

ANALYSIS OF LABOR OVERTIME AND PRODUCTIVITY IN CONSTRUCTION PROJECTS

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Abstract:

A project can be defined as a sequence of activities that should be carried out within a set period with a limited allocation of resources. In construction projects, timely completion is dependent on labor productivity as part of the needed resources. However, several studies indicate that construction projects are often affected by low labor productivity. This study aimed to examine how working overtime affects the productivity of construction projects. For the purpose of this analysis, overtime refers to discharging responsibilities beyond the normal working hours, after 1600 hours without any minimum length of time. Observations and interviews were used to collect data related to Dam Development Project. The observation was conducted for one month on 48 workers with overtime of 2 hours per day. The result showed that productivity was reduced by 9.50% - 11.41% while wages increased by 69.20% - 72.84%.

Keywords: overtime, labor productivity, labor wages.

Introduction

A project is a sequence of activities carried out within a set period with a limited allocation of resources. Cleland and King (1987) defined a project as a combination of various resources collected in a temporary organizational bucket geared towards achieving a certain goal. For instance, construction project activities or tasks could include constructing or repairing roads, buildings, dams, and bridges. Additionally, the project could also cover the cost and time for research and development during implementation. Based on the above definition, a project has several characteristics, including limited time frame, limited resources, non-repetitive, and set goals. Nevertheless, this definition is limited to construction and development projects in the construction sector. Edy Sutrisno (2016) defined productivity as the relationship between output (goods or services) and input (labor, materials, money). Furthermore, productivity measures labor efficiency by comparing the output value and the input results. The input in this study focuses on the labor time, while output is measured in physical unity, form, and value. Productivity is defined as the volume of work produced by labor per unit time. Overtime, as per this study, is work outside the scope of normal working hours (08.00-16.00), with no minimum set length of time. Overtime has several effects, such as workers fatigue, thus affecting the implementation of additional work. It also affects the procurement of equipment and materials and the employment of administrative and technical staff to manage the work facilities. Sometimes management resorts to overtime if the project drags along due to poor leadership. A delay in the construction project implementation will

force the contractor to use overtime and accelerate completing the project as scheduled. The contractor can accelerate work completion by employing various strategies, such as increasing workers during normal working hours (overmanning), implementing shift work, or using overtime hours. Increasing the workforce through overmanning is not plausible in most cases because it is not easy to find suitable workers, thus forcing contractors to utilize existing workers through overtime. Some contractors allow workers coming far away from the project to live on-site so that they are used to work overtime and speed up the project completion than bringing in new workers. The findings indicate that each worker experienced a 10% decrease in efficiency for the extra 10 hours a week of overtime (50 hours per week). Since the labor market requires at least one day of rest, the 50 hours per week is presumed to be done in 5 days or 6 working days. The rest day is supposed to provide workers with time for regaining stamina and enthusiasm. However, overtime has been found to lower productivity than normal working hours. Many studies have looked into the effects of overtime using 50 or 60 hours a week as a basis of study with varying results. For instance, Thomas & Raynar (1997) showed that contractors could use overtime for 3 or 4 weeks with limited loss of efficiency.

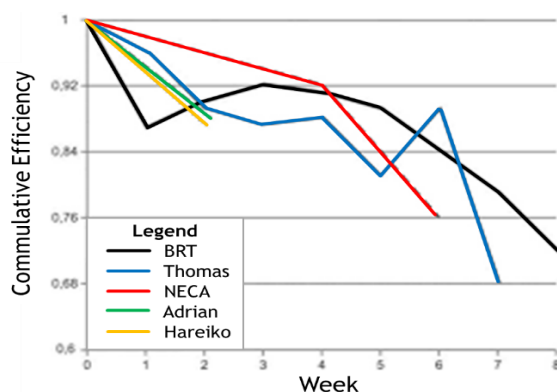


Figure 1: The efficiency of Average 50 Hours of Work per Week (Thomas & Raynar, 1997)

Figure 1 is a graph showing overtime efficiency of 50 hours per week using the research results by BRT, Thomas, NECA, Adrian, and Haneiko. This BRT graph is considered the most realistic graph depicting the general efficiency of industrial productivity, although the graph for each individual may differ.

1. Research Methodology

The labor productivity data used in this study is obtained from research on the XYZ Dam Development Project, focusing on dam structure development, including works in overflow buildings circumventing structures and others. Labor productivity research was done for one month (twenty-four consecutive working days). Each worker was observed to collect data on

their productivity during the 7-hour normal working period (08.00-16.00) and overtime for 2 hours (16.00-18.00).

2. Research Results and Discussion

The results on labor productivity during normal working hours and overtime hours are shown in Tables 1 and 2.

Table 1: Productivity during Normal Working Hours (7 hours)

No.	Type of Work	Vol. (m3)	Duration (days)	Total Worker	Average Productivity (m3/hour)
1	Foundation Excavation	90,0	6	9	0,238
2	Stone Wall	160,0	18	12	0,106
3	Foundation Concrete	84,0	10	5	0,240
4	Base Channels Concrete	490,0	24	12	0,243
5	Channel Edge Concrete	350,0	24	10	0,208

Table 2: Productivity During Overtime Hours (2 hours)

No.	Type of Work	Vol. (m3)	Duration (days)	Total Worker	Average Productivity (m3/hour)
1	Foundation Excavation	22,8	6	9	0,211
2	Stone Wall	40,5	18	12	0,094
3	Foundation Concrete	21,5	10	5	0,215
4	Base Channels Concrete	126,7	24	12	0,220
5	Channel Edge Concrete	90,1	24	10	0,188

The normal wages and overtime wages given to workers are as follows:

Table 3: List of Wages for Labor

No.	Type of Man Power	Normal Wages (Rupiah / Day)	Overtime Pay (Rupiah/day)
1	Mason	100.000	25.000
2	Blacksmith	100.000	25.000
3	Carpenter	125.000	31.250
4	Forman	150.000	37.500
5	Worker	80.000	20.000

From the study, it is found that a decrease in labor productivity due to overtime on the project under study is as follows:

Table 4: Productivity Decrease Table

No.	Type of Work	Productivity of Normal Hours of Work	Overtime Productivity	Deviation (%)
1	Foundation Excavation	0,238	0,211	11,33
2	Stone Wall	0,106	0,094	11,41
3	Foundation Concrete	0,240	0,215	10,42
4	Base Channels Concrete	0,243	0,220	9,50
5	Channel Edge Concrete	0,208	0,188	9,90

From Table 4, it can be seen that there is an increase in hourly wages of workers as follows:

Table 5: Comparison of Productivity and Wages for Normal and Overtime Working Hours

No	Type of Work	Normal		Overtime		Average productivity (m3/hr)
		Average Productivity (m3/hour)	Wage (Rp/hr)	Average productivity (m3/hr)	Wage (Rp/hr)	
1	Foundation Excavation	0,238	48.000	0,211	82.895	72,70
2	Stone Wall	0,106	108.000	0,094	186.667	72,84
3	Foundation Concrete	0,240	47.619	0,215	81.395	70,93
4	Base Channels Concrete	0,243	47.020	0,220	79.558	69,20
5	Channel Edge Concrete	0,208	54.857	0,188	93.230	69,95

The above calculations demonstrate that labor productivity decreased in the average overtime ranges from 9.50% - 11.41%, contributing to a productivity index ranging from 0.90 - 0.89. This result was slightly better than the one by Hana et al. (2005) that examined workers working for 55hours/week and resulted in a productivity index of 0.88-0.83. However, when compared with the graph of the average overtime efficiency of 50 hours per week shown in Figure 1, with 4 weeks overtime and efficiency of 0.80, the result of this study gives a bad outcome. Table 5 examines the increase in labor costs (worker wages) with overtime compared to wages for normal working hours. This table indicates that wages go up during overtime, albeit low-level productivity in the same period. The increase in workers' wages ranged from 69.20% - 72.84%, using the data for overtime duration between 6 - 24 days.

Conclusion

The results help us to arrive at some conclusions as follows:

1. Contractors can apply overtime to accelerate the work or catch up on the lost time to complete a given project on time. However, it reduces labor productivity and increases the cost of labor through higher wages.
2. A daily use of 2 hours overtime will reduce labor productivity by 9.50% - 11.41% and increase wages by 69.20% - 72.84%. These figures vary for different overtime durations, with longer durations leading to a shaper decrease in productivity.

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