CHAPTER II
LITERATURE REVIEW AND THEORETICAL BASIS

2.1 Literature Review

Literature Review is a common process by researchers in an attempt to find a theory. In order to obtain a guideline to further deepen the problem, it is necessary to put forward a theory that has to do with the material used in solving problems of theories about project management.

2.1.1 Previous Research

a. The study was conduct by Azmi Muhammad Zaki (2021) under the title **Geometric and Pavement Road Design of Cigancang Kuningan West Java**. The objective is to know the design and planning of the road section before analyze the construction management of this project.
b. The study was conduct by Aminudin (2019) under the title **Analysis Construction Management for the Development Bridge Kali Gintung Pasegeran Pandanarun District of Banjarnegara**. The objective is to determine how the methods of analysis S-Curve, Bar-Chart, CPM, and the need for tools and materials work on the construction of Bridge Kali Gintung.
c. The study was conduct by Abdul Khalim (2018) under the title **Construction Management Design of Jakarta-Cikampek Elevated Toll Road Project (P.186-P.187)**. The objective is to find out what should be researched in the analysis of construction management on elevated toll road construction projects.

2.2 Theoretical Basis

2.2.1 Definition of Project Management

Project management is the process of leading the work of a team to achieve all project goals within the given constraints. This information is usually described in project documentation, created at the beginning of the development process. The primary constraints are scope, time, budget. The secondary challenge is to optimize the allocation of necessary inputs and apply them to meet pre-defined objectives. [9]

As for the definition of project management according to some experts, among others:

a. According to PMBOK (Project Management Body of Knowledge) in Budi Santoso's book (2009:3), project management is the application of knowledge, skills, tools, and techniques in project activities to meet project needs.
b. According to H. Kerzner (1997:28), project management is planning, organization, directing, and controlling the company's resources to achieve short-term goals have been determined.
c. According to Garold D. Oberlender (2003:3), project management is the art and science coordinating people, equipment, materials, money, and schedule to complete a particular project on time and within the agreed budget.
d. According to Hughes and Cofferal (2002:8-9), project management is a way to solve problems that have to be presented by the user, the user needs must be clearly visible and should happen good communication so that the user needs to be known.

2.2.2 Project Management Functions

Project management has a very important function. This management will manage the quality, cost, safety of employees, the environment, resources, and information systems risk of a project. At least three main functions, which are:

1. Project Management serves as a planning in carrying out a project. In order for a project to run optimally then do planning. To do this, required the formulation of plans are prepared either from the administration or techniques that could be better implemented.
2. Project management is useful as a scheduling system. This is an implementation of the planning phase in which there is a span of time, schedule, and progress in the advancement of the project. This process includes the process of monitoring and updating the development of the project.

   In project management scheduling is imperative to carry out a project. In the scheduling process, the process of monitoring and updating is done in order to see the realistic state of progress of the project. The method used to manage this includes using the S-Curve, Bar-Chart, network analysis as well as the time and the long duration of the work using Critical Path Method (CPM).
3. Project management serves as a control of the project. This function is very vital role in controlling the success of the project at the end. The main purpose of this is done to prevent any irregularities for the project. By doing this function, can be a control in an effort to optimize the performance, time, and cost required. The activities must be conducted in the form of oversight function, the

correction of the work, as well as checks in during the implementation process.

A 2017 study suggested that the success of any project depends on how well four key aspects are aligned with the contextual dynamics affecting the project, these are referred to as the four P's:

1. Plan: The planning and forecasting activities.
2. Process: The overall approach to all activities and project governance.
3. People: Including dynamics of how they collaborate and communicate.
4. Power: Lines of authority, decision-makers, organograms, policies for implementation and the like.

There are a number of approaches to organizing and completing project activities, including: phased, lean, iterative, and incremental. There are also several extensions to project planning, for example based on outcomes (product-based) or activities (process-based). [9]

2.2.3 Scheduling Techniques

The main element of scheduling is forecasting, although it should be realized that changes may occur in the future and will affect the plans that have been prepared properly. Scheduling is thinking deeply through various problems, determining methods, testing logical paths, arranging various tasks that produce a complete activity and writing various activities in a logical framework and appropriate time series.

A construction project is a series of activities that involve various components and resources that work together to achieve the specified goals effectively and efficiently. Planning, implementing, and controlling a project is a

relatively complex and difficult activity to do because it is required to pay attention to various aspects such as time, costs, resources, progress towards achieving goals, and so on.

Before the project starts, a good manager should first plan the project schedule. The objectives of schedule planning are:

1. Formulation of activity schedule
2. Determining the appropriate strategy or method
3. Knowing the necessary activities
4. When an activity starts and when the activity should be finished can be clearly known

The benefits of the results of the schedule planning for the project are:

1. Knowing the relationship between activities
2. To be more organized for smooth implementation
3. Get optimum results

Project scheduling methods commonly used in construction management analysis are:

2.2.3.1 Bar Chart

Gantt chart or better known in Indonesia as a bar chart. This method was first used and introduced by **Hendri Lawrence Gantt** in 1917. The purpose of this method is to identify the elements of time and sequence in planning activities, which consist of start time, amount of time, and finish time.

The depiction of a bar chart consists of columns and rows. In the column, the sequence of activities is arranged sequentially. The line shows the time period in the form of hours, daily, weekly or monthly. The bar depiction on each activity line will

show the start time and end time of the activity. The following is an example of a bar chart or Gantt Chart that is commonly used:

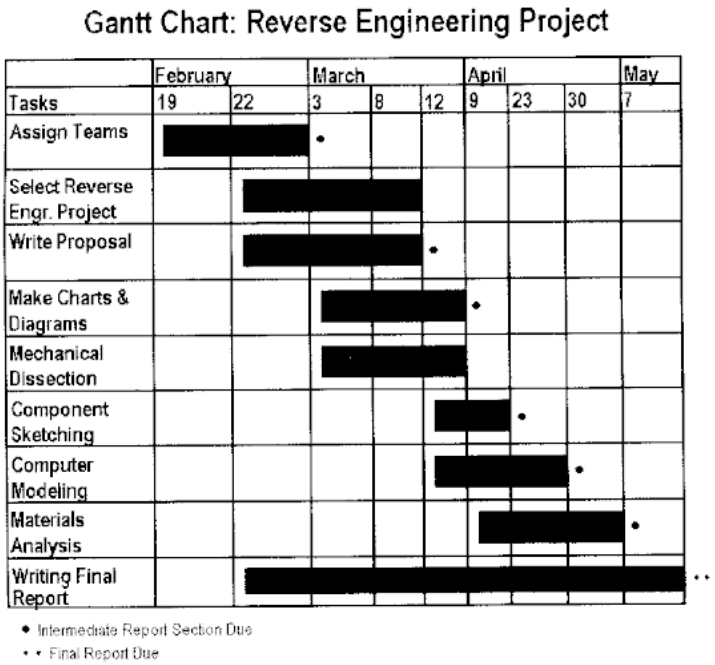

Figure 2. 1 Bar Chart or Gantt Chart Type 1

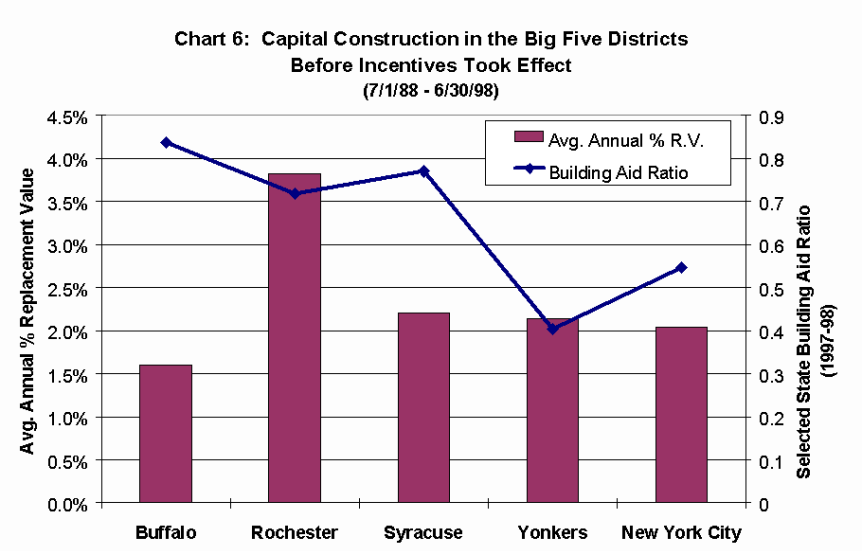

Figure 2. 2 Bar Chart or Gantt Chart Type 2

The depiction of a bar chart in the implementation of project activities will usually be distinguished on the planning bar (beam or line) with the implementation bar or it can also use a different color (it is recommended not to use too many colors so as not to lose its function or resemble a painting). This difference is to facilitate the assessment of work performance, if there is a deviation from the implementation of the plan. [2]

2.2.3.2 S-Curve

It is called the S-curve because its shape resembles the letter S. This happens because at the beginning of the project (preparatory activities) the costs incurred per unit time tend to be low, then increase rapidly in the middle of the project (construction activities), and decrease/lower again at the end of the project (final completion). This curve was first developed by Commander **Warren T. Hannum**, a United States Engineers officer on the basis of observing the execution of a large number of projects from start to finish**.**

The S-curve is a graphical representation of the cumulative work progress (%) on the vertical axis, versus time on the horizontal axis. The progress of this activity is usually measured against the amount of money that has been spent by the project. By comparing the S-curve, the plan with the implementation curve can be seen whether the progress of project implementation is appropriate, slower or faster than the implementation. Activity

weight is the percentage value of the project that is used to determine the progress of the project. The formula of activity weight is:

$$\% \text{ Weight} = \frac{Activity\ Price}{Total\ price\ of\ activities}$$

The following is an example of a S-curve that is commonly used: [2]

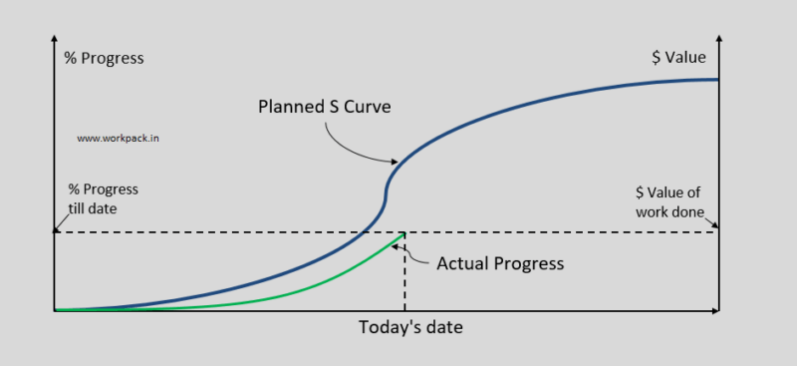

Figure 2.3 S-Curve

2.2.3.3 CPM (Critical Path Method)

In 1958, chemicals company **Du Pon Company (USA)** solved the difficulties in the manufacturing process by finding the Critical Path Method (CPM). Basically, this method is used to determine the estimated time, CPM can estimate the time needed to carry out each activity and can determine the priority of activities that must receive careful supervision, so that activities can be completed according to the plan.

This method is better known as the critical path. This is because this method will later form a path that requires special (critical) attention. The purpose of this critical path is to quickly identify activities that have a high level of sensitivity to

delays in implementation, so that at any time the priority level of the project organizers' policies can be determined if the activity is delayed.

The CPM method has the following terms: (1) symbol, (2) arrow, (3) activity, and (4) node. There are three types of arrows, which are:

= The dotted arrow indicates the dummy activity

= Bold arrows indicate an activity that should be of concern (critical)

= Ordinary arrows indicate an activity that can be done normally

At the node (small circle) the CPM is divided into three parts consisting of the node number, EET (Earlies Event Time), and LET (Latest Event Time)

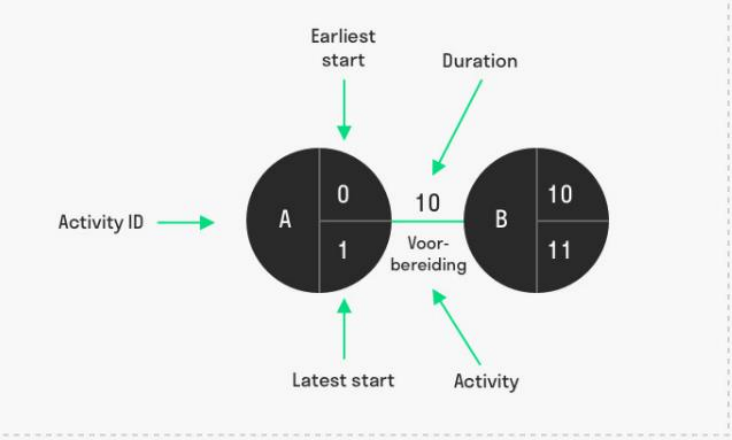

Figure 2.4 Node in CPM

CPM can control delays in activities that affect the completion of a job. The use of this method in the field is usually carried out for planning large-scale projects, where the implementer first makes a

schedule with this method, so that later the time needed to complete the project is known. However, the CPM method uses the activity dependency rule when it starts, meaning that an activity must be completed first and then it can be continued to the next activity. The following is an example of a CPM that is commonly used: [2]

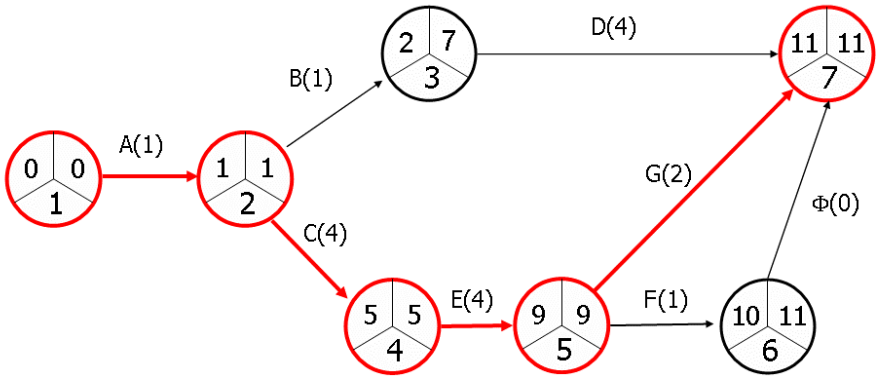

Figure 2.5 CPM Diagram

2.2.4 Bill of Quantity

Bill of Quantity or a construction budget is used to anticipate the total cost of any given project, whether it's a new building, road or bridge. A general contractor develops a construction budget with the help of professional estimators and quotes from suppliers and subcontractors. A contractor develops a budget for accounting purposes for the client or developer, which may be a private investor, corporation or a government body. A smart budget is thoroughly pre-planned to have the most productivity and efficiency while keeping overhead costs in check. [5]

The driving force for running the project is financing. The intended costs are all costs related, either directly or indirectly to the project, including costs incurred for the

procurement of resources and all costs classified as overhead costs and other fixed costs. To find out, it is necessary to make a project budget. The project budget consists of direct costs, indirect costs, and total project costs.

Direct costs or resource cost are costs that directly affect the physical implementation of the project, it can also be called labor costs. Included in direct costs/resource cost are:

1. **The cost of materials**, by taking into account the specifications, quality, and quantity of materials needed can be calculated for the cost of materials.
2. **Labor costs**, these costs are calculated by estimating the expertise and amount used to carry out each project activity.
3. **Subcontractor costs**, are costs incurred for certain activities carried out by other parties.
4. **Equipment costs**, in general, the cost of equipment is classified as a separate type of cost, this cost can be a rental or equipment depreciation cost.

Indirect costs are expenditures for management, where these costs are incurred to be able to expedite project implementation, these costs include:

1. **General project costs**, which include these costs for example construction costs for temporary facilities, employee salaries, provision of transportation, electricity, water, and others.
2. **Profit**, this cost is usually taken into account to complete the project bid.

Total costs are the sum of direct costs and indirect costs. Determination of cost is usually done at the optimum cost (lowest point) of summation. [2]

2.2.5 Cash Flow

Cash flow is something which is important to all business. Cash flow for most companies refers to the movement of money into the business (income), and the movement of money out of the business (expenditure) over time. When the company is receiving more money than they are expending, the company is said to have a positive cash flow, while when expenditures are greater than income, the company has negative cash flow.

While there is some nuance in what is good or bad when it comes to cash flow, in the long run, a positive cash flow is a necessary part of building a solvent business. Bleeding cash for long periods of time or not receiving large payments when they were expected are the reason for companies failing. Sometimes companies fail because they have a product problem or poor business, but other times it's simply because of poor cash flow management.

Cash flow in construction is slightly different to cash flow in many industries, in that construction cash flow typically refers to the analysis of when costs will be incurred and how much those costs will be over the course of a project. For companies running construction projects, understanding cash flow is critical to ensuring the right level of funding is in place to deliver the whole project or phase of work.

There has been a lot of time and effort spent on construction cash flow analysis, both from a company and project management perspective, as well as an academic and research standpoint. There has been a lot of time and effort spent on construction cash flow analysis, both from a company and project management perspective, as well as

an academic and research standpoint.

The construction industry and related heavy industries are very important to the economy and to all of our critical infrastructure, so people have spent a lot of time trying to depict construction cash flows and do accurate construction cash flow analysis. From a project management standpoint, there are many different types of construction cash flow analyses and strategies for better predicting and projecting cash flows. One of the well understood aspects of construction cash flow analysis is the construction **S-curve**.

The S-curve is an important and reliable predictor of almost all construction projects and plays a crucial role in cash flow, especially for contractors and subcontractors. What the S-curve explains is that at the beginning of a construction project, there is an initial outlay for enabling works, and then the majority of expenses are incurred through the middle period of the project when everything is happening, and then expenses trail off towards the end of the project as most of the work is complete and loose ends and defects are tied up. The trajectory of this 'normal' progress takes the form of an S, hence the S-curve.

This known flow of projects impacts cash flow in construction because the company needs to plan for that initial outlay, the rise in costs during the middle period, and then the tapering off of work. Depending on what payment terms and schedule was agreed to can have a large impact on cash flows during the project and how that will impact the contractors or subcontractors ability to pay their bills. Some companies use excel for doing these project projections and forecasts throughout project delivery. [1]

2.2.6 Contract Document

Prior to the establishment of the Local Government and Land Act 1980, which is better known as the Direct Labour Organization (DLO) Act, many small-scale projects and road maintenance were carried out by Highway Authorities with very minimal preparation of contract documents. Only major constructions invite contractors to participate in tenders or auctions.

The 1980 legislation required the Highway Authority Engineer to establish a preliminary document, in other words an initial estimate of the cost of the work before the project commenced.

Before this cost estimate is made, the Highway Authority Engineer needs to determine the nature of the work, general description and details of the work, which aims to produce contract documents. Therefore, documents of this kind have become common and widely used even in small-scale construction. The contract document consists of three main things, namely: [7]

1. The drawing of the Contract Plan
2. The specification of the working construction and its volume
3. The Budget Plan

There are several types of contract documents commonly used in construction procurement work, including:

1. **Lump sum Contract,** is one type of construction contract, sometimes referred to as stipulated-sum, where a single price is quoted for an entire project based on plans and specifications and covers the entire project and the owner knows exactly how much the work will cost in advance.

2. **Unit Price Contract,** is a contract where the Bill of Quantity is subject to remeasurement.
3. **Combined Lumpsum and Unit Price Contract**, is a contract which is a combination of lumpsum and unit price in one agreed work. For example, the procurement of buildings that use pile foundations (upper buildings use lumpsum, while foundations use unit prices).
4. **Single Year Contract**, is a contract whose work implementation binds budget funds for a period of one fiscal year.
5. **Multi-year Contract**, is contract whose work is carried out for a period of more than one fiscal year at the expense of the budget which is carried out after obtaining government approval.
6. **Integrated Work Procurement Contract**, is a construction work procurement contract that is complex in nature by combining planning, implementation and/or supervision activities. [5]