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The Analysis of Delayed Duration Caused by Unpredictable Factors in Pammukkulu Dam

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Abstract. This study aims to find the critical path which caused delay on the projects. Several factors which may affect to the delay are the weather, the lack of manpower, supply chain, equipment and so on. The research methodology was conducted to elaborate the causes are by using qualitative and quantitative researches. Over 35 respondents and 10 expert's interviewee fill the questioner and were collected within two months. The result obtained is accelerated 3 paths from critical path method (CPM) then calculated the crashing program for each alternative. The alternative of acceleration applied are add the working hours in 4 (four) hours and 7 (seven) hours. In the end, the addition of 4 (four) hours could increase the workforce up to 25% of the total number of workers to get the value of accelerated finishing projects without ignoring the quality and quantity of them. Also, the additional labour is more beneficial in terms of costs they have relatively small number of working hours and would be more efficient.

1. Introduction

A construction project is a series of sensitive work mechanisms because every aspect of a construction project is interrelated with one another. In the construction of a construction project, various things can happen which can lead to an increase in implementation time and an increase in implementation costs [1,2]. The causes of delays in a construction project are caused by several factors, including the influence of weather, lack of labor, insufficient or disrupted material supply and insufficient equipment used, or the influence of the owner himself (for example, a design change).

Delays in project work can be anticipated by accelerating the implementation, but must pay attention to the cost factor. It is hoped that the additional costs incurred are minimal and still pay attention to quality standards. Acceleration can be done by adding more working hours, more productive tools, increasing the number of workers, using materials that are faster to install, and faster construction methods. Acceleration of project completion must be done with good planning [3]. Given the limited workforce, the alternative commonly used to support the acceleration of activities is to increase working hours so that it affects the total cost of the project. To find out this, it is necessary to learn about the existing network, and the relationship between time and cost, this is known as the Time



Cost Trade Off Analysis [4]. The aim of the study is to Analyse and calculate the optimum cost of project duration acceleration in Pammukulu Dam, Takalar.

2. Literature Review

According to Santosa et al., (2003) [8], project activity can be defined as a temporary activity that takes place within a limited period of time, with the allocation of certain resources and is intended to produce products or deliverables whose quality criteria have been clearly defined. Project activity can be interpreted as a temporary activity that takes place within a limited period of time, with the allocation of certain resources and is intended to produce products or deliverables whose quality criteria have been clearly defined. The S curve graphically represents the cumulative depiction of work progress (weight%) on the vertical axis versus time on the horizontal axis. The activity weight is the percentage value of the project which is used to determine the progress of the project. The progress of activities is usually measured against the amount of money that has been spent by the project. Comparing the plan's S curve with the implementation curve makes it possible to know whether the progress of project implementation is appropriate, slow, or more than planned [5,7].

Speeding up the completion of the project time is an attempt to complete the project earlier than the completion time under normal circumstances [6]. The process of speeding up the project completion time is called the Crash Program. With the acceleration of this project, there will be a reduction in the duration of activities in the activities that will be holding the crash program. However, there is a crash duration, which is a limit where reducing the time past this time limit will no longer be effective. Cost Trade Off is a method for accelerating project duration by adding certain variables / alternatives (hours of work, labor, tools, etc.). The time and cost trade off method (Time Cost Trade Off Method) provides an alternative for project planners to be able to prepare the best planning so that efforts to optimize time and costs in completing a project, completion of resource assignments to streamline resource allocation are also needed, so that it can be generated. The desired resource at the most optimum cost increment as can be seen in figure 1 as follows.

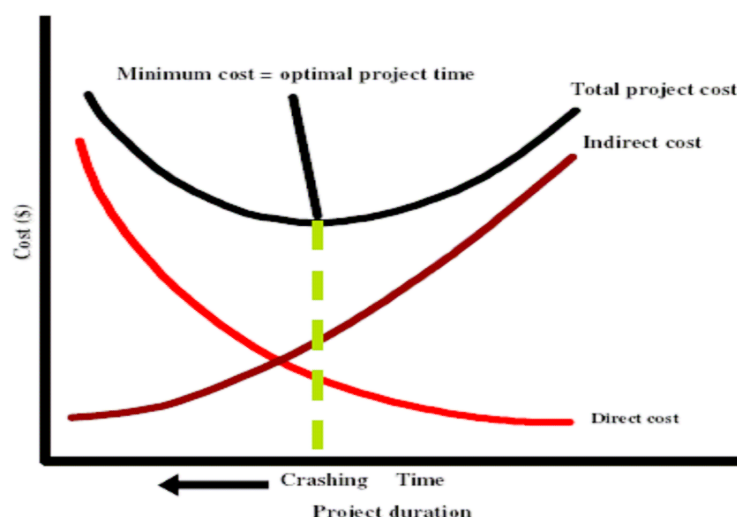


Figure 1. The Relationship between Time and Cost in Project Management

3. Research Methodology

The research method used in this research is primary data collection with the method of collecting data directly from the project owner and executor, and secondary data processing with the Crashing Program method. This study is located in Takalar regency, South Sulawesi, Indonesia. The Dam will be built with over 100 hectares of farming land. The flowchart of research methodology and how this study conducted can be seen in figure 2.

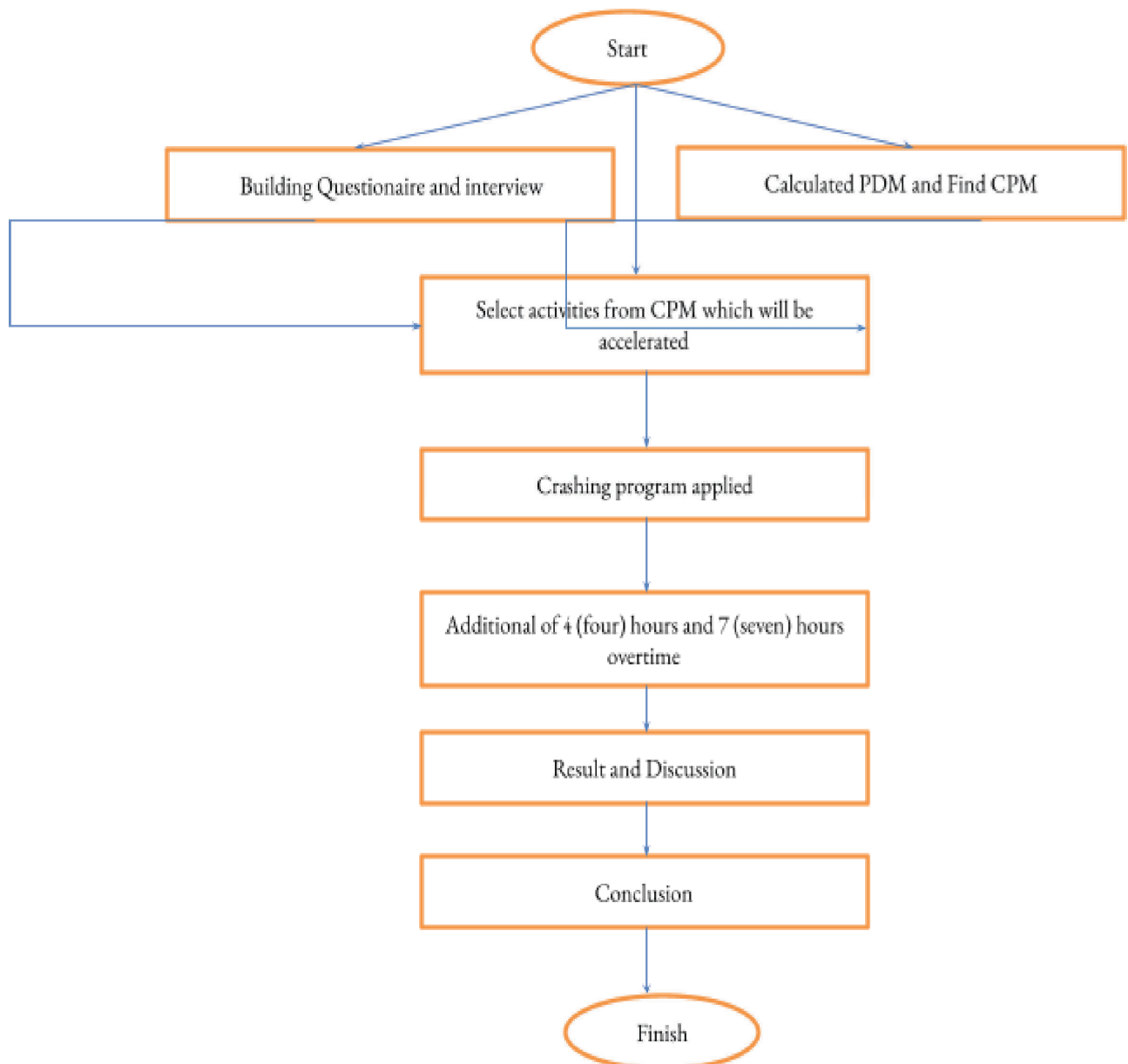


Figure 2. The Flow Chart of Research Methodology

4. Result and Discussion

The WBS is a method of organizing projects into a hierarchical reporting structure. WBS is used to break down or break each work process into more detail. This is intended so that the project planning process has a better level. The WBS is structured on the basis of learning all project documents which include contracts, drawings, and specifications. The project is then broken down into parts by following a certain structural and hierarchical pattern into fairly detailed work items, known as the Work Breakdown Structure (WBS). The definition of WBS in general is a collection of project deliverables-oriented displaying a hierarchical image / graph with product definitions that relate to each other's work elements to produce a complete final product. After that we can analyze the description of each work item with this Precedence Diagram (PDM) to help us know the physical relationship between one job and another. The critical cost can be seen in figure 3.

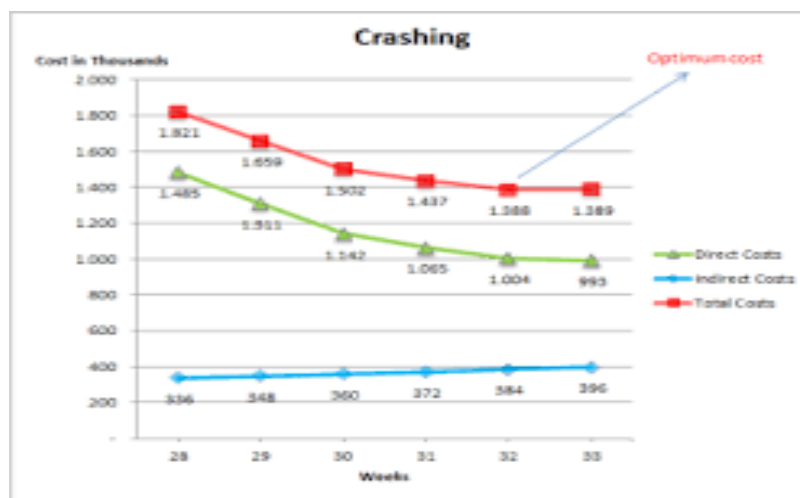


Figure 3. The Relationship between Acceleration Time and Cost

As can be seen from figure 3, the total cost obtained over the optimum duration are:

- a. The optimum duration is 663 days
- b. Total optimum costs is Rp 360.357.701.722,13

The subsequent cost slope found during the accelerated process and crashing program will always start from the lowest cost to be the alternative that we have to choose. From the total duration of the project after crashing applied, so that it can be found at least 4 (four) activities which influenced the duration after acceleration. In addition, the final result shows the optimum cost is Rp. 359.722.987.643,92 within 500 days only.

5. Conclusion

Based on the analysis and results found, the path that affected delay on the project is about supply chain and the geotechnical constructions. Therefore after applying the time cost trade off program, the delay can be accelerated by crashing the critical path. Overtime 4 (four) hours and also 7 (seven) hours produced the optimum cost for average **Rp. 359.722.987.643,92** within 500 days only.

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