

CHAPTER 6

SUMMARY AND RECOMMENDATION

6.1 Summary

6.1.1 Overview of Risk Management on Organization

In petrochemical construction plant construction, risk is more specified than other construction business due to the technical hazardous requirement. In contrast, general potential risks are almost the same as others construction business. Risk management on this business requires a long-term commitment, because each construction project requires quite a long time to complete the project, as well as the risk could change its level and additional risks continuously exist.

Standard of risk management from AS/NZS 4360:2004 is a versatile process to manage the risk. It facilitates the organization to manage the project going along with various risks. Risk management on this study focuses on the organization objective on the project as mention earlier, and categorizes into major department of the organization. Summary of significant potential risks on this study is shown below.:

<i>Department</i>	<i>Criteria Objective</i>	<i>Risks</i>	<i>Causes</i>
<i>Engineering</i>	Quality	-Inadequacy of design information	Limitation of the information from owner side
	Cost	- Additional period of design work (O/E)	Insufficient engineering designer
	Cost	-Over estimation of project configuration	Scope of the project is not clear since the bidding stage
	Schedule	-Inadequacy of site investigation	Limitation of time and permission from owner
<i>Procurement</i>	Quality	-Different interpretation of product specification	Unclear agreement of perspective on product specification
	Quality	-Improper packing in shipping process	No system for arrangement and handling of product at vendor transportation process
	Schedule	-Delayed delivery of materials and equipments	Inefficiency of vendor's supply chain management
	Schedule	-Nonconformity of materials (Dimensional, quality, and other defects)	Low consideration on investigation on product
<i>Construction</i>	Quality	-Inspection error	Insufficient consideration in more detail
	Quality	-Inappropriate condition of material and equipment	Improper utilization
	Quality	-Inexperience worker for the job	Non-systematic recruitment of labor level
	Cost	-Over material consumption and equipment utilization	No appropriate utilization control system
	Cost	- Alteration/Modification of construction	Change in client's requirement or error
	Cost	-Unpredictable cost change of subcontract work	Low experience of subcontractor
	Schedule	-Work load overloading	Ineffective distribution of work on site
	Schedule	-Accident	Poor circumstance in workplace
Schedule	-Climate change	Uncontrollable climate in geographic	

Table 6.1 Summary of Significant Potential Risks

6.1.2 Problem with Risk Management

Risk management, as mentioned earlier, is the process that requires dedication from the team, and it is the process that requires continuous commitment. Due to the risk management system requires the various participants (members) to set up team, participants of risk management for construction business must be the officer from engineering, procurement and construction department, which have their own normal work to be response. In the period that the participants have more work in hand, they will relocate the dedication from risk management to their normal work. This will result in ineffective risk management.

Apart from the advantage of risk management for the organization, specified problem areas of risk management are considered in more detail.

- ***Brainstorming for risk identification:*** The brainstorming session to identify potential risk is not achieved. The rules of brainstorming as mentioned earlier are not followed. Lists of potential risk at the early stage seem to be the same due the participants discuss to each others, and the project manager still dominates the lower level participants due to the seniority.
- ***Overlapping of identified risks:*** Most of construction business staff is engineer. After brainstorming session, potential risks are looked to be the same because of the background knowledge. Potential risks from each department are still overlapping. They must be clearly discriminated from each department in order to get correct result.
- ***Dedication among participant:*** Risk management is an important part of the project, but it is not recognized by the project team as a system. Even though the risk is considered in the project, not all risk management processes are dedicated as the important part to manage the project.

- ***Equivalence of potential risks:*** Result from brainstorming session is various potential risks, which are quite the same in their nature. This results in difficulty of risk estimation. Risk estimation for the potential risks in the same nature is difficult for the team to rank the score, which results in the difficulty of risk prioritization.
- ***Co-operation from related person:*** Human from each department is an important resource for risk management. Normally, they have normal job to be responsible. Level of co-operation from related person may not achieve the highest point due to the normal job that they have to allocate the time for.

6.1.3 Source of Project Failure

Risk is one of the most important sources of project failure. It is placed in every part of the project by itself. Project failure may come from internal organization such as organization behavior in every aspect, or external influence such as the third party. Customer requirement is now prioritized as the most important thing to be considered to achieve project objective. Project failure may come from many problem areas to be considered (Cicmill, 1997):

- Poor understanding and identification of the client/customer/end-user needs.
- Inadequate specification of project requirements and project constraints; consequently, setting unrealistic project goals altogether.
- Organizational behavior factors including structure, functions, performance, and associated behavior of groups and individuals.
- Bounded rationality in the process of project planning and project implementation, i.e. the lack of appreciation of dynamics and change.
- Poor monitoring and control during the project implementation phase; measurement and assessment of project progress against the plan.

6.1.4 Key Successes of Risk Management

It is strongly recommended that commitment of risk management is important to achieve the desired objective. Commitment from all level in the organization is an important key factor to effective risk management. Due to the risks are located in every part of the project, skill and co-ordination within the team have to be develop to deal with the risks.

Risk management must be concentrated on the high risk level, and continue monitoring the high risk level of the project in order to deal with new or changing risks. Effective risk management is normally depended on the characteristic of risk management team and the appropriate risk management utilization. Key successes of risk management to be considered normally depend on (Office of Information and Communications Technology, 2004):

- The commitment of the sponsor and senior management to the risk management process.
- The skills and experience of the project team in the assessment of risks and the development of effective risk treatments.
- The project team, the business and other stakeholders working closely together to identify and manage all risks affecting the project.
- The use of an appropriate risk management process, methods and techniques continuously throughout the project.
- Regular reporting of performance against risk treatments, with this reporting provided by the project team and through appropriate independent quality assurance processes.

6.1.5 Conclusion of Risk Management Methodology

From the study of this thesis, the team for risk management must be established before starting risk management process. The team is established by selecting the representative from related department, which the representative should have enough experience in order to ensure that all processes of risk management are appropriately managed. Recommended representative is the manager or experienced staff (leader) of each department. Qualification of representative is also the factor to measure the level of effective risk management.

The Australian and New Zealand Risk Management Standard (AS/NZS 4360:2004) is conducted, and all steps are explained as follow.:

1. Goals and Context of the project are established by the agreement of the team to specify the objective and the circumstance of the current situation.
2. Identify Risks in various aspects by brainstorming. As mention earlier, rules of brainstorming must be strictly followed.
3. Analyze Risks and Estimate Risk Level by consideration of likelihood and consequence. Experience of estimator is very important for this step.
4. Evaluate Risks by indicate the causes of significant potential risks in order to decide the action plan.
5. Treat Risks by the use of risk treatment option and propose the feasible action plans to deal with significant potential risks.
6. Continuously Monitor and Review the risks after they are managed from the previous step into acceptable level.

Supporting from the organization to establish risk management system and long term commitment from the team are very important to ensure that risk management will facilitate the organization to achieve the project's objective.



6.2 Recommendation

After the study of risk management on petrochemical plant construction for the example organization, the important recommendations for further project includes:

- ***Risk management team should be founded into a new section:*** Risk management is a process that requires long term commitment due to the life of the project and the change of risk. It is difficult for normal staffs to manage their normal work and the risk in the same time. Risk management team should be founded into a new section in order to achieve effective risk management.
- ***Risk management for the whole part of organization:*** Project is the work done for the organization. To successfully achieve objective of the project by applying risk management, it should be applied to the whole part of the organization. Human resource department is the example to be considered. Project is managed by the team of organization. Without efficient human resource, the project cannot achieve its objective.

6.2.1 Management on Project Objectives

Objectives of the example organization are focus on three major criteria as mention at the early stage.:

- ***Quality:*** Requirement on technical standard, including safety and fitness to purpose.
- ***Cost:*** Obtaining value for money and completing the project within budget.
- ***Time:*** The needs for rapid construction and completion on specified date.

Those three objectives are widely recognized as the organizational objective for any project. However, organizational objective may vary depending on the characteristic and scope of the project organization.

To systematically manage the project on identified objectives with their risks, the practical guideline for project management of various size and complexity by scaling of project management techniques of Chapman (1997) to manage risks is recommended for further project, which is known as Project Management Scalable Methodology (see detail in appendix c.).

6.2.2 Alternative Risk Estimation by FMEA

Risk estimation in this study is conducted by the risk management standard of AS/NZS 4360:2004 by focusing on the likelihood and consequence. The result from this estimation is in the form of risk level to show the significant by the product of likelihood and consequence.

For FMEA, it is the process to analyze the defect, which might happen through the process or design starting from raw material, production and utilization by specify the severity, probability of occurrence and detection including action plan. The similarity of FMEA to the risk estimation of this study is the consideration on ranking the level of risk. Risk level of FMEA is in the form of Risk Priority Numbers (RPN), which is the product of severity, probability of occurrence and detection.

Factor and scaling of ranking of FMEA is more than risk estimation on this study. Risk estimation on this study is focusing on two factors and scaling of five, while FMEA is focusing on three factors and scaling of ten. FMEA generally facilitates the engineer to manage the risk that might happen to the design or the process. It can also be applied to the construction project, because the project is the transformation of inputs to outputs by proper management. Benefits from proper utilization of FMEA include (Crow, 2002):

- Improve product/process reliability and quality
- Increase customer satisfaction
- Early identification and elimination of potential product/process failure modes
- Prioritize product/process deficiencies
- Capture engineering/organization knowledge

- Emphasizes problem prevention
- Documents risk and actions taken to reduce risk
- Provide focus for improved testing and development
- Minimizes late changes and associated cost
- Catalyst for teamwork and idea exchange between functions

System _____
 Subsystem _____
 Component _____
 Design Lead _____
 Core Team _____

**Potential
 Failure Mode and Effects Analysis
 (Design FMEA)**

Key Date _____

FMEA Number _____
 Prepared By _____
 FMEA Date _____
 Revision Date _____
 Page _____ of _____

Item Function	Potential Failure Modes)	Potential Effects) of Failure	S e v	Potential Causes) Mechanisms) of Failure	P r o b	Current Design Controls	D e t	R P N	Recommended Actions)	Responsibility & Target Completion Date	Action Results				
											Actions Taken	Act Start	Act End	Act Start	Act End
								0							0
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Table 6.2 FMEA Worksheet

Source: Crow, Kenneth (2002)

6.2.3 Recommended Sequence on Project Objectives

In the case of the project cannot meet its objectives, the organization will suffer financial loss and the reputation. Recommendation from Flanagan et al. (1993) on the sequences of technical delivery (associate with quality), money delivery (associate with cost) and time delivery (associate with schedule) for construction project is useful to manage the objectives of the project.

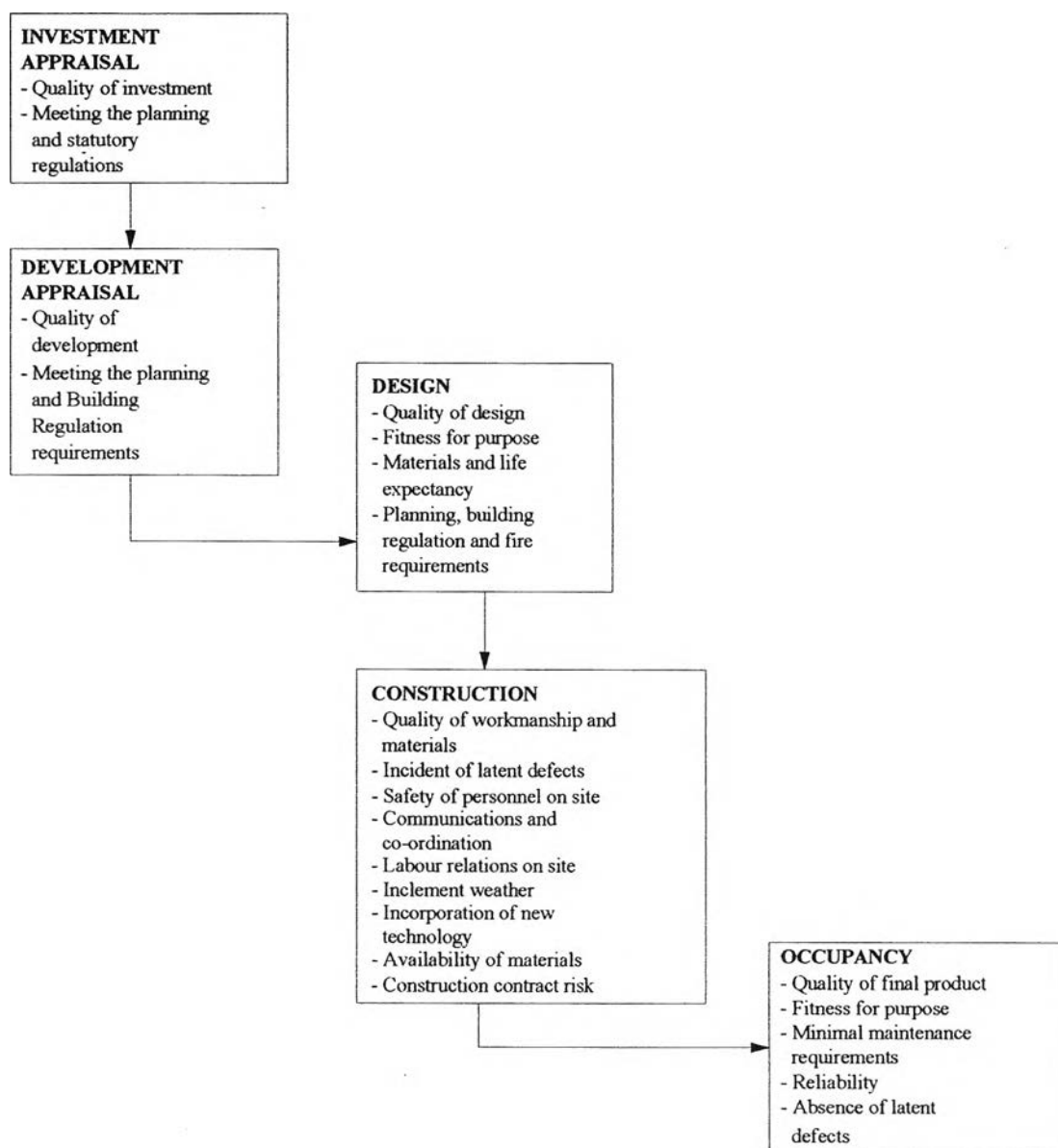


Figure 6.1 Technical Delivery Sequence

Source: Flanagan, Roger and Norman, George (1993)

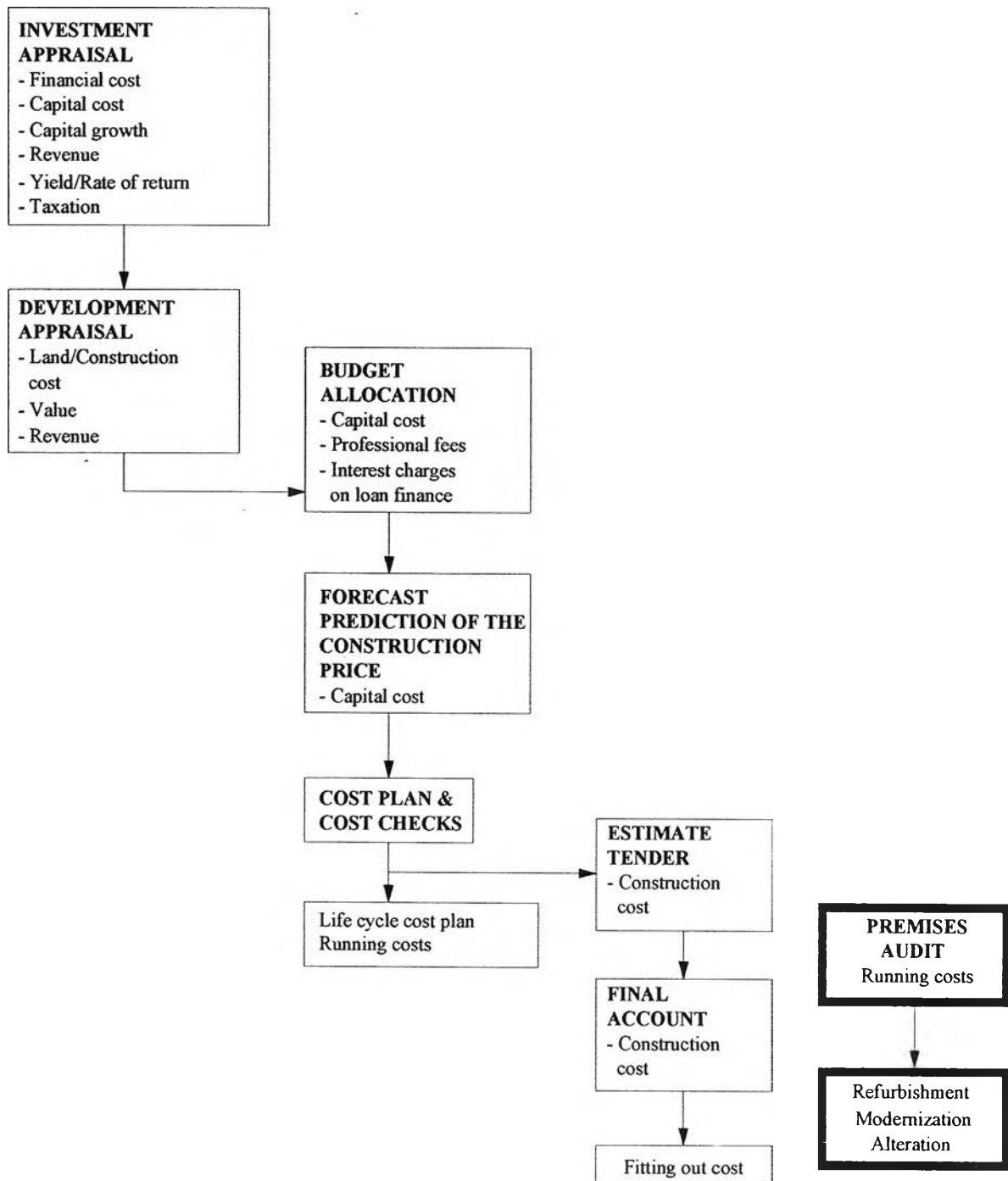


Figure 6.2. Money Delivery Sequence

Source: Flanagan, Roger and Norman, George (1993)

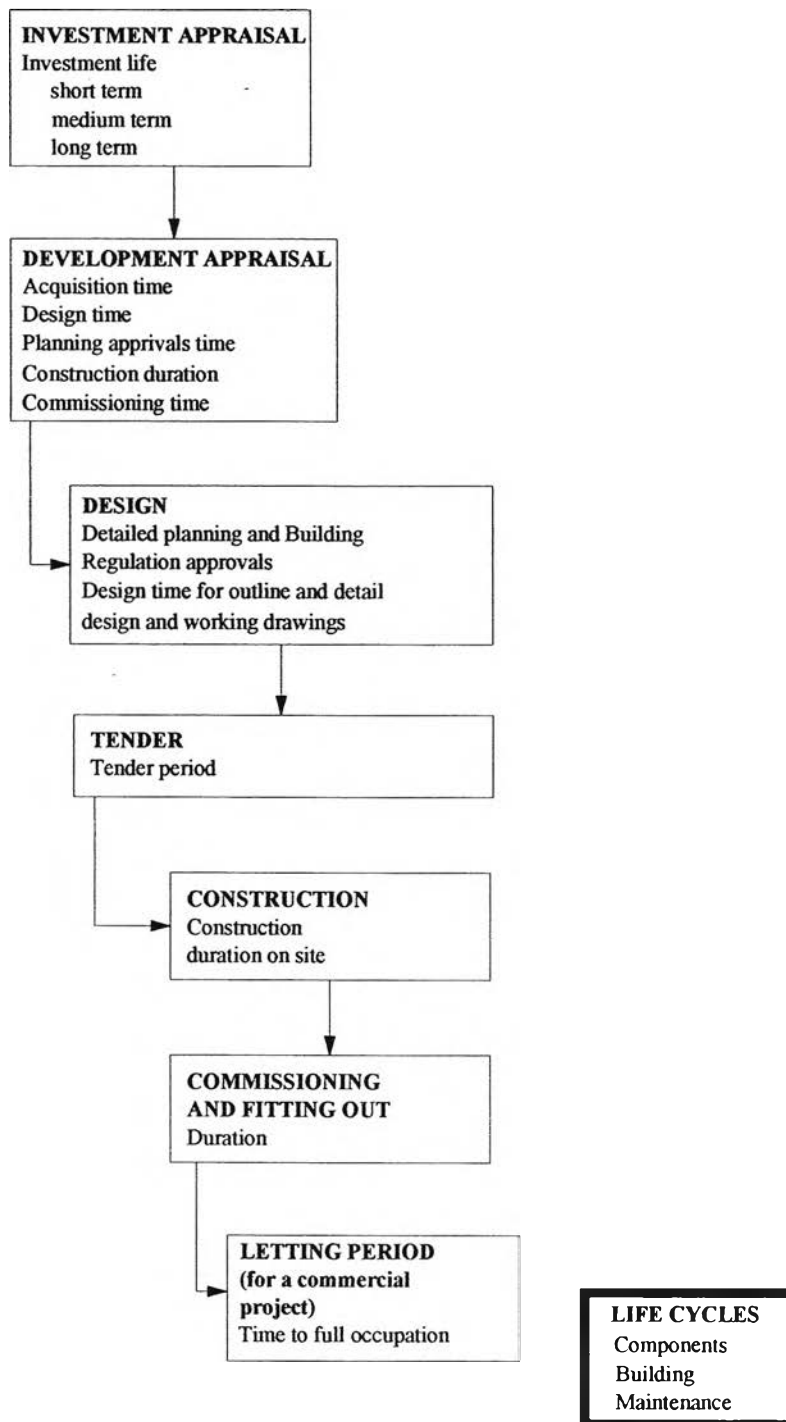


Figure 6.3 Time Delivery Sequence

Source: Flanagan, Roger and Norman, George (1993)