

CHAPTER II

LITERATURE REVIEW

2.1. Construction Project

Construction project is an activities series that are related each other to reach certain purpose (building or construction) in boundary of time, cost, and certain quality. Construction project always need resources, they are man, material, machine, method, money, information, and time.

In a construction project there are three important things that have to be considered, they are time, cost, and quality (Kerzner, 2006).

2.2. Construction Safety Regulation

There are many explanations in UU No. 1 in 1970 about safety that have to be followed by each people in order to minimize accident during work.

The purposes of this regulation are:

1. To prevent and minimize accident
2. To inform the safety equipment for labor
3. To prevent any injuries that are caused by accident
4. To guarantee the quality of the project

2.3. Accident Causation Models

Accident is an event that is not wanted and can cause loss of life and property (Rahman, 1990). There are many researchers have tried to understand

accidents in constructions application by introducing accident causation models.

These are some theory that becomes literature for this study:

2.3.1. Domino Theory

In 1930, research in causation theory was pioneered by Heinrich. Heinrich (1959) discussed the cause of accident, the interaction between man and machine, the relation between severity and frequency, the reason for unsafe acts, and finally the effects of safety on efficiency. There are five dominoes in this theory: ancestry and social environment, fault of person, unsafe acts or mechanical or physical hazards, accidents, and injury.

Based on statement of Petersen (1982), the work of Heinrich can be summarized into two point, they are: people are fundamental reason behind accidents, and management who have ability is responsible to prevent the accident.

2.3.2. Human Error Theory

Human error is any one set of human action that exceeds some limit of acceptability.

2.3.3. ARCTM

There are three points in this model about the causes of accident, they are: unsafe condition, workers response to unsafe condition, workers unsafe acts.

Unsafe condition is a condition which the physical layout of the workplace, status of tools or equipments and the material are under the safety standard. For example: Improperly scaffolding, defective equipment, ungrounded electrical tools, etc.

The meaning of workers response to unsafe condition is distinguishing between types of unsafe condition and who responsible for them. A worker may commit unsafe acts regardless of the initial condition of the work. Example of worker unsafe acts include the decision to proceed with work in unsafe condition, disregarding standard safety procedures such as not wearing hard hat or safety glasses, working with insufficient sleep, etc.

2.4. Classification of Work Accidents

Based on International Labor Organization (ILO), there are four classifications of work accident, they are:

1. Classification according to kind of accident
 - a. Falls from height
 - b. Being struck by falling objects, materials or tools
 - c. Pounded by falling objects, materials, or tools
 - d. Impacted by materials
 - e. Influence of high temperature
 - f. Electrocutions
 - g. Radiation by dangerous materials.

2. Classification according to the causes

- a. Machine
- b. Transportation
- c. Materials
- d. Work environment

3. Classification according to kind of injury

- a. Be sprained
- b. Broken bones
- c. Be bruised
- d. Be crushed
- e. Burned injury
- f. Radiation influence

4. Classification according to location of injury

- a. Head
- b. Neck
- c. Body
- d. Many location

2.5. Lost of Cost Injury

Tarwaka has separated two kinds of loss of labor injury due to the Employer or the project its self.

2.5.1 Direct Cost

The Loss that can be calculated start from the accident is occurred until the rehabilitation:

- a. The suffering of the labor and their family
- b. First aid cost
- c. Medicinal treatment cost
- d. Transportation and Hospital cost
- e. Accident assurance compensation cost
- f. Salary for the worker during they can not work because of accident
- g. Repair of broken equipment cost

2.5.2. Indirect Cost

The loss as cost that is used and include something is not seen at the accident occurred.

- a. The loss of working time from the labor that experience an accident
- b. The loss of working time of other labor because of their sympathy to help the victim
- c. The stopped of production process, the failure to reach target, etc
- d. The loss because of broken equipment

e. Investigation and other cost, such as:

- Investigate the cause of accident
- Replace the victim with other worker
- Recruit new labor

2.6. Loss-Time injury

A lost-time injury is defined as an occurrence that resulted in a fatality, permanent disability or time lost from work of one day/shift or more. This definition comes from the Australian standard: Workplace Injury and Disease Recording Standard (Australian Standard 1885.1– 1990), published by Standards Australia.

2.7. Project Continuity

A primary objective of all Project Managers is to understand clearly the history of a project and to ensure a smooth transition to the next phase. Overall Project Work Phase depicts the typical work flow from planning to maintenance. So, project continuity can be concluded as an execution process in each steps of the project its self.

Based on *PROJECT MANAGEMENT HANDBOOK, PART 1 - ISSUES COMMON TO ALL PROJECT MANAGERS*, there are six phases of construction, they are:

1. Planning
2. Project Development and Environment

3. Design
4. Right of Way
5. Construction
6. Maintenance

2.7.1. Planning

Planning is the systematic identification of program and project tasks, task schedules, and resources required for task accomplishment. Planning is the production of budgets, schedules, and other detailed specification of the steps to be followed and the constraints to be obeyed in project execution” (Ballard and Howell, 1998).

2.7.2. Project Development and Environment

Project Development and Environment is a report or environmental documentation that contains of improvement alternatives considered, the selected alternative, anticipated socio-economic and environmental impacts, and projected right of way and construction costs.

2.7.3. Design

The right of way phase officially begins during the design phase. All commitments that have been made from the beginning of a project must be made available to the right of way Project Manager.

2.7.4. Right of Way

During the right of way process, there must be frequent communications and careful coordination between right of way and design. Small changes in the design can have a major impact on right of way, and right of way commitments must be accounted for in the design. When appropriate, right of way commitments should be shown on the construction plans.

2.7.5. Construction

The construction Project Manager should be involved in the design of a project from the outset, and the design PM should continue to be involved through construction completion. The construction Project Manager should review the plans at each phase submittal to ensure that the project is constructible. The familiarity gained through these reviews will greatly aid in planning the inspection and engineering efforts required for the construction project.

2.7.6. Maintenance

The responsible maintenance professional should be involved in a project from the design phase through the construction phase. The maintainability of a project is an important consideration for both the design and the construction Project Manager. From a life-cycle perspective, maintenance costs can be a major portion of the total project cost. Expenditures during design and construction that improve maintainability reduce cost to the taxpayer in the long run.

2.8. The Measurement of Project Continuity

It is already mentioned above if project continuity can be concluded as an execution process of each phases of the project itself. In this study there are three main points that will be used to measure or determine the execution of construction processes, they are:

2.8.1. Cost

The decision to construct a new building is a complicated investment that requires careful consideration. Different building will have different needs, it means it will produce different price tag also. Cost plans of project commonly planned by cost consultant. They determine the life of project, develop the information in detail as more information, and then determine the actual prices of the project.

2.8.2. Time

Times, with its associated costs are vitally important for each participant in the construction process including the lender, owner, architect engineers, contractor, and subcontractors. Effective management and the administration of the contract time and change provisions are central to the avoidance and mitigation extended time and cost overruns.

2.8.3. Quality

Quality control and safety represent increasingly important concerns for project managers. Defects or failures in constructed facilities can result in very large costs. Even with minor defects, re-construction may be required and facility operations impaired. Quality requirements should be clear and verifiable, so that all parties in the project can understand the requirements for conformance. Safety during the construction project is also influenced in large part by decisions made during the planning and design process. Some designs or construction plans are inherently difficult and dangerous to implement, whereas other, comparable plans may considerably reduce the possibility of accidents.