CHAPTER II

LITERATURE REVIEW

2.1. Projects Definition

According to Tuman (1983), A project is an organization of people dedicated to a specific purpose or objective. Projects generally involve large, expensive, unique, or high risks undertakings which have to be completed by a certain date, for a certain amount of money, with some expected level of performance. At a minimum, all projects need to have well defined objectives and sufficient resources to carry out all the required tasks.

Align with the definition provided by Pinto & Slevin (1988), and accepted for this thesis, a project can be illustrated possessing the following characteristics:

(1) A defined beginning and end (specified time to competition).

(2) A specific, preordained goal or set of goals (performance expectation).

(3) A series of complex or interrelated activities.

(4) A limited budget.

Diallo & Thuillier (2003) reviewed the project management literature outlined a set of evaluation dimensions which appear regularly although not with the same occurrence:

(1) Respect to the three traditional constraints.

(2) Satisfaction of the client.

(3) Satisfaction of the objectives as outlined in the logical framework.

(4) Project impacts.

(5) Institutional or organizational capacity built in the organization by the project.

(6) Financial returns (in the case of productive projects) or the economic or social benefits (in the case of public sector projects), and

(7) Project innovative features (outputs, management or design).

2.2. Construction Project

According to Business Dictionary, projects are unique because of the short-run actions followed by limitations such as special working conditions, a budget, personnel, fixed starting and ending dates to reach specific goals (Business Dictionary 2011). As a result of the special conditions, and limited resources, the nature of the project assumes risks (Perminova 2011, 214).

Construction is commonly done on a stated location for a known client. A Project manager normally manages the construction job beside several other people who are handled in one way or another. Some notable characters in the construction industry include construction manager, design engineer, construction engineer or project architect supervises it. (Halpin, et. Al, 2010).

Chitkara 1998 & Halpin 2010 identified three sectors of the construction industry. These include:

i. Buildings – These includes both residential and non-residential buildings.

ii. Infrastructure – This includes highways, heavy civil or heavy engineering works like large public works, construction of dams, bridges, railways, highways, water/wastewater and utility distribution

iii. Industrial – This includes things like refineries, process chemical, power generation, mills and manufacturing plants.

The construction project is becoming increasingly complex as it involves risks and uncertainty and requires different types of professional skills to develop a well thought out plan at various phases of the project's life-cycle. (Chitkara, 1998). Chitkara says the success of a construction project from execution to finish needs effective planning.

2.3. Project Management

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. The primary challenge of project management is to achieve all of the 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, quality and budget. The secondary and more ambitious challenge is to optimize the allocation of necessary inputs and apply them to meet pre-defined objectives. It has always been practiced informally, but began to emerge as a distinct profession in the mid-20th century.

PMI's A Guide to the Project Management Body of Knowledge (PMBOK® Guide) identifies its recurring elements:

Project management processes fall into five groups:

(1) Initiating

(2) Planning

(3) Executing

(4) Monitoring and Controlling

(5) Closing

Project management knowledge draws on ten areas:

(1) Integration

(2) Scope

(3) Time

(4) Cost

(5) Quality

(6) Procurement

(7) Human resources

(8) Communications

(9) Risk management

(10) Stakeholder management

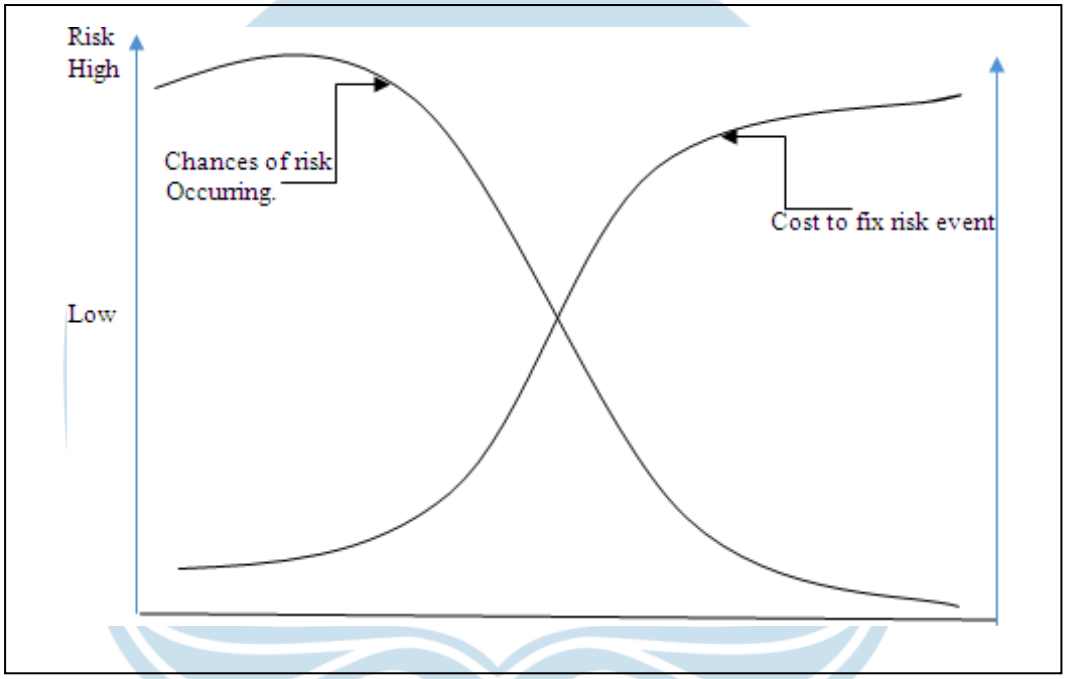
2.4 Risk

Risk is a multifaceted concept (Wang et al, 2004), which is defined as the probability of a damaging event occurring in the project, affecting its objectives (Yu, 2002; Baloi and Price, 2003) however not always associated with negative results. The risk may also represent opportunities, but the fact that most of the risk usually has negative results has led individuals to only consider the negative side of risk (Baloi and Price, 2003; Hillson 2011). The risk of the project can be defined as an elaboration of unfortunate consequences, both finance, and structure of the

project, as a result of decisions taken or due to environmental conditions on the project location. Risks in construction projects are the matter that cannot be eliminated, but their impact can be minimized

Project Life Cycle

Figure 2.1 Risk event, source: Clifford & Eric, (2006).



Risks in construction projects are actually borne by many parties that involved in the project. Generally, risks are identified just from the owner and contractor perspectives; however, some other parties are also involved in the project.

A construction project is unique, specific, and dynamic, and therefore projects have different levels and combinations of risks, hence different responses are taken to minimize those risks and different consequences affect the project performance. Risk categories in building projects:

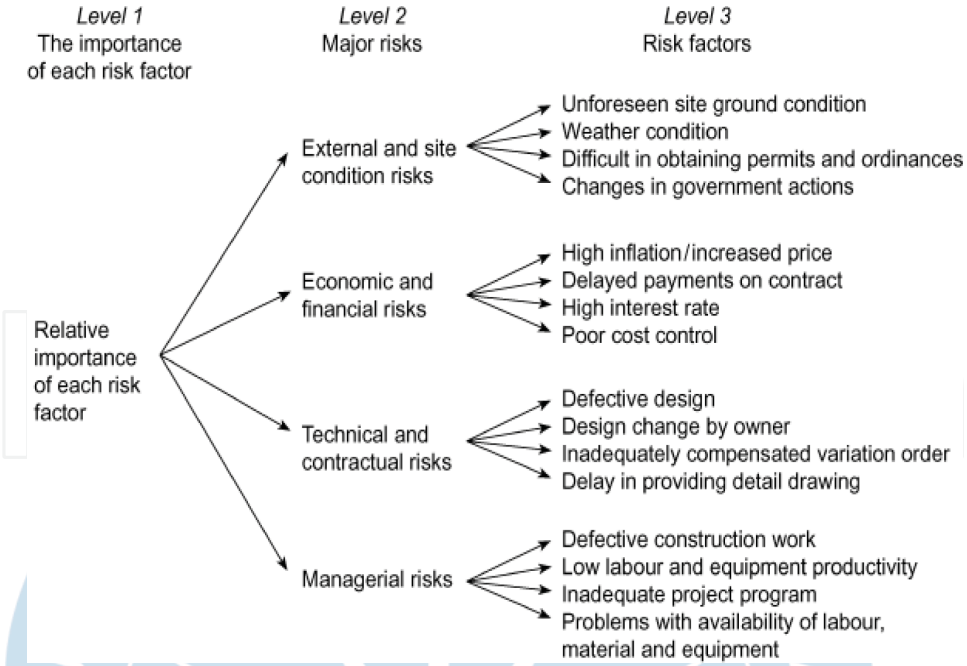


Figure 2.2 Hierarchy of risk at building project in Indonesia.

Source: Wiguna and Scott

There is some example that author provided in this thesis regarding risk in Construction Projects:

(a) Changes require additional resources or different resources than predicted causing resourcing conflicts/delays.

(b) Choice of plant or cranes is found to be unsuitable during construction.

(c) Construction staging (storage) areas are not large enough.

(d) Failure to achieve the quality required and/or functional requirements of the build.

(e) Errors in method statement lead to delays.

(f) False work design is not sufficient for example it is not completed or accurate.

(g) Not enough time to getting permits.

(h) Sub-contractors delay or resourcing problem

(i) Sub-contractors had financial issues/cash flow issues.

(j) Water table is found to be higher than expected or changes resulting in the need of dewatering.

(k) Working at height and management of associated hazards leads to delays and increase cost.

(l) Special parts or equipment has to be manufactured to provide the utilities leading to longer lead times and delays to start of construction.

2.5 Risk Management

Risk management is defined as the process of identifying and assessing risk, and to apply methods to reduce it to an acceptable extent (Tohidi, 2011). Then, the main purpose of a project's risk management is to identify, evaluate, and control the risk for project success (Lee et al, 2009). Overall, risk management process includes the following main steps: (1) Risk planning; (2) Risk identification; (3) Risk assessment (qualitative and quantitative); (4) Risk analysis; (5) Risk response; (6) Risk monitoring, and (7) Recording the risk management process (ISO 31.000, 2009; Baloi and Price, 2003).

2.6 Step in Risk Management

a. Risk Identification

The beginning of the project risk process is the identification of potential risks to the project. Therefore, understanding the scope of the possible risk will benefit project managers in establish a more realistic and cost-effective approach in dealing with such risk factors. So, the progress of any project depends on the proper identification of all types of risk factors without limit to the obvious. Risks identification is the process of examining the program areas and each critical technical process to identify and document the associated risk. This is both a creative and a disciplined process.

The creative process includes brainstorming where the project team prepares a list of everything that could go wrong ((David Hillson, 2003). Hillson suggests the use of Risk Breakdown Structure (RBS) just like Work Breakdown Structure (WBS) where checklists of all potential risks are prepared and evaluation is done on the likelihood that those events might happen during the project lifespan. Thus, ended up specifying the main sources of potential risks and categorized them as technical, cost, schedule, client, contractual, whether, financial, political, and environmental and people. The table below gives the risks breakdown structure as suggested by Hillson.

Level 1	**Level 2**	**Level 3**	**Risk Mitigation**
	1.Technical 2. Cost		

Plan move	3.Schedule 4. Client 5. Contractual 6. Weather 7. Financial 8. Political 9. Environmental 10. People	Potential risk	

Table 2.1: Work Breakdown Structure, source: PMBOK guide, (2008).

The Hillson's approach helps the project team to identify known risks and plan mitigation strategies; however, this approach is that it is restrictive and less creative in identifying unknown risks and risks not easily found inside the work breakdown structure. (PMBOK guide, 2008).

Further, Boyce (1995) suggests three techniques of identifying risks:

(1) Brainstorming

All the relevant people associated with the project convene and discuss all the aspects of the project comprehensively and raise their ideas and thoughts foreseeing the risks in their perceptions. There is a facilitator who notes it all down and differentiates between the imperative and unnecessary ones.

(2) Delphi Technique

Questionnaires are answered in anonymity by a group of expert panelists in rounds followed with an aim of converging towards one mutual answer by

improved judgement after consecutive rounds. The process is stopped after a predefined stop criterion (no. of rounds, stability).

(3) Interviewing/Expert Opinion

Experienced personnel and relevant people are consulted for their opinions and advice to avoid factors affecting risk.

(4) Past Experience

Similar projects are brought up and perused rigorously to identify the factors that could affect the project.

(5) Drawing on existing risk database and concludes that these techniques differ in nature and provide the best opportunity in identifying several risks.

(6) Checklist

A predetermined list of all the risks that could pose a threat to the project are delved, drawn and juxtaposed from the previously completed projects with analogous criterion.

Figure 2.3: Five basic ways through which risk identification is done.

b. Risk Assessment

Organizations need to assess its potential in terms of the critical business activities including services, resources, manpower, power failures, natural disasters, and illness and so on. Assessing the organization properly will help in identification of the most appropriate factors that are absolutely necessary for undertaking the project. This risk assessment process involves the determination of quantitative or qualitative estimates in identifying potential risk and evaluation of the potential impact of this risk on the project so as to increase the likelihood of project success in meeting cost, performance and schedule objectives.

Quantitative risk assessment requires calculation of two components of risk (R); the magnitude of the potential loss (L) and the probability (P) that the loss will occur (David Hillson, 2003). While Qualitative risk assessment is concerned with determining the probability of risk event occurring and the impact the risk will have if it does occur. Impact affects project elements such as schedule, budget, resources, deliverables, costs, quality, scope and performance. (Kim Helman, 2011).

The assessment of probability and impact is subjective but needs definitions for it to be an appropriate level of details for any project. (A step-by-step practical guide, 2004). This guide proposes a five-point scale work for almost all project work. The Table 5 below shows this five-point scale;

Scale	**Probability**	**Impact**
• Very low	• Unlikely to occur	• Negligible impact

• Low • Medium • High • Very High	• May occur occasionally • Is as likely as not to occur • Is likely to occur • Is almost certain to occur	• Minor impact on time, cost & quality • Substantial impact on time, cost & quality • Substantial impact on time, cost & quality • Threatens the success of the project

Table 2.2: Source: A Step-by-Step guide, (2004).

c. Risk Response

After identification and assessment of the risks are done, available options to avert the risks are marked and discussed in case they ever crop up in future. Besides opting the apt remedial measures for risks affecting the project, positive opportunities too are gleaned from the risks. Risk response is further subcategorized into Risk avoidance, Risk transfer, risk mitigation and risk acceptance depending upon the nature of the risks.

d. Risk Monitoring and Control

This is an ongoing process that systematically tracks and evaluates the performance of risk mitigation actions against established metrics throughout the acquisition process and provides inputs to updating risk mitigation strategies throughout the project lifespan. (PMBOK guide, 2008). Risk control may involve

choosing alternative strategies, implementing a contingency plan, taking corrective measures or repeating planning process. The Table 6 below shows a sample input of risk monitoring and control

Input	**Tools & Technique**	**Outputs**
• Risk management plan • Risk response plan	• Project risk response audits • Periodic project risk reviews	• Workaround plans • Corrective action
• Project communication	• Earned value analysis	• Project change requests
• Additional risk identification and analysis	• Technical performance measurement	• Updates to the risk response plan
• Scope change	• Additional risk response planning	• Risk database • Updates to risk identification checklists

Table 2.3: Source PMBOK guide, (2008).

2.7 Risk Response

a. Avoid

Shunning away from the tasks that involve risks is risk avoidance. Though it's not always possible to avoid the risks this way, it is the simplest way to tackle the risks. In easier terms, steering clearing of the parts of the project that may introduce new risks that may endanger the whole project is risk avoidance. Risk avoidance is most likely to take place where the level of risk is at a level where the project is potentially feasible.

b. Transfer

There are various ways through which one can transfer risks from their projects to the third parties. Purchasing insurance, outsourcing intricate and sophisticated work to an experienced organization, using a fixed price contract instead of unit price contract and the complete removal of warranty and guarantee terms.

c. Mitigate

Reducing the impact of the risks that are inevitable and nontransferable in a project is termed as risk mitigation or risk reduction. The purpose of risk identification and risk assessment as mentioned earlier is to prepare for risk mitigation. (The owner's role in project risk management, 2005). This means that the risk management planning is a continuous process and does not stop after qualitative risk assessment, or Monte Carlo simulation or the setting of contingency levels.

Risk mitigation plans characterize the root cause of risks that have been identified in the first step and quantified in the earlier phases of the risk management process. Secondly it evaluates risk interactions and common causes. Thirdly it identifies alternative mitigation strategies, methods and tools for each major risk. Fourthly it assesses and prioritizes mitigation alternatives. Fifthly, it helps in the selection and commitment of resources required for specific risk mitigation alternatives and finally communicates planning results to all project participants for implementation.

d. Accept

Every project carries risk in some form. Some risks have to be hauled and made a part of the project with the consensus of all the relevant parties associated with the project. Keeping cost and time factor in view, management authorities must be informed regarding the consequence in case the risk occurs.