

## CHAPTER 2

### LITERATURE REVIEW AND BASIC THEORIES

#### 2.1. Literature Review

The research conducted by Arukala (2015) is about risk management in the construction industry. Risk management is a tool used to identify, analyze and determine risk mitigation priority. This thesis was discussing how the risk management is successfully used in the construction projects, different risk management method used in risk management, and the aspect which could affect the use of life cycle of the project. After the implementation of risk management in BB-terminal 5, the risk management has been strongly connected to the production phase according to the project participant.

Research conducted by Renaldhi (2014) entitled "Analysis of delay risk for Tank X construction Project in TTU-Tuban (Study Case: PT. Pertamina UMPM-V). This research aim is to do a risk analysis of risks that affect project delay. The research started by doing risk identification, analysis, evaluation, and mitigation for all risks that affected project delay using monte Carlo simulation and loss estimation caused by the project risk.

Research conducted by Zulvantino and Syahrizal (2015) entitled "Analisa Faktor – Faktor Resiko yang mempengaruhi Keterlambatan proyek Gedung (Studi Kasus: Pelaksanaan Proyek Konstruksi Gedung Di Kota Medan). This research is analyzing risk factors affecting the delay of building construction projects. The data collection gathered from the Questionnaire and interview with the respondent. Analysis of the data processed by descriptive statistics and analysis of the risk level to get the ranking factor.

Research conducted by Junior and Carvalho (2013) is about to understand the impact of project risk management on project performance. They're using the qualitative method as an alternative method. This method used on respondent perception. The result demonstrates that the impact of risk management practices on project success.

Vladut-Severian (2014) researched about risk management and the evaluation and qualitative method within the projects. The method used is risk assessment with the probability-impact matrix. This research concluded with a practical example of the used of probability-impact matrix or the risk matrix to obtain

information relative safety in a descriptive lighter way on risk, the manager turns to the qualitative method of evaluation that easier to explained to others.

Ganame and Chaudari (2015) in a journal entitled “ Construction building schedule risk analysis using Monte-Carlo Simulation” researched by distributing questionnaires among 31 industries to know how to organize and finish the project to be done on time consider the effect that causes the project. The method used in qualitative analysis is Probability impact matrix and quantitative analysis is using PERT and Monte Carlo. The analysis result of this research shows the simulated completion time within which the project should be completed, it can help the contractor to consider the overall completion duration of the project so avoid delay.

Yuliani (2016) in her research entitled “Evaluasi Risiko Teknis Pelaksanaan Struktur Atas Berdasarkan Konsep Severity Index Risiko (Studi Kasus Proyek Gedung P1-P2 Universitas Kristen Petra Surabaya)” is about how to manage the risk that ever done by the company, by done a technical risk evaluation to determine the dominant risk which is affecting time and cost, and also risk response. The research started by done risk identification and risk analysis through questionnaires and interviews, risk assessment with Severity Index.

The research conducted by Jefri et al. (2014) entitled “Manajemen Resiko Pada Perusahaan Jasa Pelaksanaan Kontruksi di Propinsi Papua (Studi Kasus Di Kabupaten Sarmi) is about to define the various types of risk that may happen, and how to respond the identified risk. The method risk management process is applied, started by doing risk identification, risk analysis, and evaluation, risk response planning, and Monitoring and control risk.

The research conducted by Norken et al. (2012) is about risk management on a construction project applied risk process. The research started by risk identification through brainstorming and interview using questionnaire, and then risk assessment to define risks that are dominant and control through mitigation action. The method used is the qualitative method.

Setiawan (2014) researched about project risk management in PT. Multimedia Intermitra Mandiri. The data analysis is started by risk identification, risk assessment, and control risk. The analysis would construct a risk matrix to define the major risk effect on the project that needed to solve. The PERT (Program Evaluation and Review Technique) method is used also in this research to define

the project activities in the critical path, and also help to manage project risk towards delay of project completion time.

The PT. DAP is a medium-sized enterprise which has two branch office in other cities in Indonesia. As the company grows, risk management is needed to help the company (former or a new member) to identify, analyze and evaluates the risk that may occur and to provide a strategy to respond and solve either the same or not possible risk happens in the future and do the control risk to make sure the strategy action have been applied. This research could be a reference to the company to prepare advance risk management.

## **2.2. Theoretical Background**

### **2.2.1. Project**

Project is a temporary activity group to achieve a result of the product or service. The following are some definitions of the project according to the experts:

- a. Project activities are temporary, occurring within a limited period of time, with the allocation of certain resources required to meet the purpose it intends to be accomplished (Soeharto, 1999).
- b. Project are also complex, not routine or always available, it has time constraints, costs, income/revenue and design to meet the different preferences of the customer or project owner (Gray and Larson, 2000).
- c. Project is a set of activities with the following basic characteristics (Kerzner, 2003):
  - i. Have specific purpose, final product or final work result.
  - ii. The amount of cost/fees, certain targets and quality standards used to achieve the specified goals.
  - iii. Temporary, which mean have certain limited time to complete the project. The starting and end point clearly determined
  - iv. Non routine, not repeated. The type and intensity of activities changed throughout the project.

### **2.2.2. Project Management**

As stated in PMBOK (2000), Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirement.

Project management is accomplished through the use of processes such as: initiating, planning, executing, controlling and closing.

Project led by a project manager which manage and coordinate the project using a management principles where the objective is to fulfill the vision and guaranteed project success. Customer satisfactory, rivalry, project profitability and third-party market availability could affect the project success (Kerzner, 2003).

In other words, project management, is a logical sequence, planned activities required to complete a project. In this approach, given the constraints of time, resources and cost, the project team aims to achieve the project objectives and obtain feed-back for each phase of the (construction project plan, manage and track the implementation of activities; completion of the project).

There are several descriptions of project management's knowledge and practice area PMBOK (2008):

- a. **Project Integration Management**, consist of the mechanism used by the project to guarantee that every element of the project could be conducted effectively complete with the project design, implementation and plan to control the integrated improvement.
- b. **Project Scope Management**, consist of the mechanism used by the project to guarantee that projects consist of all significant jobs to complete the project effectively. These include initiating, scope planning, defining, verifying and control changing.
- c. **Project Time Management**, consist of the mechanism used by the project to guarantee that completion time defined effectively which is consist of task identifying, sequencing, operation time forecasting, and controlling.
- d. **Project Cost Management**, consist of the mechanism used by the project to guarantee that the completion of the project using below the expenses defined by planning the resources, forecasting, budgeting and keeping the expenses under control.
- e. **Project Quality Management**, consist of the mechanism used by the project to guarantee that the quality and specification of the project meet the standard required which could be achieved by planning assuring and controlling the quality well.
- f. **Project Human Resource Management**, consist of the mechanism used by the project to achieved human resources used effectively which organizational

plan, staff procurement, and team development needed to achieved the objectives.

- g. Project Communications Management**, consist of the mechanism used by the project to guarantee that proper generating, collecting, disseminating, saving and discarding information is efficient which communication planning, distributing information, reporting the performance and terminating administration is needed.
- h. Project Risk Management** consist of the mechanism used by the project related to the risk assessment and response which consists not only planning risk management, identifying risk, analyzing both qualitative and quantitative risk, responding risk, monitoring and controlling risk.
- i. Project Procurement Management**, consist of the mechanism used by the project to procure third-party resources (materials and services) which planning for procurement, request, requesting, selecting the resources, contracting and closing.

### 2.2.3. Risk

Project risk could be considered as a situation which is uncertain caused by one or more factors which would have positive or negative impact on the project. These factors have a cause, assumption, limitation or circumstances that resulted in negative or positive unpredictable result which is a common concept.

Vaughan and Vaughan (2008) stated that risk is a condition in which an undesirable effect is likely to be anticipated and excluded from the desired result. Risk could also be defined as future uncertainty that might affect the result of the organization's strategy, operational and financial target which could be found on International Federation of Accountants (1999). In its relation to the project, risk can be defined as the cumulative impact of the uncertainty that negatively impacts the project.

Although the risk is a closely related to uncertainty, both have differences. Uncertainty is a condition in which there is a lack of knowledge, information or understanding of a decision and its consequences. The risk arises from uncertainty about whether future outcomes can be predicted. The higher uncertainty, the greater the risk.

The construction industry risk could be categorized into:

- a. **Technical Risks:** Risks associated with unfinished design, incomplete specification, inadequate site investigation, and change in context, constructions method and unavailability of resources.
- b. **Construction Risks:** These risks include productivity of the workers, arguments between the workers, condition of the project site, failure of equipment use, changes of design, over high-quality standards, and newest technology.
- c. **Physical Risks:** The risks resulting from the structural damage, machinery damage, workers' injuries, fire and stealing of the material and equipment, etc.
- d. **Organizational Risks:** The organizational risks include of Contractual relations, Contractor's experience, participant's behaviors, less workforce experience and Communication.
- e. **Financial Risks:** the cost of material's increase, minimum of market demand, rate exchange's fluctuation, payments are not made in time, and odd estimation taxes, etc. are related to financial risks.
- f. **Socio-Political Risks:** Changes in laws and regulations, rules of pollution and safety, Bribery or Corruption, barrier of Language or Cultural, Law and Order, War and civil disorder and claim for permits and the approval.
- g. **Environmental Risks:** The risk cause by the natural disaster and climate

#### 2.2.4. Project Risk Management

Planning, identifying, analyzing, response planning, and controlling risk are the process of project risk management. The objectives of project risk management are to increase the likelihood and impact of positive events and decrease the likelihood and impact of negative events in the project (PMBOK, 2013).

The objective of the risk management according to standard Australia/Standard New Zealand (2004) are as follows:

- a. Help to minimize the undesirable effect
- b. Maximizing the achievement of company's goal and minimize loss
- c. Perform management method efficiently therefore could give profits not loss
- d. Increase decision making to all levels
- e. Establish appropriate method to minimize loss when failure occur.

Risk management is looking at risk areas systematically then conclude a better solution. Thereby, through management will be known appropriate method to avoid or reduce the amount of loss suffered by risk. In good risk management, it can

avoid possible cost that are forced it be incurred due to the occurrence of an event and support in increase business profits. Information based on past experience is very helpful to analyze the uncertain events on the future. Risk management leverages information to focus on the future when there is uncertainty and then develops an appropriate plan to address the potential issue of adverse impact.

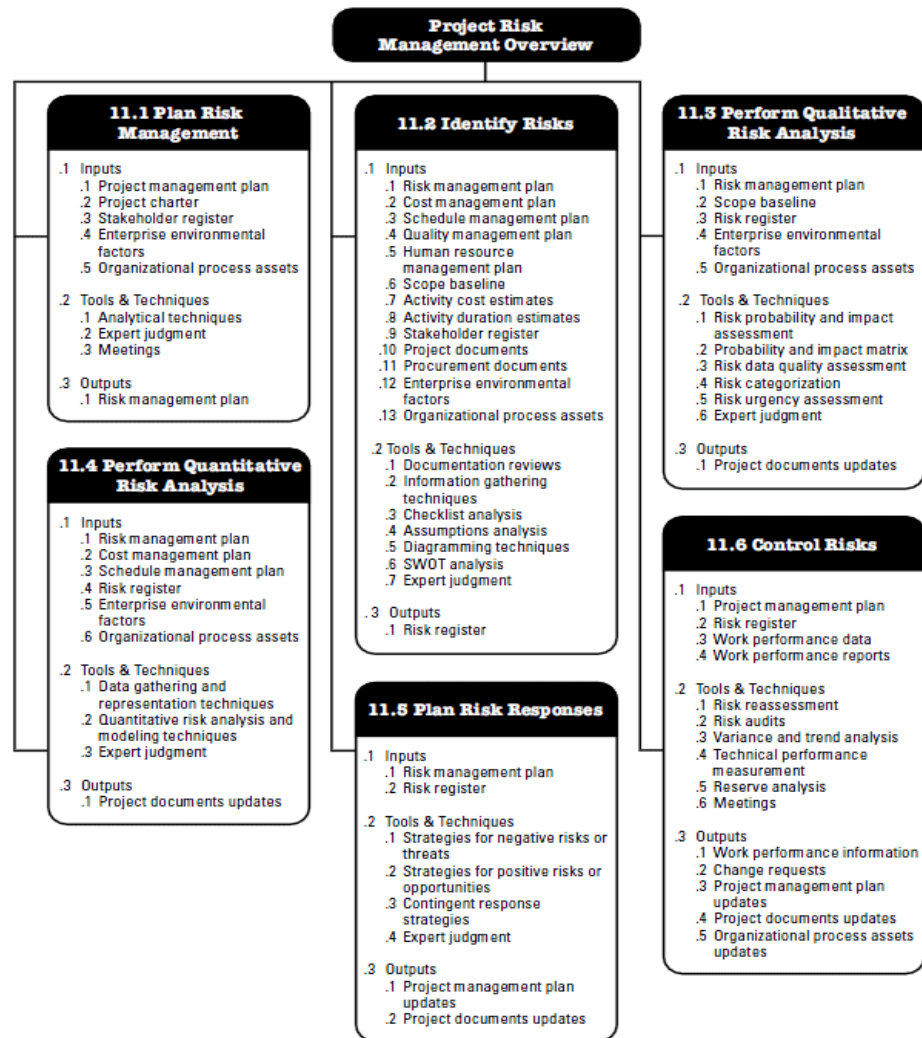
The risk management have a lot of advantages which are (Mok et al., 1996):

- a. Decision making in dealing complex problem
- b. Facilitating the budget expenses
- c. Providing and forecasting idea in deciding the best result
- d. Decision maker could handle risk and uncertainty from any factor and decide the number of information gathered to solve the problem
- e. Making a decision systematically and logically
- f. Providing guidelines as an assistant to formulate problem
- g. Alternatives option could be analyzed carefully

The Risk management process according to PMBOK Guide 5<sup>th</sup> Ed. (2013) are:

- a. **Risk Management Planning** – The process of defining how to conduct risk management activities for a project.
- b. **Risk Identification** - The process of determining which risks may affect the project and documenting their characteristics.
- c. **Qualitative Risk Analysis** - The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.
- d. **Quantitative Risk Analysis** - The process of numerically analyzing the effect of identified risks on overall project objectives.
- e. **Risk Response Planning** - The process of developing options and actions to enhance opportunities and to reduce threats to project objectives.
- f. **Risk Monitoring and Control** - The process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

These are the steps of risk management process based on Project Management Body of Knowledge Guide 5<sup>th</sup> Edition shows in figure 2.1.:



**Figure 2. 1. Project Risk Management Overview**

**(Source: Project Management Book of Knowledge 5<sup>th</sup> Edition)**

### 2.2.4.1. Plan Risk Management

Risk Management planning is the process of deciding how to conduct risk management activities for a project. The Risk management planning illustrates how risk management is well structured and implemented in a construction project. The main advantage of plan risk management is the degree, type and visibility of risk management which compatible with importance and company's project risk



guaranteed by it. Project success is measured through four objectives, namely cost, Time, Scope and Quality.

The tools and techniques used to plan risk management are:

**a. Analytical Technique**

This technique is understanding and defining the whole risk management contexture. Risk management context is a combination of stakeholder risk attitudes and the strategic risk exposure of a given project based on the overall project context.

**b. Expert Judgement**

Interpreting the information collected from the monitor and control process is the job of the expert judgement. The project manager working together with his team ensure the performance meet the goals by determining every action needed. Judgement and expertise have to be specialized trained or have the knowledge of the related field in order the risk management plant could be understand completely namely senior manager, stakeholders, project managers which has a knowledge or experience related with the project, subject matter experts (SMEs), consultant and professional associate.

**c. Meeting**

Project teams hold planning meetings to develop the risk management plan. Attendees at these meetings may include the project manager, selected project team members and stakeholders, anyone in the organization with responsibility to manage the risk planning and execution activities, and others, as needed.

Meeting could be conducted direct, indirectly, formal or informal which consist of project team members, stakeholders, and others party related to the project. High-level plans consist of risk management plan discussed and defined in this step. Generally company has templates for categories of risk and description of terms such as risk level, type of risk towards the probability of each risk, the objectives towards impact of the risk, and the probability and impact matrix would adjust to the defining project. When the company does not have the templates for those steps of process, in the meeting, the company or team could be generated.

**2.2.4.2. Identify Risk**

Identifying risk is a process of determining which risk may affect to the project and documenting their characteristic. The key benefit of this process is the

documentation of existing risk and the knowledge and ability it provide to the project team to anticipate the events. The primary output form identify risks is risk register. The risk register is a document in which the result of the result of risk analysis and risk response planned are recorded.

Participants in risk identification activities may include the following: project manager, project team members, risk management team (if assigned), customers, subject matter experts from outside the project team, end users, other project managers, stakeholders, and risk management expert.

Risk Identification can be done by the following tools and techniques, such as:

**a. Documentation review**

The project documentation, likes plans, assumptions, files of the previous project, agreement, and other information be going to perform. The indicators of the risks in the project may be the quality of the plans, accord between these plans and the project claim and assumptions.

**b. Techniques to Gathering the Information**

- i. **Brainstorming.** This technique is a method to solve the problem by gathering many opinions in instance. The goal of brainstorming is t obtain a comprehensive list of project risks. Risk are identified and categorized by type of risk and their definitions are defined.
- ii. **Delphi Technique.** This technique is a process to achieve general agreement from a few expert without knowing each other.
- iii. **Interviewing.** Interviewing is collecting information by asking the question directly to the respondent.
- iv. **Root and Cause Analysis.** This is a tool use to identify the root of the problem appeared on a system or a process.

**c. Checklist Analysis**

Risk Classification checklist are designed on the basis of past facts and knowledge obtained from former similar projects and another information sources .The team should also look for things not included in the checklist. Therefore, from every now and then, the checklist should be split to delete the preserve related items. At the point of project completion, the checklist should be reviewed to implement or develop new learning for future project.

**d. SWOT Analysis**

This approach of analysis the plan from every point of view for strengths, weaknesses, opportunities and threats, with the goal of increasing the scale of

identified risks by internal risk inclusion. The strategy continues by defining the strengths and weaknesses of the company and focuses on the project, business or the company.

#### **e. Assumption Analysis**

The design and development of every project and its plan are built upon a series of hypotheses, scenarios and assumptions. The validity of assumptions for the project is being explored in an analysis of the assumption. The project identifies risks from inaccuracy of assumptions, instability, inconsistency, and incompleteness.

#### **f. Diagram Techniques**

- i. Cause and effect diagram.** This diagram also known as fishbone diagram, which it used to identify causes of risks.
- ii. System or process Flow charts.** This illustrates the interrelation between different element of a process and the causative mechanism.
- iii. Influence Diagram.** This is a graphical descriptions of circumstances that illustrates causal factor, the time order and other relationship between variables and results.

#### **g. Expert Judgement**

Risks may be identified directly by experts with relevant experience with similar projects or business areas. Such experts should be identified by the project manager and invited to consider all aspects of the project and suggest possible risks based on their previous experience and areas of expertise. The experts' bias should be taken into account in this process.

**The output of the risk identification risk process are:**

##### **a. Risk Register**

Risk register is known as primary output of the risk identification process. The risk register is a document that also consist of the risk analysis and risk response result. This risk register embody the output of other risk management process. The preparation of risk register starts by identify the process of the risk with these follows information, and then could be used for another management of project and processes of risk management:

##### **b. List of identified risks**

The identified risks will be writing much as detail as reasonable. The description about the risk using risk statement could be applied, for instance, a risk may occur causing impact, or if the causes exist, a risk that occur may leading to an effect.

The root cause of the risks could be clearer when it is added to the list identified risk. The risks should be written and used to support the future risk analysis of the project.

**c. List of potential responses.**

When identify risks, potential responses could be identified too and it should be used as an inputs to the plan of risks management process.

**2.2.4.2. Perform Qualitative Risk Analysis**

Perform Qualitative Risk Analysis is the method to prioritize risks for farther analysis by assessed and combined their probability of appearance and impact. The advantage of this approach is to help project managers to decrease the level of ambiguity and concern on the risks with high priority.

Perform Qualitative Risk Analysis is usually fast and economical way to set goals for risk response plan which, if appropriate, lays the foundation for perform qualitative risk analysis.

Qualitative analysis is often used first to obtain general indication of the level of risk and to reveal the major risk issues. Qualitative analysis uses words to describe the magnitude of potential consequences and the likelihood that those consequences will occur. These scales can be adapted or adjusted to suit the circumstances, and different descriptions may be used for different risk. (Risk Management guidelines companion to AS/NZS 4360:2004)

Qualitative analysis may be used (Risk Management guidelines companion to AS/NZS 4360:2004):

- a. Where the quantitative precision is not needed
- b. To perform an initial screening of risks prior to further, more detailed analysis.
- c. Where the level of risk does not justify the time and resources needed to do numerical analysis
- d. Where the numerical data are not available or inadequate for more quantitative analysis

**The following tools and techniques to do risk qualitative analysis:**

**a. Risk probability and Impact Assessment**

Risk probability assessment evaluates the likelihood of each specific risk. Risk Impact assessment explores the possible impact on a project goals, for instance,

schedule, cost, quality or performance contains of negative and positive effect that cause threats and opportunity. The probability and impact value of each risk also calculated. Risk can be measured in interviews or meeting of chosen stakeholders for their understanding of the risk groups on the agenda. Team member of the project and competent people from the outside of the company are also included. The level of probability and impact for each risk are assessed during the interview or meeting. Explanatory details are also documented, including assumptions justifying the assigned levels. Risk probabilities and impacts are calculated according to the criteria given in the risk management plan.

#### **b. Probability and Impact Matrix**

Risk can be prioritized based on their risk score for further quantitative analysis or risk response planning. Rating are appointing to identify risks according to the determined probability and impact. A probability-Impact matrix is used to do an evaluation of the significance or urgency of each identified risk. Risk rating defines as Low, moderate and high priority resulted by combined the probability and impact value in a matrix. Depends on the company choice to use descriptive or numeric values. The company should conclude which combinations of probability and impact result in a categorization of high, moderate or low risk. The risk-rating rules are specified by the company of the project and contained in organizational process assets. Risk rating rules of a project can be defined in the Plan Risk Management process.

As illustrated in Figure 2.2. , the red area with the largest number represents high risk, the green area with the lowest number represents low risk and the orange area represents the moderate risk with in-between number. The company could rate a risk separately for each objective (e.g., cost, time and scope). It would help to develop to determine one overall rating for each risk. In conclusion, opportunities and threats are handled with the Figure 2.2. matrix using definitions of the deferent levels of impact that are appropriate to each risk.

The risk score helps guide risk response. Risk that have negative impact, otherwise known as threats if it occur, and that are in high-risk are of the matrix, would require priority action and aggressive response strategies. Threats found in low-risk area may not require proactive management action beyond being placed in the risk register as part of the watch list or adding a contingency reserve. Same as to the opportunities, those in the high-risk area, which may obtain most easily

and offer the greatest benefit should be targeted first. Opportunities in the low-risk area should be monitored.

Probability	Threats					Opportunities				
	Risk Score = Probability x Impact					High (RED) / Med (YEL) / Low (GRN)				
0.90 Very Likely	0.05	0.09	0.18	0.38	0.72	High	High	High	Med	Low
0.70 Likely	0.04	0.07	0.14	0.28	0.56	High	High	Med	Med	Low
0.50 Possible	0.03	0.05	0.10	0.12	0.40	High	High	Med	Low	Low
0.30 Unlikely	0.02	0.03	0.06	0.12	0.24	High	Med	Med	Low	Low
0.10 Very Unlikely	0.01	0.01	0.02	0.04	0.08	Med	Low	Low	Low	Low
	0.05	0.10	0.20	0.40	0.80	Very High	High	Med.	Low	Very Low
Example Impact Definitions – May Be Tailored to Each Project Objective Impact on an Objective (e.g. Cost, Schedule, Scope, Quality)										

**Figure 2. 2. Probability-Impact Matrix**

**(Source: Project Management Book of Knowledge 5<sup>th</sup> Edition)**

**c. Risk data quality assessment**

The assessment of risk data quality is to determine the degree to which each risk data is useful in risk management. This includes analyzing the degree to which each risk is understandable as well as the accurateness, quality, completion, consistency and credibility of information of the risk. The application of low-quality data on risk could contribute to a minimal-use qualitative risk analysis for the project. If data quality is inadequate, better data collection may be needed. It is difficult to collect data regarding risk which required more time and resources than the initial plan.

**d. Risk Categorization**

Risk Categorization is done by defining the risk in these parts, such as causes of risk, the area of the project affected, or other appropriate categories to identify the task areas most exposed to the impact of the uncertainty. Root causes also could be used to identify risk. This approach helps identify work packages, tasks, project phases and even project positions that can contribute to successful risk response.

**f. Risk Urgency Assessment**

Risks that need to be handled in the short term may be considered urgently. Priority indicators may include risk identification, risk response time, symptoms and warning sign and risk rating. The risk urgency assessment is joined with the risk ranking from the result of probability and impact matrix to provide a final risk severity rating to the other qualitative analysis.

#### **g. Expert Judgement**

Expert judgment is required to evaluate the probability or impact of each risk in the matrix. Experts are generally those with the similar, recent project. Those are having experience with similar, recent projects. The use or risk facilitation seminars or interviews also could help in the gathering expert judgement. In this phase, the biases of the experts should be taken into account.

**The Perform Qualitative Risk Analysis's output are:**

#### **a. Project Documents Updates**

The updated project documents that may include, but are not limited to:

- i. **Risk Register updates.** When the new information is available through the assessment of qualitative risk, the risk register will be updated. The probability impact of each risk, risk scores, information of risk urgency, the risk categorization, and a watch agenda for probability risk with lower value or category and when a further evaluation is needed, are all written in report of risk assessment.
- ii. **Assumptions Log Updates.** Assumptions could be changed when the new information is have been made available in the assessment of qualitative risk. The assumptions may be integrated into the description of the project scope or a specific list of assumptions on quantitative risk analysis. This report can be separate from the risk register or connected to it.

#### **2.2.4.5. Plan Risk Responses**

The method to acquire strategy and action to improve the opportunities and the project objective, known as plan risk response. The advantage of this approach is to manage risks by prioritizing assets and action as requires in the financial plan, schedule and the plan of project management.

The process of plan risk response follows by performing the risk analysis of quantitative method (if used). So that the risk response needs to understand the process by which it addresses the risk. To evaluate the intended effect of the risk response plan, this method may use. It include identifying and assigning one person (responsible person) to take charge for each risk response concord upon and funded. Response actions towards the risk should be reasonable for the nature of the risk, cost-effective to meet the challenge practical in the scope of the

projects, accepted by all involved parties and held by a responsible person. It is important to select the optimal risk response from several options.

**Risk response plan's tools and techniques are as follows:**

**a. Strategies for Negative Risks or Threats**

- i. **Avoid.** When the project team works to minimize the threats or protect the project into its impact, it is call risk avoidance. This commonly includes adjust the plan to manage the project to completely reduce the threat. The project manager can also set apart the goals of the project from the impacts of the risk and adjust the goal that is at risk.
- ii. **Transfer.** Along with the ownership of the response, the project team shifts the impact of a threat to a third party, it call risk transfer. The transfer of risk simply assigns responsibility of another party for its management- it does not remove it. The most successful method to address exposure to financial risk is transfer potential responsibility. Transference tools may be quite complex, and include insurance use, quality commitments, contracts, guarantees, etc. but not limited to these. Contracts or agreements can be used to pass liability to some other party for specified risks.
- iii. **Mitigate.** Risk mitigation is a risk response strategy through which the project tram acts to reduce the probability of the occurrence or impact of the risk.  
This means reducing the probability and/or effect bellow acceptance minimum limits of an adverse risk. Often more effective to take early action to reduce the probability and/or impact when a risk occur in a project than trying to fix the damage after it has occurred.
- iv. **Accept.** This is where the project team come to decision to allow the risk and not require to take any action when the risk occur. When the risk happen and there's no possible cost-effective to address, this strategy could be affirm. Company could be considerate this strategy when not able to identify other appropriate response action or when the company decide not to do correction on the plan of project management.

**b. strategies for dealing with opportunities :**

- i. **Exploit.** The exploit strategy may be selected for the risk with positive impact where the organization wishes to ensure that the opportunity is realized. This strategy seeks to eliminate the uncertainty associated with a particular upside risk by ensuring the opportunity definitely happen.



- ii. **Enhance.** The enhance strategy is used to increase the probability and/or the positive impacts of an opportunity. Identifying and maximizing key drivers of the positive-impact risk may increase the probability of their occurrence.
- iii. **Share.** Sharing a positive risk involves allocating some or all the ownership of the opportunity to a third party who best able to capture the opportunity for the benefit of the project.
- iv. **Accept.** Accepting an opportunity is being willing to take advantage of the opportunity if it arises, but not actively to finish early.

#### **c. Contingent Response Strategies**

Some response actions are created for use only if the certain risk occur. The project team able to make a response plan due to the certain condition, if it is assume that there may be adequate warning to apply the plan. Missing intermediate milestone or acquire higher priority with a supplier that known as event that trigger contingency response, should be outline and tracked. Response of risks identified using this tools are often called contingency plans or fallback plans and include describes triggering events that set the plans in effect.

#### **d. Expert Judgment**

Input from the knowledgeable parties belong referring to the actions to be taken towards a risk, known as Expert judgment. Expertise could be provided by any group or person with specific education, knowledge, skill, experience, or training in establishing risk responses actions or strategy.

#### **The outputs of Plan Risk Management are:**

##### **a. Project Management Plan Updates**

Elements of the project management plan that may be updated as a result of carrying out this process include, but are not limited to:

- i. Schedule management plan.
- ii. Cost management plan.
- iii. Quality management plan
- iv. Procurement management plan
- v. Human resources management plan
- vi. Scope baseline
- vii. Schedule baseline
- viii. Cost baseline

## **b. Project Documents Updates**

In the Plan Risk Response process, some project documents are brought up to date as required. For example, when responses of the risk are named and accorded upon, they will be registered in a risk register template. A level of feature that corresponds with the rating priority and the plan of response should be written on the risk register. Updates to the risk register can be counted.

### **2.2.4.6. Control Risk**

Control Risks is the process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project. The key benefit of this process is that it improves the efficiency of the risk approach throughout the project life cycle to continuously optimize risk responses. Planned risk responses that are included in the risk register are executed during the life cycle of the project, but the project work should be continuously monitored for new, changing, and outdated risks.

Other purposes of the Control Risks process are to determine if:

- a. Project assumptions are still valid
- b. Analysis shows an assessed risk has changed or can be retired,
- c. Risk management policies and procedures are being followed
- d. Contingency reserves for cost or schedule should be modified in alignment with the current risk assessment.

**The tools and techniques of control risks are:**

#### **a. Risk Reassessment**

Control risk also leads to the new risks being found, current risks reevaluated and expired risk closure. Risk reassessment of the project should be frequently anticipated. How the project progresses associated to the objective is relied upon the amount and the detail of repetition.

#### **b. Risk Audits**

The effectiveness of the risks management process and risk response toward identified risks and their root causes are examined and documented in Risk audits. As described in the plan of risk management, the project manager is in charge to ensure that the risk audits are at an applicable frequency. The team could choose to hold the risk audits separately or include them during the meeting of project review. Before

the audit conducted, the format and objectives for the audits should be certainly outline.

**c. Variance and Trend Analysis**

This technique use to compare between the planned and actual results, many control processes apply variance. Performance information is using to review the trend in project's execution as the purpose of the risk control. For monitoring the performance of the overall project, Earned Value analysis and other method could be used. The output of these analysis could predict the potential at completion from cost and schedule target of the projects.

**d. Technical Performance Measurement**

During the project execution, the comparison between technical accomplishment and the schedule of technical achievement, it calls technical performance measurement. To compare actual target to the results, it's needed the definition of objective and quantifiable measures of technical performance. Weight, transaction times, delivery defect numbers, storage capacity and other, are included the technical performance measurement.

**e. Reserve Analysis**

Risks may occur either positive or negative impacts on the budget or contingency reserves schedule during a completion of a project. In order to conclude the remaining reverse is adequate, reserve analysis is needed to compare the amount of the contingency reverse remaining with the amount of risk remaining.

**f. Meetings**

At the periodic status meeting, project risk management should be an agenda item. The amount of time suitable for that item will be varied, based on the risks that have been identified, the priority, and the difficulty of the response. Expected discussion about risk make the risk is more probable that people will identify risks and opportunities.

**The output of risk control are:**

**a. Works Performance Information**

Works Performance Information, as a control Risk Output, provides a mechanism to communicate and support.

**b. Change Requests**

Change request may resulted implementing contingency plans or workarounds. To perform integrated changes control, changes requests are required to be prepared and submitted. Change request may involves, such as:

- i. **Recommended corrective actions.** These are activities that modify the accomplishment of the project work along with the plan of project management.

It involves contingency plans and workarounds. The latter are not originally scheduled response, but must resolve the known risks that were previously undetected or passively embraced.

- ii. **Recommended preventive actions.** These activities to assure that expected achievement of the project work is cooperate with the project management plan.

#### **c. Project Management Plan Updates**

If the approved change request have an effect on the risk management processes, the corresponding component documents of the project management plan are revised and reissued to reflect the approved changes. The elements of the project management plan that mat be updated are the same as those in the Plan Risk Responses process.

#### **d. Project Documents Updates**

Project documents that may be updated as a results of Control Risk process include, but are not limited to the risk register. Risk register updates may include:

- i. **Outcomes of risk reassessment, risk audits, and periodic risk reviews.** These outcomes might involves identification of new risks, amend to probability, impact, priority, responses plan, ownerships, and other aspects of the risk register. Outcomes can also include closing risks that are no longer applicable and releasing their associated reserves.
- ii. **Actual outcomes of the project's risks and of the risk responses.** This information can help project manager to determine plan for upcoming risk throughout their organizations, as well as on coming projects.

#### **e. Organizational Process Assets Updates**

The processes of risk management present the information that could be used for upcoming projects, and should be recorded in the organizational process assets.

The organizational assets that might be updated include, but are not limited to:

- i. risk management plan templates, involves the probability and impact and risk register
- ii. Risk breakdown structure
- iii. Lessons learned from project risk management activities

At the project closure these documents should be bring up to date, and also the last version of the risk register, the templates of plan risk management , checklist and RBS should be counted.

### **2.2.5. Delay in Construction Project**

Delay in a project often is inevitable, this delay could often be caused by both internal and external factor. Therefore, construction project could be categorized as a success project when it could be finished on time, cost as estimated price, and suitable with the specification determined (Majid, 2006).

The delays are classified or categorized into four basic ways as stated by Jervis and Levin (1998):

- a. Excusable delays** are a delay that happens by any events uncontrollable by the owner nor contractor.
- b. Non-excusable delays** are a mistake that caused by a negligence or omission caused by the project contractor.
- c. Compensable delays** are the delay caused by the action or negligence of the owner of the project which caused the schedule off. Due to these several caused, there will be a compensation on cost claimed by the contractor to the owner.
- d. Concurrent delays** are several delay events happens at the together at the same time which affect multiple activities and has an impact on the completion of the project.

Aibinu and Jagboro (2002) identified the effects of construction delays on project delivery in the Nigerian construction industry. They also said that the six major effects of delays follow:

#### **a. Time overrun**

Time overrun it mean contractor could not accomplish their work within the given period of time. In general, excusable delays and non-excusable are included in time overrun. When the time overruns happen, it will affect to the project of the work activities that cannot be done on time. The fault party will take into responsible to pay the party for the damages that they cause. For example, during the project almost done, but at the same time because of exceptionally implement weather cannot complete the project within the contract period by the contractor. In this situation, the contractor have right to claim the time extension. On the other hand, if that contractor cannot finished the work within the contract time due to his fault.

The contractor have no right to claim the time extension and he needs to pay for the damages.

**b. Cost overrun**

Due to the cost underestimation, cost overrun is an unexpected cost acquire over a budgeted amount. When the project cannot be done on time, it could affect to the cost of the project over budget, that's how the cost overrun and time overrun are related. Contractor should take responsibility to pay the project owner loss and expense due to the contractor' fault of inaccurate cost estimate, this is how over overrun happens.

**c. Dispute**

The dispute between the contractual parties as project owner, consultants, subcontractors and relevant parties that cause the project delay. Related parties could go through meditation when the disputes happens. The mediator should make into decision how to solve the problem. The parties involved could appeal the decision of the arbitrator when one of the parties does not agree and accept the decision of the arbitrator. The project delay will be pay by the fault parties if they agree with the decision of the arbitrator.

**d. Arbitration**

In the common delay project when the contractual parties do not agree with the decision of the mediator and appeal the arbitration. The arbitrator should try to solve the problem as well. But if one of the parties refuses to accept the arbitrator decision again, they can still appeal court judgement.

**d. Litigation**

In some delay projects, the parties involved have not yet accepted the arbitrator's decision. The results of the dispute resolution are appealed by the courts. In litigation, parties either have a trial alone or through a jury. If the parties are not again pleased with the decision, they can appeal again if new evidence process their right but if the parties accept the judgment, the party's fault has to take responsibility for paying the penalty.

**e. Total Abandonment**

Total abandonment means that the entire project would stop immediately due to financial difficulties faced by the company. Some of the current delay project abandoned due to customer or contractor problem, including the bankruptcy of

clients, run-off of the contractors, poor marketing and sales strategies, etc. The effect of the abandoned project would impact several parties including contractual groups, including vendors, managers, subcontractors, distributors, and other relevant parties. In contrast to those parties, the customers will also experience cost damage due to the abandoned project.

