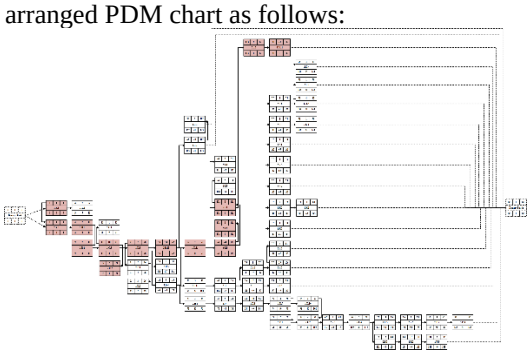


Figure 2.3 Diagram Network PDM

Then get critical path and non critical path from project activity. The critical line is composed of 14 activity or project activity that is activity 2.A.1, 2.A.3, 2.B.1, 2.B.2, 2. C.3, 2.C.2, 2.D.3, 2.D.11, 2.D.13, 2.I.1, 2.I.2, 2.J.1, 2.J. 2 and activities 12.L.1. Non-critical path is divided into 16 channels of activity, namely:
1) Activity 2.A.2
2) Activity 2.C.1
3) Activities 2.D.1 and 2.D.2
4) Activity 2.D.5
5) Activity 2.D.4, 2.D.6, 2.D.7, 2.D.8, 2.D.9, 2.D.10, 2.E.2, 2.E.3 , 2.E.4, 2.F.1, 2.F.2 and 2.F.3 6) Activities 2.E.5, 2.E.6, 2.E.7 and 2.E.8
7) Activities 2.G.2 and 2.G.4
8) Activity 2.D.12, 7.G.1, 7.G.3, 2.H.1, 2.H.2, 2.J.3 and 2.H.3
9) Activity 2.I.3 and 2.I.4
10) Activity 2.K.1
11) Activity 2.K.2 and 2.K.3
12) Activity 2.K.4
13) Activity 2.K.5
14) Activity 2.K.6
15) Activity 2.K.7 and 2.K.9
16) Activity 2.K.8, 2.L.3, 2.L.2 and 2.L.4

Results from PDM calculations, scheduling takes 143 days 20 days faster than company planning

2.8. Metode RPWM (Ranked Position Weight Method)

This RPWM method is used to perform weighting on non-critical path, determining the weight of the position of an activity based on the

amount of activity duration plus the duration of all following activities.

The weighting of each activity line is done by calculating:

Activity duration + duration of activity that follows

Berikut contoh perhitungan untuk pembobotan jalur non kritis:

Jalur non kritis A = 2.A.2 = 2

Jalur non kritis B = 3.C.1 = 1

Jalur non kritis C = 2.D.1 + 2.D.2 = 5 + 3 = 8

So from the above calculation results obtained from the weighting arrangement of the largest to the smallest:

1. Non-critical path C
2. Non-critical path A
3. Non-critical path B

The method of smoothing in this research is Burgess Method, that is with determine the sum of squares (Z) of labor to be analyzed. The smaller the value of Z then the fluctuations that arise on the needs of resources will be smaller. By knowing the allocation of the number of resource requirements, it can be calculated Z value with the formula:

$$Z = \sum_{i=1}^{T} Y_i^2$$

Where: Z = The sum of squares of a time period

T = project duration

Y i = the sum of the required resources of each activity per unit of time

Flattening is done by shifting non-critical activities as long as the float value owned by the activity and starting from non-critical activities that have the greatest weight.

2.9. Calculation Quadrant Amount Before Leveling (Equity)

Initial need of "Workers" workforce before equity refers to scheduling that has been done using PDM is as follows:

$Z = \sum_{i=1}^{T} Y_i^2$ = $14^2 + 14^2 + 14^2 + 17^2 + 12^2 + 12^2 + 9^2 + 9^2 + 9^2 + 13^2 + 17^2 + 17^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 16^2 + 20^2 + 20^2 + 25^2 + 13^2 + 13^2 + 13^2 + 4^2 + 11^2 + 11^2 + 11^2 + 15^2 + 11^2 + 15^2 + 11^2 + 11^2 + 15^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 13^2 + 9^2 + 10^2 + 10^2 + 14^2 + 8^2 + 8^2 + 8^2 + 18^2 + 14^2 + 14^2 + 16^2 + 12^2 + 15^2 + 9^2 + 15^2 + 13^2 + 13^2 + 22^2 + 18^2 + 18^2 + 17^2 + 26^2 + 50^2 + 49^2 + 36^2 + 32^2 + 29^2 + 25^2 + 23^2 + 25^2 + 22^2 + 23^2 + 18^2 + 23^2 + 17^2 + 17^2 + 17^2 + 19^2 + 17^2 + 15^2 + 12^2 + 17^2 + 17^2 + 17^2 + 17^2 + 17^2 + 19^2 + 17^2 + 8^2 + 6^2 + 6^2 + 6^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 7^2 + 12^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 10^2 + 5^2$ = Zo

Z0 = $14^2 + 14^2 + 14^2 + 17^2 + 12^2 + 12^2 + 9^2 + 9^2 + 9^2 + 13^2 + 17^2 + 17^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 16^2 + 20^2 + 20^2 + 25^2 + 13^2 + 13^2 + 13^2 + 4^2 + 11^2 + 11^2 + 11^2 + 15^2 + 11^2 + 15^2 + 11^2 + 11^2 + 15^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 13^2 + 9^2 + 10^2 + 10^2 + 14^2 + 8^2 + 8^2 + 8^2 + 18^2 + 14^2 + 14^2 + 16^2 + 12^2 + 15^2 + 9^2 + 15^2 + 13^2 + 13^2 + 22^2 + 18^2 + 18^2 + 17^2 + 26^2 + 50^2 + 49^2 + 36^2 + 32^2 + 29^2 + 25^2 + 23^2 + 25^2 + 22^2 + 23^2 + 18^2 + 23^2 + 17^2 + 17^2 + 17^2 + 19^2 + 17^2 + 15^2 + 12^2 + 17^2 + 17^2 + 17^2 + 17^2 + 17^2 + 19^2 + 17^2 + 8^2 + 6^2 + 6^2 + 6^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 2^2 + 7^2 + 12^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 5^2 + 10^2 + 5^2$ = 196 + 196 + 196 +289 + 144 + 144 + 81 + 81 + 81 + 169 + 289 + 289 + 81 + 81 + 81 + 81 + 81 + 81 + 81 + 256 + 400 + 400 + 625 + 169 + 169 + 169 + 16 + 121 + 121 + 121 + 225 + 121 + 225 + 121 + 121 + 225 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 144 + 64 +64 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 169 + 81 + 100 + 100 + 196 + 64 + 64 + 64 + 324 + 196 + 196 + 256 + 144 + 225 + 81 + 225 + 169 + 169 + 484 + 324 + 324 + 289 + 676 + 2500 + 2401 +1296 + 1024 + 841 + 625 + 529 + 324 + 529 + 289 + 289 + 289 + 361 + 289 + 225 + 144 + 289 + 289 + 289 + 289 + 289 + 361 + 289 + 64 + 36 + 36 + 36 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 49 + 144 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 100 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 +25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 + 25 = 29325

2.10. Calculation of Quadrant Amounts After Leveling (Equity)

Equity begins in accordance with the prior weighting sequence using the RPWM method. The above example starts from non critical path C to A to B.

Equity is done by noting the value of the equalization must be smaller (<) than the previous value. Here is an example of the equalization done:

1. Non Critical Line Equivalence C has float 5 so it can be shifted for 5 days. On non critical path C equalization is done by delaying for 3 days.

   Z1 = $14^2 + 14^2 + 14^2 + 17^2 + 12^2 + 12^2 + 9^2 + 9^2 + 9^2 + 13^2 + 17^2 + 17^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 + 16^2 + 16^2 + 16^2 + 16^2 + 8^2 + 8^2 + 13^2 + 13^2 + 13^2 + 13^2 + 8^2 + 12^2 + 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 13^2 + 9^2 + 10^2 + 10^2 + 14^2 + 8^2 + 11^2 + 11^2 + 13^2 + 11^2 + 7^2 + 7^2 + 7^2 + 9^2 + 7^2 + 12^2 +$

$11^2 + 9^2 + 12^2 + 9^2 + 12^2 + 27^2 + 30^2 +$
$17^2 + 13^2 + 10^2 + 10^2 + 8^2 + 8^2 + 17^2 +$
$24^2 + 17^2 + 17^2 + 17^2 + 17^2 + 13^2 + 13^2 +$
$13^2 + 13^2 + 13^2 + 13^2 + 16^2 + 11^2 + 11^2 +$
$11^2 + 11^2 + 11^2 + 13^2 + 8^2 + 8^2 + 10^2 +$
$10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 +$
$10^2 + 15^2 + 16^2 + 9^2 + 9^2 + 9^2 + 9^2 + 9^2 +$
$9^2 + 9^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 +$
$14^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 +$
$14^2 + 14^2 + 14^2 + 15^2 + 15^2 + 17^2 + 16^2 +$
$16^2 + 16^2 + 18^2 + 16^2$

= 196 + 196 + 196 +289 + 144 + 144 + 81 + 81 + 81 + 169 + 289 + 289 + 81 + 81 + 81 + 81 + 81 + 81 + 81 + 256 + 256 + 256 + 64 + 64 + 169 + 169 + 169 + 169 + 64 + 144 + 64 + 64 + 64 + 144 + 64 + 64 + 144 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 169 + 81 + 100 + 100 + 196 + 64 + 121 + 121 + 169 + 121 + 49 + 49 + 49 + 81 + 49 + 144 + 121 + 81 + 144 + 81 + 144 + 729 + 900 + 289 + 169 + 100 + 100 + 64 + 64 +289 + 576 + 289 + 289 + 289 + 289 + 169 + 169 + 169 + 169 + 169 + 169 +256 + 121 + 121 + 121 + 121 + 121 + 169 + 64 + 64 + 100 + 100 + 100 + 100 + 100 + 100 +100 + 100 + 100 + 225 + 256 + 81 + 81 + 81+81 + 81 + 81+ 81 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 225 + 225 + 289 + 256 + 256 + 256 + 324 + 256= 22351 < 29325

The result is smaller than the value before equality is Z = 29325

2. Non-critical Aedding A has float 8 so it can be shifted for 8 days. On non-critical path A equity is done by delaying for 1 day.

   Z2 = $14^2 + 14^2 + 14^2 + 14^2 + 12^2 + 12^2 + 12^2 +$
   $9^2 + 9^2 + 13^2 + 17^2 + 17^2 + 9^2 + 9^2 + 9^2 +$
   $9^2 + 9^2 + 9^2 + 9^2 + 16^2 + 16^2 + 16^2 + 16^2 +$
   $8^2 + 8^2 + 13^2 + 13^2 + 13^2 + 13^2 + 8^2 + 12^2$
   $+ 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2 + 12^2 + 8^2 +$
   $8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 12^2 + 8^2 + 8^2$
   $+ 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 8^2 + 13^2 +$
   $9^2 + 10^2 + 10^2 + 14^2 + 8^2 + 11^2 + 11^2 +$
   $13^2 + 11^2 + 7^2 + 7^2 + 7^2 + 7^2 + 5^2 + 10^2 +$
   $10^2 + 8^2 + 11^2 + 9^2 + 12^2 + 22^2 + 23^2 + 14^2$
   $+ 10^2 + 10^2 + 9^2 + 9^2 + 9^2 + 17^2 + 24^2 +$
   $17^2 + 17^2 + 17^2 + 17^2 + 13^2 + 13^2 + 13^2 +$
   $13^2 + 13^2 + 13^2 + 16^2 + 11^2 + 11^2 + 11^2 +$
   $11^2 + 11^2 + 13^2 + 8^2 + 8^2 + 10^2 + 10^2 +$
   $10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 +$
   $15^2 + 16^2 + 14^2 + 16^2 + 14^2 + 14^2 + 11^2 +$
   $11 + 9^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 +$
   $14^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 + 14^2 +$
   $14^2 + 14^2 + 14^2 + 15^2 + 15^2 + 17^2 + 16^2 +$
   $16^2 + 16^2 + 18^2 + 16^2$

   = 196 + 196 + 196 + 196 + 144 + 144 + 144 +81 + 81 + 169 + 289 + 289 + 81 + 81 + 81 + 81 + 81 + 81 + 81 + 256 + 256 + 256 + 64 + 64 + 169 + 169 + 169 + 169 + 64 + 144 + 64 + 64 + 64 + 144 + 64 + 64 + 144 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 64 + 169 + 81 + 100 + 100 + 196 + 64 + 121 + 121 + 169 + 121 + 49 + 49 + 49 + 25 + 100 + 100 + 64 + 121 + 81 + 81 + 144 + 484+ 529 + 196 + 100 + 100 +81 + 81 + 81 + 289 + 576 + 289 + 289 + 289 + 289 + 169 + 169 + 169 + 169 + 169 + 169 +256 + 121 + 121 + 121 +121 + 121 + 169 + 64 + 64 + 100 + 100 + 100 + 100 + 100 + 100 +100 + 100 + 100 + 225 + 256 + 81 + 81 + 81+81 + 81 + 81+ 81 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 196 + 225 + 225 + 289 + 256 + 256 + 256 + 324 + 256

   = 21997 < 22351

The result is smaller than niali before equalization ie Z1 = 22351

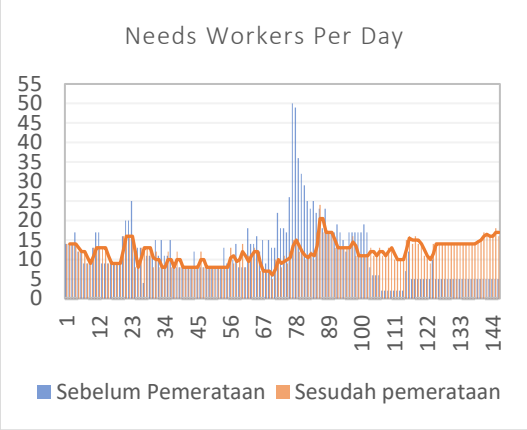


Figure 2.4 Graph of Equity Comparison

Description: blue before equalization
orange color after equity

From the picture above can be seen the result of equity that done impact or can be said successful. Originally the needs of the workers on the 77th day were 50 people / day after the distribution was only 11 people / day, and the peak requirement of manpower reached only 24 people / day occurred on the 86th day. In addition, the workforce spread was more evenly distributed and realistic to do.

2.11. ERD (*Entity Relationship Diagram*)

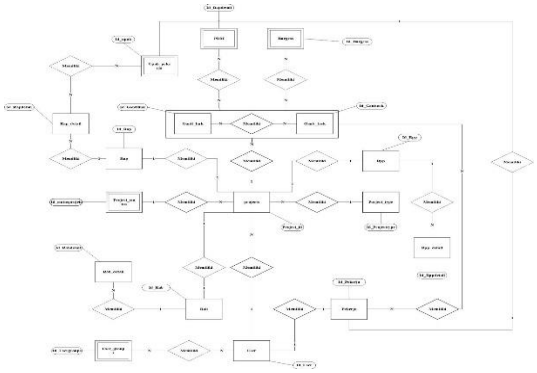


Figure 2.5 *Entity Relationship Diagram*

2.12. Diagram Konteks

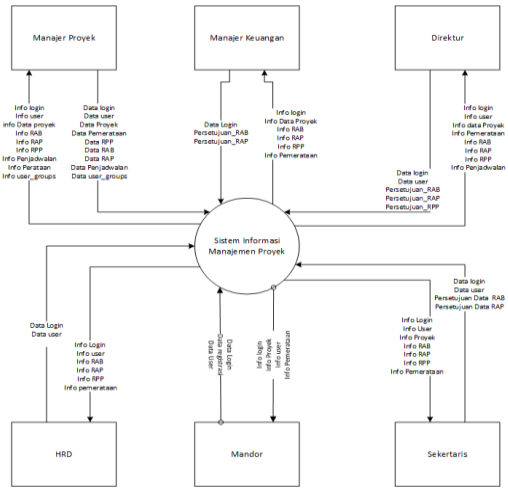


Figure 2.6 Diagram Konteks

2.13. DFD (Data Flow Diagram)

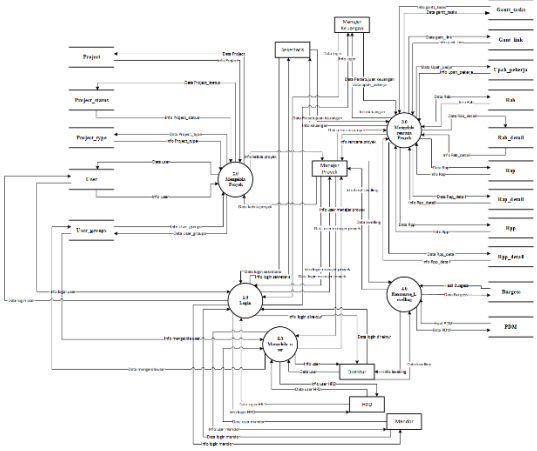


Figure 2.7 *Data Flow Diagram*

2.14. Test result

The data to be input is the project data from CV. MEGALOMAN. The project data input is a recap of a report from the construction of the H. Rahman house construction project completed with 50 workers and 163 days starting on 2 January 2017 and ending on 13 June 2017.

The results of testing on the built system can be seen in the image of the system implementation below:

1. Project Start Schedule
   The project started on 2 January 2017

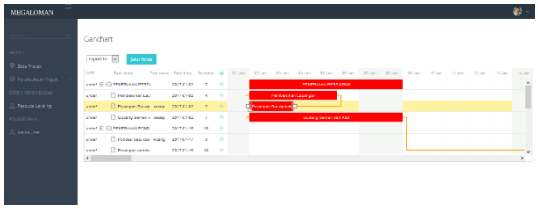


Figure 2.8 Project Start Schedule

2. Final Project Schedule
   The project schedule ends on 25 May 2017

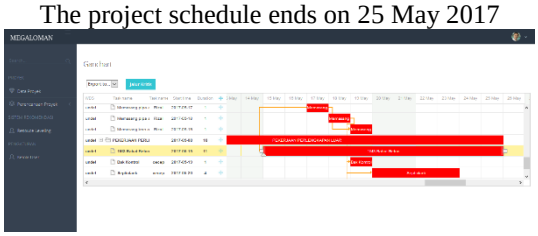


Figure 2.9 End of Project Schedule

3. Labor Before Equity
   Represents the amount of labor needs before equity is performed by the system. Can be seen in the picture below:

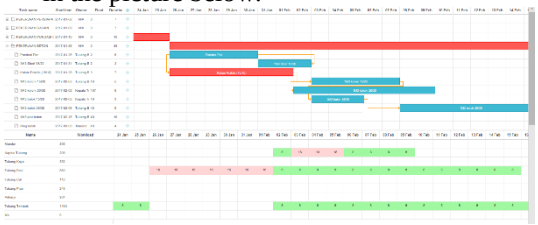


Figure 2.10 Labor Before Equity

4. Labor After Equity

   Represents the amount of labor needed after the system has been distributed. Can be seen in Figure 4.4 below:

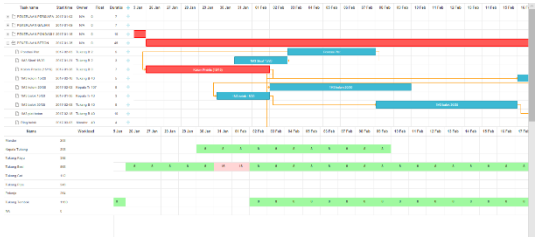


Figure 2.11 Labor After Equity

3. CLOSING

3.1. Conclusion

Based on the results obtained in the research and preparation of this thesis, it can be concluded as follows:

1. The human resource management information system built can help the Project Manager to schedule project scheduling as well as know which jobs can be delayed.
2. The system is built to make the distribution of the amount of project work so that the fluctuation can be minimized.

The built system makes use of human resources on construction projects at CV. MEGALOMAN is more effective and efficient it is proved the results of project scheduling 20 days ahead of the initial schedule which takes 163 days to 143 days to complete the project and the number of workers needed more evenly

3.2 Saran

Based on the whole process in building this human resource management information system, following some suggestions given in further system development is to improve and develop the system more broadly for the needs of interested parties in the management of the company from the top to operational to produce more results good for company CV. MEGALOMAN. As for suggestions from the author:

1. Make it look more interesting because the display is still used now is simple, need a better development and maintenance of the system that has been built
2. Further research is expected that the built system can perform human resource management with evaluation system so that resources can be more controlled and use advanced leveling methods so that the equity can be maximized again.

BIBLIOGRAPHY

[1] Iman Soeharto. Ir, Manajemen Proyek (Dari Konseptual Sampai Operasional) Jilid 1, Jakarta: Erlangga, 1999.

[2] Ifnu Bastian. Sugiono. Ceria Farela Mada Tantrika, Optimasi Perencanaan Proyek Pembangunan Perpustakaan Menggunakan PDM Dan *Resource Leveling* (Studi Kasus Proyek Perpustakaan Oleh CV. Maju Indah), "*Jurnal Rekayasa Dan Manajemen Sistem Industri*, Vol. 3, No. 1 Teknik Industri Universitas Brawijaya" Malang, 2007.

[3] I Gusti Ngurah Oka Suputra, "Penjadwalan Proyek Dengan Precedence Diagram Methode (PDM) Dan Ranked Position Weight Method (RPWM)", *Jurnal Ilmiah Teknik Sipil*, vol. 15, No. 1, 2011.

[4] Ardentius. Hamzah Hasyim. M. Kartika Puspa Negara, Analisis Perataaan Sumber Daya Menggunakan Metode Burgess Dengan Alat Bantu *Software Primavera Project Planner* Pada Pembangunan Proyek Gedung PT. Bank Muamalat Cabang Malang, "*Jurnal Sipil Fakultas Teknik Universitas Brawijaya Malang*" Malang, 2007.

[5] Abrar.Husen, Manajemen Proyek, Yogyakarta: Andi, 2011.

[6] Rahardjo. Budi, 2009 Keamanan Sistem Informasi Berbasis Internet, Bandung: Insan komunikasi.

[7] Khadir.Abdul, 2007, Dasar Pemrograma web dinamis menggunakan PHP, yogyakarta: Andi.

[8] A.-B. B. LADJAMUDIN. Analisis dan Desain SISTEM INFORMASI. Yogyakarta: GRAHA ILMU. 2005.