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DOCTORATE OF PHILOSOPHY (PH.D) IN
CIVIL ENGINEERING

**SELECTION OF TEAM STRUCTURE - THE ESSENTIAL
FACTOR OF PROJECT MANAGEMENT
FOR CONSTRUCTION PROJECTS**

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**SELECTION OF TEAM STRUCTURE - THE ESSENTIAL
FACTOR OF PROJECT MANAGEMENT
FOR CONSTRUCTION PROJECTS**

Dissertation Submitted to

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for the degree of Philosophy of Doctorate (Ph.D) in Civil Engineering**

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October 2019



DECLARATION

"I do hereby attest that I am the sole author of this project/thesis and that its contents are only the result of the readings and research I have done". The dissertation titled "Selection of team structure – the essential factor of project management for construction projects" submitted for the Degree of Doctorate of Philosophy (Ph.D) in Civil Engineering at University of Selinus, faculty of Engineering and Technology; is my original work and the dissertation has not formed the basis for the award of any degree, associateship, fellowship or any other.

The research papers published based on the research conducted out of the course of the study are also based on the study and not borrowed from other sources.

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Date: 25th October 2019

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ABSTRACT

Project management for construction projects depends heavily on suitable team members in delivering successfully the project on key concepts of cost, time and quality. The composition of project management team for construction project requires each team member to possess not only management skills but also technical skills to suit the assigned development project. This study focuses on the arrangement of composition of team structure and selection of team members of project management team in order to find the right structure of composition of team members to tackle many problems such as project delay, overrun cost of project and project with unacceptable quality in construction project.

The theories of previous researches on team structure and team member selection on construction project to provide project management on key issues of cost, time, and quality together with the trending demand of Health Safety Environmental (HSE) and Ethical conduct in order not only to deliver the successful project but also to avoid the biggest problem in construction of being corruption in different phases of construction procedure.

Naturalist – constructionist paradigm is employed for the research with an in-depth interview technique with participants from four (4) construction project case studies. Four (4) projects with different kinds of scopes of project management and different kinds of project development are selected with participants coming from different backgrounds to attend the in-depth interviews on the research subject. Qualitative content analysis with the inductive approach is applied to analyze data from the in-depth interviews to provide the findings for problem statement of the studied subject.

Based on the findings, recommendations and conclusions on the subject of team structure for construction projects are presented with the aim to contribute to the future success of project management for construction project on selection of team structure and team members for construction projects.

I. INTRODUCTION

I. INTRODUCTION

1.1 Background of the Study

Construction industry has been considered one of the most important industries that contribute to the growth of the economy, especially in the developing countries. Construction proceeding in any project is affected by many stakeholders such as developers, funders, design consultant, contractors, material suppliers, etc. Therefore, it is necessary to have a project management team to provide the project management to ensure the successful delivery of the construction project.

The project management in construction depends largely on composition of the selected individual professional in many fields of construction industry – the project management team – in order to meet demand of client's requirements of completion within time, cost and quality standard. Regardless of type or scale of the project, the project management team is needed to set up with the suitable qualified human resources to take care of all elements of the project for delivering successfully a constructed product (Egan, 2002).

In project management for construction project, the project management team has to manage all phases of the project such as design, tender and construction. Traditionally, the design phase is used to be considered as a separate activities phase of the project (Anumba et. al., 2002), but most of the failures of construction projects are related very much to lack of management in the design phase. Tender phase reflects the cost, time and quality of the project in accordance with the requirement of client by selecting the appropriate contractor to match with these required conditions. The tender phase also sets out the basis of the management of construction phase based on the established contract between the contractor and client. Construction phase is the execution of the design by complying with the contract to carry out the construction of the project. Therefore, the project management team has to be formed differently for each project and also at each phase of the project with different combinations of qualification resources (Cornick and Mather, 1999). The difficulty of setting team structure is that gathering a group of professional people does not certainly make a functional team to manage a construction project.

The purpose of this study is to examine the important role of team structure in project management in order to find the most suitable arrangement of human

resources team to function properly in management of a construction project in the most effective way. The study also analyzes the performance of project management team in the reflection of arrangement of the team structure, especially the contribution of each team member in the management of each component in complexity of any construction project.

1.2 Problem Statement

A successful project depends on good project management to deliver a management system with an appropriate team structure on balancing three key constraint factors of time, quality and cost. The balancing of key constraints means that any of the key constraints is changed without affecting another or changing the specified quality of the project.

But most of the implemented projects in construction industry have failed to make the balancing of key constraints, and one of main reasons for the failure to deliver the project management for construction projects is the inability of forming the appropriate human resources to be a project management team (Kozlowski and Ligen, 2006).

The poor arrangement of project management team together with wrong selection of qualified team member resulted in the uncontrollability of key constraints by increasing the cost, delaying in the construction schedule and producing the low quality of the project. The selection of inappropriate team member in project management team also leads to a huge financial claim from the contractor and in some cases lead to a court case to damage the reputation of not only the project management team but also all related stakeholders such as the project owner, funders (King, 2015).

The performance of each individual and ability to function in a team to deliver project management service has generated in many research (Mohrman et al., 1995). It is necessary to have project management team comprising the suitable team member in different fields of construction industry who could function in their assigned position and could co-ordinate to cover all key constraints of project management (Cantu, 2007).

The project management problems for construction projects highlighting in the Inadequate Resources, Uncommitted Team Members and Unclear Goals and

Senior Executive Direction are illustrated in Figure 1.1 – Frequently Encountered Problems in project management.

Figure 1.1 – Frequently Encountered Problems in Project Management



Source: Taylor (2006)

Beside the basic concept of the management of cost, time and quality, the Health Safety Environment (HSE) and Ethical Conduct are other serious issues in construction project as construction generates problems on the construction site safety (Hughes & Ferrett, 2008), the environmental impact (Gluch and Raisanen, 2012) and the unethical conduct (Transparency International, 2005). The reason for this is that the team structure arrangement usually ignores to include the expert team member in HSE to co-operate with the team to take care of the HSE issues and the unethical conduct detection is not considered as a part of the team structure in project management scope.

Therefore, the failure in project management in construction project is improved by selecting the appropriate team member to make a sound management team structure on fulfilling the key constraints of project management and also bring the safety, employee's ethic throughout the construction process.

1.3 Objectives

The study focuses on the problems of arrangement of team structure and team member in the construction projects to cause the blow-out of the budget, the extension of the construction period and the lack of quality in construction projects (PMBok, 2013), and to determine the important factor of team structure in selecting the suitable personnel and coordinating between team members on the successful performance of project management in construction project.

The study also looks at the Health Safety Environmental (HSE) and Ethical Conduct management for construction projects related to the arrangement of team structure which is being examined to eliminate the impact of the implementation of a construction project to the HSE and ethical issues.

In order to expedite the mentioned issues in team structure to deliver the successful project management in construction project, it is also vital to examine the ability of human resources and leadership in team structure to work together for sharing the same goal in project management of the any assigned project.

The aim of this study is to provide the answers for the following questions in team structure in project management of construction projects:

- 1) What is the typical model of arrangement of team structure in project management of construction projects?
- 2) How to have the most effective team composition in project management of construction projects?
- 3) Is the right composition of team structure of project management team to be a key factor to deliver successfully the construction project?

1.4 Scope of the study

Methodology

The qualitative method is applied with the in-depth interviews with project team leaders, project directors and different professional team members of various project management teams of case study projects recently completed such as:

- (i) Ho Tram Entertainment and Resort Project – Construction cost of USD 450 Million.

- (ii) SP – PSA (Saigon Port – Port Singapore Authority) International Port Project – Construction cost of USD 350 Million.
- (iii) Vinhomes Landmark Residential Complex Project – Construction cost of USD 800 Million.
- (iv) Expansion of Thu Duc Water Plant Project – Phase III, Capacity 300,000m³/day– Construction cost of USD 120 Million.

The above-mentioned four (4) selected case studies of different types of projects and different scales are supposed to provide all necessary data on the arrangement of team structure of each project, the performance of the project team in management of each component of the project. The case studies are to reflect the reality of the performance of each team member on affecting the success or failure of the project.

Team structure in project management is just a factor in the big picture of the construction of the project with stakeholders, including the developer, the funder, the design consultant, the authorities, and the contractor to implement the project from the idea becoming the actual physical project. Therefore, the inductive approach is the selection of this research for the finding and the analysis to give a result on the researched subject. The in-depth interviews are conducted in each project with different levels of stakeholders to find the effectiveness of the team structure in the performance of each project. All the unclear answers from the interviewees are clarified to have the worthwhile finding of the subject (Rubin & Rubin, 1995).

Research Design

To ensure the collection of all the correct data on the research based on the quantitative and qualitative techniques, the following procedure is implemented.

1. Setting up the question and data collection forms
2. Conducting the interview with the appropriate stakeholders.
3. Briefing the performance of each case study project for comparison with the data collection.
4. Performing the data analysis based on the result from data collection and the performance of each case study project.

The results and findings on the research design are set out to answer the questions stated in the objectives of this research.

Ethical approval

All the requirements on ethical approval from Selinus University are fulfilled with the approval from the developer/organization of each mentioned project together with the research participant consent form to be agreed by the interviewee.

Even the ethical issue is not mentioned in detail and the approval on ethical issue is not required to present in this study but all the approvals and the participant's consents are obtained for the proceeding of this research compliance with the requirement of the University. The research interview is undertaken by the leader of the developer/organization, the team leader of the project and the member of the team.

All information related to each mentioned project is generated in the secure account which can be only accessed by the researchers. There is no name to be mentioned in the research, but only the position of a person for facilitation in this research.

1.5 Limitation

Construction is a wide subject with the difference in the development of the proposed project. Infrastructure could impose many development scenarios in transportation, water supply, environment, etc.; Real estate could impose many different scenarios in hotel, condominium, commercial developments, etc.; and industry could impose different scenarios in manufacturing plant, warehouse, refinery, etc. The variety in scale of the project could also make the difference in the way to approach the project. Therefore, there is a limitation to draw a definite conclusion on the team structure or the composition of the team to provide the project management in the construction industry but with the sample of the case studies, the research could provide a guideline on the team structure and the selection of the appropriate team members of the large scale project (project cost above USD 100 million) which could prove to be the key successful factor in project management of the construction projects (Spatz, 2000).

1.6 Structure of the Dissertation

The structure of this study is prepared in six (6) Chapters as follows:

- **Chapter 1 – Introduction:** to introduce the concept of the research based on the problem statement, the objectives and aims of the research. To define the research technique, the method of the gathering of data. To produce the result and the analysis to come to the conclusion of the research.
- **Chapter 2 – Literature Review:** To review the theories of the team structure in project management especially for construction projects. The review also includes all themes related to the team structure such as team member selection, the effectiveness of team members on the success of project management for construction projects.
- **Chapter 3 – The Context – Project Management of Construction Project and Team Structure Composition:** To introduce the concept and framework of project management together with the phasing of a construction project in order to compose a suitable team structure in each phase. To clarify the role of Project Director/Team Leader and team members to have a competent team structure in performance of the successful project management practice.
- **Chapter 4 – Research Methodology:** To clarify the selection of the research technique and method for the research procedure and the research design to ensure the data to be collected with reliability and validity.
- **Chapter 5 – Results and Analysis:** To gather all the data to provide the results together with the analysis to provide the finding and the influence of the team structure in project management for construction projects.
- **Chapter 6 – Conclusions and Recommendations:** To finally provide the result of the finding to fulfill the objectives of the study. To recommend the required action on the team structure in project management for construction projects and the further required study on this subject.

II. LITERATURE REVIEW

II. LITERATURE REVIEW

2.1 General

All theories related to the subject of team structure in project management including the arrangement of the team, team member selection and type of team structure on the management of the concept of construction management of the cost, time, quality, safety, environment and ethics are thoroughly reviewed.

The team structure comprised a group of professionals with different disciplines co-operated for the success of the project (Bell, 2004). It was agreed that the construction projects could be successfully accomplished by the appropriate team structure (Cohen and Bailey, 1997).

The function and performance of a team are depended very much on the maintaining of the entire team during the project period (Uher and Loosemore, 2004). It is important to have a right team structure for a construction project – construction project team – to take the responsibility for the delivery of the project (Alshawi and Faraj, 2002).

Construction projects now have no boundary on the resources with the funds may come from one country, the design team and management team would come from other country, the same is also applied for the team structure with team members come from all the places in the world with different cultures and different set of method of delivery project to work together for the success of the project (Emmit and Gorse, 2007).

It is quite normal in construction projects, team structure is comprised with personnel come from different organizations to co-operate to deliver the project management for the project (Jefferies et al., 1999). The functioning of team structure is needed to clarify clearly to all team members to ensure the project team to perform based on the scope of work (Parker, 2008).

Burke (2006) stated that the team structure was formed to provide the effectiveness in management and the ability to cover all the requirements of the technical issues with the following functions in project management of construction projects:

- To achieve the completion of the construction schedule.
- To have the combination of skills for every aspect of the project.
- To provide the brainstorming to solve the problem in the quick time.

- To take the necessary actions on the team decisions.
- To support the other team member in technical and emotional matters.

Due to complications of different kinds of construction work, such as infrastructure, building or industry and the scale of the project, it is very difficult to set a typical structure for team structure. Mintzberg (2007) offered the different type of team structure for project management in various industries. In order to find the most suitable type of team structure in construction project, the selected team structure should provide the speedy replies to all the technical and management issues which happen rapidly on site of any construction projects (Child & McGrath, 2001). The selected team structure also needs to execute successfully the performance of the assigned project.

The justification of the performance of the project in relation to the team structure is agreed with many previous studies and in which the performance of the team is given by the performance of the project on the key elements of cost control, high quality and on time (Bai and Yang, 2011). The performance of the team could also depend on the team member performance and client satisfaction (Pinto and Pinto, 1991). It is clearly that the performance of the project is on the quality of each team member and the management of the team member by the project leader (Takim et al., 2003). The successful performance of project management of the team in construction could be evaluated in relation to the achievement of the project main components of time, cost and quality and the successful performance is the proven record of the implemented team structure to the project (Henderson and Walkinshaw, 2002).

2.2 Knowledge and skill of team member in Project Management in Construction Project

Team member of Project Management in construction project requires not only the management skill but also the technical knowledge. Technical knowledge plays a vital factor in construction industry (Snowden, 2002); for example, the project management in construction project monitors the delivery of technical demand projects such as high-rise building, bridge, reclamation land for airport or tunnel in seabed, etc. which requires to have not only technical knowledge but also high technical knowledge and vast experience of team member in the related fields to provide the project management successfully (Omidvar et al., 2012). In other industry, project management only requires knowledge and skills of management to deliver the project and the application of software also gives a big help to provide

the project management. However, it is not the case for project management in construction project as technical knowledge and experience are needed to solve the change or problem occurred in developing a project that depend closely on the composition of team structure and technical knowledge and skill of team member (Edum-Fotwe et al., 2000). The processing of technical knowledge and skills in different disciplines of each team member should be facilitated in each different construction project and/or in different phases of a construction project (Ly et al., 2005).

In 2013, Hwang and Ng have made a research on three (03) text books and eight (08) journal articles on the requirement of technical knowledge and skills for each team member in team structure in order to deliver project management successfully for construction project.

Table 2.1 and 2.2 illustrate the summary of knowledge areas and skills needed from team member in the research in 2013.

Table 2.1 – Summary of Knowledge Areas

Essential knowledge area	Dogbegah et al. (2011)	PMI (2008)	Ling (2003)	Odusami (2002)
Schedule Management and Planning	X	X	X	X
Cost Management	X	X	X	
Quality Management	X	X	X	
HR Management	X	X		X
Risk Management	X	X		
Supply Chain Management	X	X		
Claim Management	X			
Knowledge Management	X		X	
Health and Safe Management	X		X	
Conflict and Dispute Management	X			
Ethical Management	X			
Stakeholder Management	X		X	
Information Technology Management	X		X	
Communication Management	X	X		X
Materials Resources Management	X			
Financial Management	X			X
Plant and Equipment Resources Management	X			

Source: Hwang and Ng (2013)

Table 2.2 - Summary of Skills

Essential skills	E-dum-Fotwe and McCaffler (2000)	Odusami (2002)	Fraser (1999)	Tett et al. (2000)
Basic technical skill	X	X	X	
Site layout and mobilization	X		X	
Estimating and tendering	X		X	
Design activities and background	X		X	
Reading and understanding drawing	X		X	
Technical writing, Drafting contract	X		X	
Leadership	X	X	X	
Decision Making	X	X		X
Problem solving	X	X		X
Negotiation	X	X		
Human behavior	X			
Delegation	X		X	X
Team working	X		X	
Stress handling	X	X		
IT skill	X			
Presentation and Report Writing	X			X
Public speaking	X			X
Marketing and Sales	X			
Chairing meeting and Public relation	X		X	

Source: Hwang and Ng (2013)

The above tables showed the important link between knowledge and skills of team member in the execution of project management successfully in construction project. In fact, the success of project management in construction project vitally depends on the competence of their technical knowledge and skill and the structure of team member to suit the assigned project (Harrison and Lock, 2004).

The next part of this literature review is going to review the different requirements of team structure in different functions and phases of the project.

2.3 Team Structure Arrangement

Project management team for construction projects are differed from project to project due to the different scope of work of each project, therefore the arrangement of team structure for project management in construction is not a

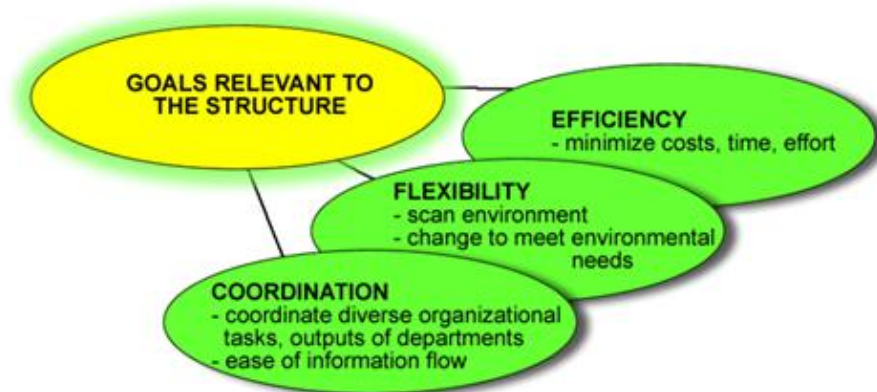
simple task to compare with project management in other industry (Cornick and Mather, 1999).

The arrangement of the team structure is usually based on the experience of each team member in the required field to deliver the project management for the specific project (Jefferies et al., 1999). During the construction period, only key members of the team are full time and other technical specialists are part-time or to complete the task early when their fields of expertise are completed (Cornick and Mather, 1999). To ensure the completion of the project, the responsibility of the project management is rested heavily on the key members of the team, including team leader, contract manager, commercial manager, construction programmers, etc. (PMBok, 2013).

Regardless of the difference of the scope of work of the projects and the different arrangement of the team structure to suit the project, the team structure and team member have to complete the assigned tasks individually to ensure the success of the project (Lock, 1996).

Sobkowiak (2003) offered the requirement of elements of the team structure being efficiency, flexibility and co-ordination as illustrated in figure 2.1 – Goals relevant to the team structure.

Figure 2.1 – Goals relevant to the team structure



Source: Sobkowiak (2003)

In order to obtain the mentioned goals, the team selection of the individuals to match the elements of efficiency, flexibility and co-ordination is so important. Practically, beside the requirement of skills to suit the project, each individual has to have the personal ability to work in group for the co-ordination, to deliver the assigned tasks for the efficiency and to be able to adapt with the team culture for the flexibility.

2.3.1 Type of team structure

In project management, generally there are three (3) types of the team structures of functional structure, matrix structure and project-based structure (Larson, 2004). The brief description, strengths and weaknesses of each type of the mentioned team structure are illustrated in table 2.3 – Summary of type of team structure.

Table 2.3 – Summary of type of team structure

No.	Description	Strengths	Weaknesses
1.	Functional Structure		
	Authority to manage is determined by the relationship between project functions and activities.	<ul style="list-style-type: none"> ✚ Economies of scale within functions. ✚ Internal efficiency, in-depth skill development, specialization, high quality. ✚ Best for small companies. ✚ Keep staff located in their unit organizations with only one or a few products. 	<ul style="list-style-type: none"> ✚ Slow response time to environmental changes. ✚ Process orientation (getting it done within discipline approach rather than the best way it works). ✚ Decisions may pile-up on top; hierarchy overload. ✚ Poor inter-unit coordination. ✚ Less innovation. ✚ Restricted view of organization goals.
2.	Matrix Structure		
	Authority to manage is shared between functional managers in the project.	<ul style="list-style-type: none"> ✚ High level of integration (sharing skilled people and resources). ✚ Improved communication (due to high level of integration). ✚ Suited to complex decisions and frequent changes in unstable environment. ✚ Provides opportunity for functional and project/product skill development. ✚ Best in highly uncertain environments and organizations with multiple products and project based work. 	<ul style="list-style-type: none"> ✚ Causes participants to experience dual authority: frustrating and confusing. ✚ Means participants need good interpersonal skills and extensive training.

No.	Description	Strengths	Weaknesses
3.	Project-Based Structure		
	Authority to manage is fully responsible by the project manager to run the project.	<ul style="list-style-type: none"> ✚ Clear authority and responsibility. ✚ Improved communication. ✚ Is suited to rapid change in unstable environment. ✚ Improves coordination among company. ✚ Divisions of work are on the projects. ✚ Best in large organizations with several projects. ✚ No functional organization interfaces to manage. ✚ There is only one executive, the Project Manager. 	<ul style="list-style-type: none"> ✚ Duplication of effort (various projects may require resources that are duplicated on other projects). ✚ Project isolation (each project may be thought as a self – contained unit, so the project may become isolated from other projects in the organization). ✚ Technical experts have no professional headquarters.

Source: Adapted from Larson (2004).

On the above analysis of description, strengths and weaknesses of the three types of team structure, the selection of the appropriate team structure could be briefed as follows:

- (i) The functional structure has authority to share between the functional department and the group activities. The competition to complete the works of each department makes the scope of the project to be overlapped and non-transparent. The acceptance of sharing the leadership role (authority to act) (Carson et al., 2007; Hiller et al., 2006; Pearce and Conger, 2003) could not provide the necessary rapid decision on management and technical in the construction environment. So the functional structure is not suitable for the team structure of project management for construction projects.
- (ii) The matrix structure creates the overlap of authority on team members. The order to complete a task could be interfered by other parallel activities or orders. The strength of the matrix structure is the support of top of various layers of management to provide the share of resources (Kerzner, 2001;

Tinnirello, 2001) but in the team structure, resources of construction projects can not be shared due to the different discipline of each different department in the team. So the matrix structure is also not suitable for the team structure of project management for construction projects.

- (iii) The project-based structure is always applied for the project management in construction project in which the full authority to manage the project is on the project manager (Hartmann & Bresnen, 2011). The project-based structure is preferred by the projects in construction industry with the characteristics of the complexities in different technical disciplines (Hillson and Simon, 2007). Each project is an entity itself with the requirements to deliver an expected cost, schedule and quality. So the project-based structure is the most suitable for the team structure in project management for construction projects.

2.3.2 Team structure selection – Project-based structure

The comparison of three different types of team structure of Functional Structure, Matrix Structure and Project-Based Structure has given the selection type for project management in construction to be Project-based structure.

The project-based structure is formed with different figurations to suit the need of managerial focus on each type and size of different projects and could be easy to modify to suit different phases of the project (Cattani et al., 2011 and Whitley, 2006). The selection of project-based structure in a construction project is mostly based on the sole decision-making authority to make the team operate their function under a centralized project director.

The project-based structure provides the focus of all team members toward the delivery of the success of the project under the centralized project director. The projects are constantly in the environment of changing in the process with logical constraints and technical involvements; therefore, the handling of the project management in team structure is needed to have the centralization control (Chitkara, 2014; Cooke, 2014; Fewings, 2012; Winch, 2009 and Loosemore & Uher, 2003). Under the project director, there are department leaders to take care of the specialized department of the project.

The centralized authority of the project director creates the independence of the project team from the headquarter organization and it also grants too much power to a project director in both management and technical decisions. In order to

strengthen of the weaknesses of the project-based structure of being the self-unit and technical expert lacking of professional headquarter involvement in the decision making, all projects which apply the project-based structure now have a representative from the head office in the team structure. The representative of the head office who is usually in the executive position of the organization acting as project executive could review and interact on the management of the team. The representative of the head office could also mobilize other technical experts at home base or from other project to come to assist the team at any time needed (Seningen, 2011).

In the large scale construction project (project value more than USD 100 Million) divided into multiple similar packages, the project-based structure generates the “core team” on top of the department level to provide the technical and management assistance to all the departments.

The term “core team” is not popular in project management in other industries but it is quite common in project management of construction industry (Cobb, 2012; Hartman, 2000, Haugen, 2010; Robles, 2009; and Wysocki, 2009). Many complex projects, the core team which consists of project experts in different fields is formed to provide strategic technical and management issues to the normal team set-up. The core team is acting as the “headquarter” of the team structure to provide all the answers and instructions not only on technical issues but also on the management of the resources of the team. The method of the setting up of the core team is varied to suit the requirement of the experts and the construction phase of the project but regardless of the type of project, the core team has to have the key technical experts to assist multiple sub-teams to successfully deliver the tasks of the project management of the project.

The setting up of the core team is very useful in the project with multiple similar sub-teams but the function of the core team and the department of the team need to be clarified clearly to avoid the overlap in the authority of the issuance of instruction and the authority to act on behalf of the team.

In the subject of team structure of project management, many studies have linked the team structure of the organization to the team structure of the project management for successful delivery of the project. The link was emphasized due to the importance of the organizational culture and behavior to provide the lead to the team structure (Brown, 2008; Andersen et al., 2009). But in construction projects,

the team structure is not required to follow the organization team or to follow the culture and behavior of the organization because each project has its own culture and behavior and the team structure only needs to have the full back-up of the organization on mobilization, the assigning of the appropriate technical members and its management system to be selected for the project.

Wallace (2007) indicated that the team structure in construction could be adjusted to suit the completion phase of the project and the team structure of project management for construction projects generated its own function to meet the requirements of the project. It is a fact in project management for construction projects due to the different phase of construction to be completed for the carrying out of the next phase with the different function of management. Therefore, the team structure of the construction projects should be independent from the structure of the organization.

2.4 Team Member Selection on cost, time, and quality management concepts

The balance and the effectiveness of the team structure in project management for construction projects have to be satisfied before commencing the management of the project (Mello and Rucks, 2006). The performance of required task of each team member is essential because the performance of the team depends on each team member contribution in the project management task (Templar, 2011).

As mentioned previously, the project-based type structure is selected to apply in project management in construction; it means that the team members of each department are independent in the assigned works under the team leader – project director. There are different types of leadership in management but in construction projects, the team leader – project director – is the center of all the project management activities for construction project and is required to have a good technical background, experience in the field and the ability to manage the team and manage the project on the concept of cost, time and quality (Andi et al., 2004; Toor and Ofori, 2008).

The project director requires to gather the team members on the different qualifications and backgrounds to work together to obtain the objectives of the project (Moore, 2002; Muller & Turner, 2007). The objectives of the project should be delivered by the team but the team is driven by each member, therefore, the objectives of the project have to be comprehensive clearly by each individual of the team to ensure the success of the project.

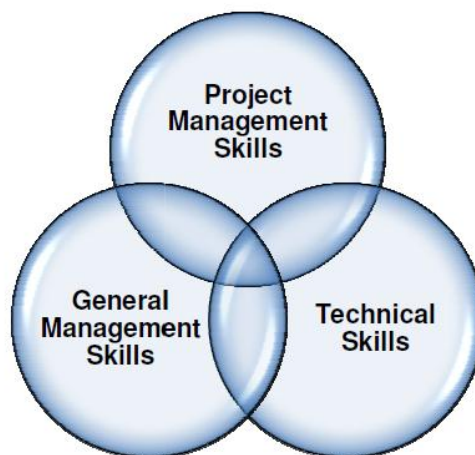
The process of the selection of each team member to suit the formation of the team structure is crucial for the delivery of the project management for the project (Belbin, 2007).

Many studies have been conducted with the guidance to select the team members on the following criteria (Liker, 2004; Slevin & Pinto, 2004; Galbraith and Lawler III, 1993).

- Comprehensiveness on the objectives of the project.
- Having the right Project Director.
- Having the technical skills on project needs.
- Having the technical back-up if needed.
- Monitoring the performance of each team member on the process of the project.

Beside the common mentioned requirements, the technical skill is a necessary requirement for any team member in project management for construction projects as the team members in the team structure are always expected to be the technical experts in the assigned discipline as well as the management members of the project (Burke, 2006 and Chitkara, 2014). The need of the technical skill and the management skill for construction projects is illustrated in figure 2.2 – Intersecting Management Skills.

Figure 2.2 – Intersecting Management Skills



Source: Burke (2006)

It is quite difficult to define a selection method for the team structure in construction projects in literature, including the guidance of PMBok and PMI Handbook due to the big gap difference in the kind of construction projects. However, the selection of

the team members could be based on the job-task and individual experience on the required expertise field (Crawford, 2005).

In order to compose a team for the construction projects, only the Project Director is identified together with the in-house available technical team up to the contract award. The Project Director then selects the Department Manager to suit the project tasks and to have the extensive experience on the assigned field (Ogunlana et al., 2002). The next level of resources under the Department Manager is identified mostly on the technical background and the knowledge of the local conditions in the expertise field to assist the Department Manager to complete the assigned tasks (Thompson, 1996).

Every project has its own construction schedule based on the scale of the project which defines the length of the period of construction. The employment for the team members in construction projects is not usually classified as long term employment; therefore, the control of the performance of each team member and individual behavior is also a big task for the Project Director (Cheng et al., 2005). To avoid the problem in the replacement of unsuitable team members that could cause the interruption of the progress of the project, the Project Director should prepare the “Task Description” to each department manager on the selection of the demanded quality and quantity of the resources. The selection of the lower level team members may need to look for the additional personal skills beside the technical skills (Luthans et al., 2008).

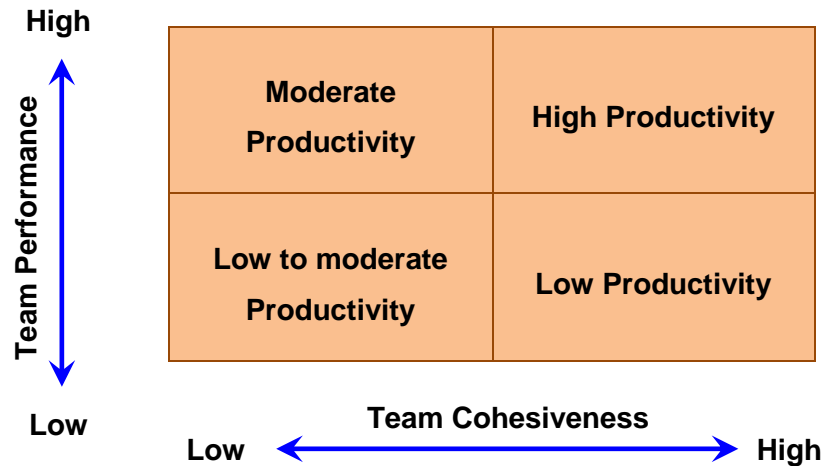
Antoniadis (2012) stated that team members in project management of construction projects should need to process the following personal skills:

- Being innovative and open minded.
- Being team player.
- Being presented and respectful.
- Being adapted in any working environment.
- Being of comprehensiveness of the assigned tasks.

Agreeing with the mentioned characteristic of team members, but in addition to the qualification to suit the assigned position and the mentioned personal skills to blend with the team, another important issue for the selection of right team members is the record on the code of ethics and conduct of the selected team members on the previous projects.

The blend in or the cohesiveness between the team members is the key for the successful performance of the team (McShane – Von Glinow, 2002). Figure 2.3 illustrates the relation between the performance of the team and the cohesiveness between the team members.

Figure 2.3 – Team performance on cohesiveness



Source: McShane-Von Glinow (2002)

There was rare literature to study about the method of selecting the team members for construction projects, but all studies agreed that the right composition of the team members is vital for the performance of the team. The performance of the team having the ability to adapt and to blend in quickly in project environment is essential for the isolated team composition in project-based structure for construction projects (DeRue et al., 2008; Gibson and Vermeulen, 2003 and LePine, 2003).

The three key issues of cost, time and quality are determined to evaluate the performance of construction projects (Winter & Szczepanek, 2009). It is difficult to separate any issue of the three for the evaluation because all three issues of cost, time and quality are all related in the project in which the team structure on the project based organization has to assign appropriate and experienced resources to undertake and co-ordinate to ensure the control of the three issues (Hillson & Simon, 2007).

The assignment of the Contract Manager, Quantity Surveying Manager, QA/QC Manager and the Construction Program Manager in the team is the key to control the performance of cost, time and quality. The management of the cost by Quantity Surveying team, the management of schedule by Construction Program team, and the management of quality by QA/QC team with the co-ordination of the Contract team in relation to the signed contract have to be clearly assigned to each

manager. The co-ordination between the mentioned positions is very important in the management of the key issues of cost, schedule and quality.

The ability of the assigned resources and the good communication system between them are essential for the management of the cost, time and quality in the construction projects (Dlakwa and Culpin, 1990; Kaming et al., 1997; and Koushki et al., 2005).

Besides the specialist and technical team member involved in the management and control of the three key issues, in construction project, the administration and the document controls which are very important to ensure all the changes in design or on-site modification and the instructions from technical exports are filed and sent to the appropriate parties. The position of the document control manager and administration manager looks like very low key to compare with all other technical position managers but the appropriate and effective document control manager and administration manager together with the designed software could prevent significantly of the arisen problems in the three key issues (Lee et al., 2005).

In contrast, many studies stated the application of the available software to assist the management of cost, time and quality (Erbas and Erbas, 2013; Exman, 2013). The ability and knowledge of the related team members are actually the key on the cost, time and quality management.

Practically, another issue regarding the management of the cost, time and quality in team structure is that the team members should understand the construction regulation together with the culture and political of the project location.

The team members with the full knowledge of the construction regulations would be able to avoid all the unpredicted cost incurred or the delay in construction schedule (Sonuga et al., 2002; Iyer and Jha, 2005; and Baloi & Price, 2003).

Most of the previous studies discussed the method and the management system on the management of the concept of cost, time and quality in construction projects, some studies discussed the team management on the management of the subject but none has directly studied on the impact of the assignment of an individual to provide the required management on the issue.

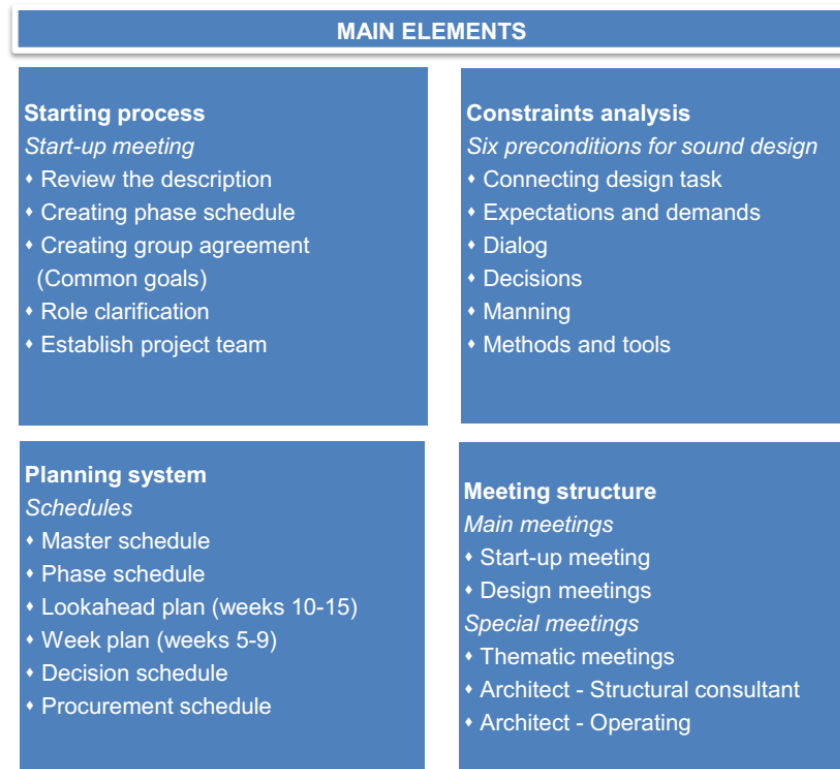
2.5 Team Structure in Design Management

Architectural and engineering design for a construction project is involved in many stakeholders such as architect, structural engineer, mechanical and electrical engineer, building service engineer, fire protection engineer, etc. which generate

very difficult managerial problems for project management team (Formoso et al., 2002). The complexity of managerial problems in the design phase could only be solved with technical knowledge and ability to provide the interactions between all professional disciplines in the project (Sebastian, 2005).

However, design management traditionally has been approached with the coordination from the different professionals involved in the design of the assigned project (Press and Cooper, 2002). These approaches are not sufficient for design management concept on following client’s requirements to meet high-quality design solutions through shorter timescale and approved budget of the project; therefore, design management is needed to solve the gap in construction project. Design management is a necessary function of a project management team to improve the design process, creating high quality innovative through cost control planning and to get the better flow in the design. Therefore, team member of the project management to provide design management has to have technical skill to understand the design in coordination with other disciplines, cognitive skill to approach the specialty and limitation of the designer and social skill to interact between different disciplines of designers (Cross and Clayburn, 1995 and Mozota, 2003). Figure 2.4 illustrates main elements in Collaborative Design Management.

Figure 2.4 – Main elements in Collaborative Design Management



Source: Veidekke (2013)

The project management team to provide design management has to follow the two (2) different processes of design such as aiming for the understanding of nature design activities (Lawson et al., 2003) or aiming for focusing on different stages of the design (Kagioglou, 1998). Regardless of the design process, each team member of the management team needs to have appropriate skill in design discipline and capability to understand the concept of design or to comprehend clearly each different phase of the design in order to successfully manage the design. The main problems in design management which are poor communication, lack of adequate documentation, missing input information, lack of coordination between disciplines and erratic decision making are all related to the most important factor of resources allocation in the project management team (Cornick, 1991; Austin et al., 1994; and Koskela, 1997).

The project management team should be able to control and monitor the design team by establishing the design brief for each discipline; the design planning to clearly define time and cost of the project, the information management, and the coping with design changes (Cockshaw, 2001).

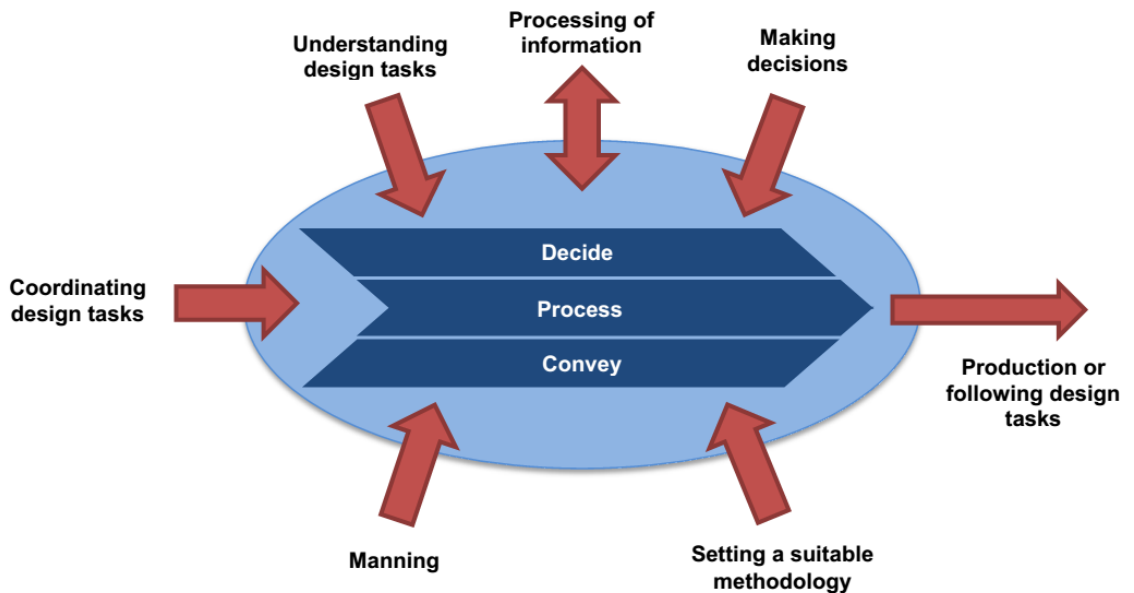
The team member of project management team has to create a design planning in order to coordinate time factor on the design from each discipline and their sequences (Austin et al., 1994). It is important to have a team member to comprehend cost estimation of the project in order to manage the estimated cost of the proposed project within the budget as it is now recognized that the construction cost of the project heavily depends on quality of the design management (Austin et al., 1998). The project management team member has to define clearly the concept of design and to clarify the demand of each design phase to manage the resource of the design team and to ask for the replacement of the unsuitable resource of design team (Koskela et al., 1997). The decision on the judgment of the design team is vital to avoid not only the initial delays but also the escalation of further problems in construction phase (Love et al., 2000).

The processing of information to all disciplines in an assigned project still is a big problem in management design (Kagioglou et al., 1998). The releasing of information from clients, compulsory regulation or changes of design function has never been clearly delivery to all related parties due to lack of information management team member who should be acting as a site clerk of the construction project site (Formoso et al., 1998). This team member of the project team need to be predominantly through schedule to ensure the on-time delivery in sequence to all design team members (it should be noted that there are sometimes more than

15 disciplines to be involved in design of construction project such as architect, structural engineer, mechanical and electrical engineer, fire protection engineer, façade engineer, foundation engineer, quantity surveyor, interior architect, kitchen design specialist, pool and water specialist, audio specialist, building information modeling (BIM) specialist, lift specialist, security specialist, sound and heat insulation specialist, lighting specialist, etc. and the list still goes in many complex projects). The information management in design is become the basic phase for project management for construction project, the next phase of project of tender and construction.

Due to the poor coordination, lack of delivery of necessary information on-time to different team members of the design team, and changing of function of the project, design changes have happened in almost every project during design phase to affect the delivery time and increasing cost of the project (Love et al., 2000). The design management process demands all the above-mentioned constraints to be coordinated and solved on the decision of project leader, this process contains the six preconditions for design tasks (Veidekke, 2013). The figure 2.5 illustrates the six preconditions for design tasks.

Figure 2.5 – The six preconditions for design tasks



Source: Veidekke (2013)

The six preconditions for solving all constraints in design management process are clarified as follows:

- (i) Coordinating design tasks – to ensure the tasks are fully covered by all disciplines.
- (ii) Understanding design tasks – to comply with the client’s requirements and design solution.
- (iii) Processing of information – to ensure the required information is sent to all stakeholders on time.
- (iv) Making decisions – to take responsibility for undertaking decisions.
- (v) Manning – to provide appropriate human resources with ability and competence.
- (vi) Setting a suitable methodology – to adapt the required design tasks.

Based on the six preconditions for solving all constraints, the project management team structure should allow having a team member to have the right to make quick decision on solving any design changes to avoid the disruptions of schedule delay and increasing of the project cost (Mokhtar et al., 2000).

2.6 Team Structure for Tender Management

Tendering in construction is defined as “the process of preparing and submitting for acceptance a technical and commercial proposal after to carry out work for a price, thus converting the estimate to a bid” (Baker and Champion, 2008). The aim of tender process is to evaluate and to select the contractor who appropriately satisfies the terms and conditions of the Client, and the design consultant to construct the assigned project to match the key constraints of cost, time and quality with the acceptable commercial value of the project. Tender process is very important in selecting an appropriate contractor with the most economic-financial proposal to complete the project on time and achieve a specified quality for the project. To produce the expected result, the appointment of team member to conduct all necessary procedures is the key for successful tender. The team member has to have the skill to evaluate the ability and the risk in awarding the contract to the selected contractor. The tender process consists of two separate phases of Tender Preparation and Tender Evaluation. Table 2.4 illustrates phase of contractor selection in post qualification public tendering with one file.

Table 2.4 – Phase of contractor selection in post qualification public tendering with one file

Phase	Stage
A. Bid preparation	1. Planning of goods/service providers selection
	2. Selection of procurement system
	3. Determining method for qualification evaluation
	4. Determining schedule for selecting goods/services provider
	5. Drawing out of goods and services procurement document
	6. Determining owner estimated.
B. Bidding process	Post qualification, one file:
	1. Announcement
	2. Registration and bidding documents obtaining
	3. Information session
	4. Bid document submission
	5. Bid document solicitation
	6. Bid evaluation
	7. Qualifications evaluation
	8. Qualification verification
	9. Preparing minutes of tender results
	10. Determining tender winner
	11. Award announcement
	12. Disclaimer
13. Refusal of appeal (if required)	

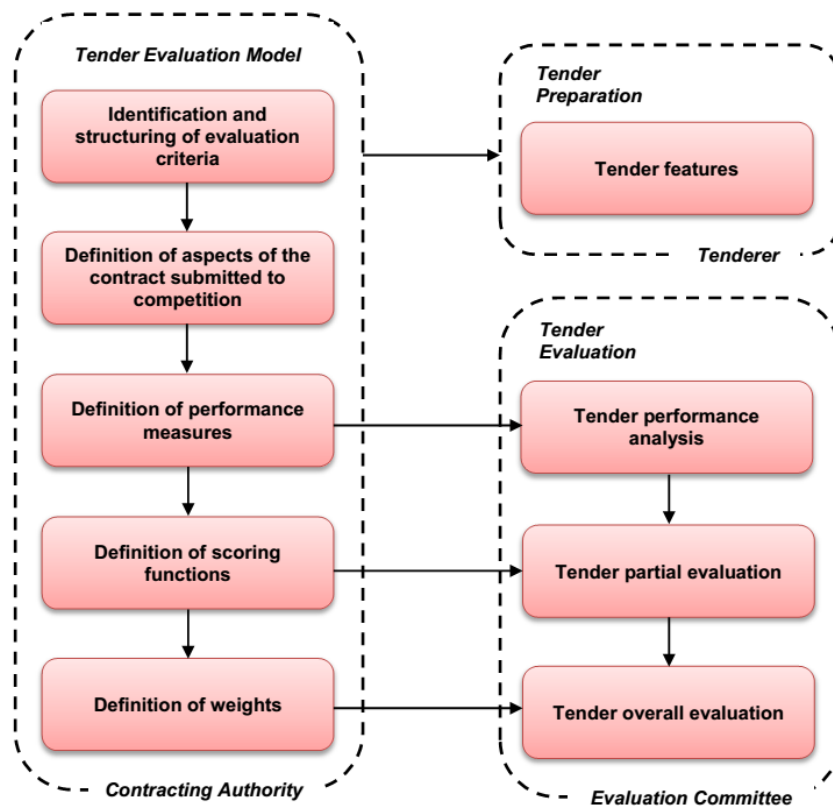
Source: President Regulation No. 70, 2012

Traditional Tender Process

Tender process is classified as the most frequently encountered corruption behaviour in construction industry (Sohail and Cavill, 2008). In order to proceed with the tender process, tender document should be prepared in accordance with the final design document, specifications of all related works (to define the quality of the supplied material, method of construction and quality of workmanship) and Bill of Quantity set (to describe the quantity of each related works of the whole project) (Stader, 1997). To avoid any collusion in the tender process, the project management team has to assign a contract specialist to look at closely at the specifications and terms and conditions to participate in tender as many specifications and terms and conditions are written to suit some contractors on the market; for example the specifications mentioned the quality to suit only one available product or the terms and conditions to participate the tender based on strong finance and broad experience in the assigned field only applying to a few contractors (Ward and Chapman, 1988).

The next step of the tender process after tender preparation is issuance of the tender document and tender evaluation. The tender evaluation is undertaken by the selected multi-disciplinary committee to assess the tender on legal and technical compliance with the utmost important issue of cost to match performance analysis. Most of tender evaluation process goes through two phases of pre-qualification for eliminating the non-complying with tender requirements and selection phase for evaluation cost/performance and negotiation of terms and conditions of the proposed contract (Standard Tender, 2010). Figure 2.6 illustrates building blocks of the tender evaluation methodology.

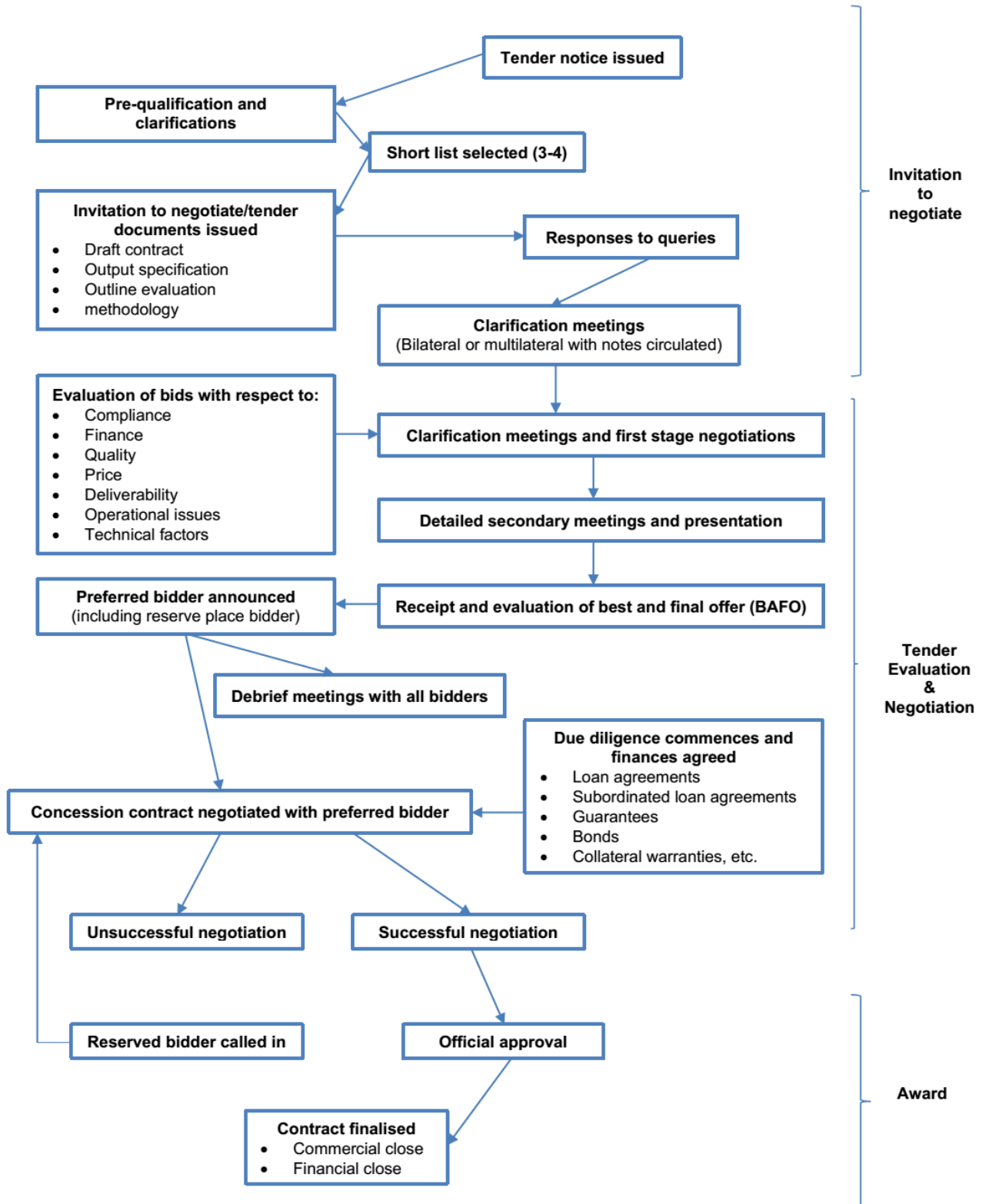
Figure 2.6 – Building blocks of the tender evaluation methodology



Source: Mateus, 2010

The contract specialist of the project management team needs to preview all the necessary actions on pre-qualification and on evaluation of the tender and then to review the selection result to ensure the tender process being transparency and compliance with the regulation and appropriate procedures by the Tender Evaluation Committee. The assigned team member also has to provide coordination with design team to clarify all unclear technical issues during the tender process. Figure 2.7 illustrates the tender phases up to financial close.

Figure 2.7 – The tender phases up to financial close



Source: CIC, 1998; Ahadzi and Bowles, 2001

E-Tender Process

In order to quicken and provide transparency in tender process, e-tender has been introduced to carry out the entire tender process including pre-qualification, submission technical and financial proposals for tender evaluation and announcement of awarding tender publicly online (Kerridge et al., 2000). However, e-tender process has shown many problems such as lack of technology understanding, heavy dependence on training of professional human resources. These mentioned problems actually result in impacts on transparency, competency of the tender value and mixing up the tender sequences (Costa et al., 2013). Due to many illegal practices to get through the tender process such as counterfeiting the qualified document and submitting hidden cost of tender, unfortunately, e-tender has not been able to detect distortion (Hanak, 2015).

Many researches have been conducted on the applying of e-tender to show that there are still many problems on the process and more difficult to detect and prevent cheating on tender process, especially collusion conspiracy between participants (Costa et al., 2013). Therefore, it is a lot of caution in applying e-tender process over the general concern over security and legal issues as the unguarded use of electronic technology has generated contradictory effects between efficiency and security (Laryea, 2011).

To make e-tendering being effective and popular to apply in tender process, it should include appropriate security factor to increase the reliability of the system.

2.7 Team Structure in Establishing Construction Contract – FIDIC Forms

A tender which is judged successfully has a good qualification and evaluation process to select the most appropriate contractor to undertake the construction works specified in the tender. But these successes have to formalize in a document called “Construction Contract” between Client and the Contractor. To simplify the contractual issues, an international organization based in Geneva called Federation Internationale De Ingenieurs-Conseils (International Federation of Consulting Engineers), in short FIDIC, has been instrumental in the evolution of various standard forms of contracts used widely worldwide in construction works. All international funders such as Asia Development Bank (ADB), World Bank (WB) – have adopted FIDIC standard forms with suitable modifications for applications in the works.

The table 2.5 below gives a brief overview of FIDIC contracts to date:

Table 2.5 - Brief Overview of FIDIC contracts to date

FIDIC contract	Year released	Notes
The (old) Red Book	First published in 1957, the fourth and final edition was published in 1987, with a supplement added in 1996.	These contracts were aimed at the civil engineering sector, as differentiated from the mechanical/electrical engineering sector.
The (old) Yellow Book	First published in 1967 with the third and last edition in 1987.	These contracts were aimed at the mechanical/electrical engineering sector.
The Orange Book	The first and only edition of this contract was released in 1995.	This was the first design and build contract released by FIDIC.
The (new) Red Book	Released in 1999.	The Red Book is suitable for contracts that the majority of design rests with the Employer.
The (new) Yellow Book	Released in 1999.	The Yellow Book is suitable for contracts that the contractor has the majority of the design responsibility.
The Silver Book	Released in 1999.	The Silver Book is for turnkey projects. This contract places significant risks on the contractor. The contractor is also responsible for the majority of the design.
The Pink Book	First published 2005 – an amended version was published 2006, with a further edition in June 2010.	This is an adaptation of the Red Book created to fit the purposes of Multilateral Development Banks.
The Gold Book	Released in 2008.	This is FIDIC's first Design-build and operate contract.

Source: Udom (2014)

Other contracts in the FIDIC family include the FIDIC sub-contract, *The Blue Book*, which is concerned with dredging and reclamation works, and *The White Book*, which is for the engagement of consultants by Employers.

Although the FIDIC family covers a wide range of contracts, there are some common features of Presentation of FIDIC and Dispute Resolution of FIDIC clarified as follows:

Content of FIDIC

FIDIC is usually divided in two parts: Part I consisting of the general conditions and Part II concerning the conditions of particular application (including guidelines for the preparation of Part II clauses). Part I contains the general terms of the contract, such issues as rights and obligations of each party, procedure for payment, variation, certification and dispute resolution.

Part II of the contract is the conditions of particular application and is to be used to introduce project specific clauses, such as language of the contract, choice of law, the name of the person or firm appointed to act as Engineer or Employers representative for the project among other terms. The appendix usually contains sample of documents to be used for the procurement process.

In most FIDIC forms there is a default hierarchy for the documents forming the contract. The order of priority is as stated below and in the event of inconsistency the first on the list takes precedence:

1. The Contract Agreement
2. The Letter of Acceptance (this is the formal acceptance of the contractor's tender and marks the formation of the contract).
3. The Letter of Tender
4. Part II – the conditions of particular application
5. Part I – general conditions of contract
6. The Specifications and Drawings (*Red Book*), The Employer's Requirements (*Yellow Book*), the Schedules (*Red and Yellow Books*)
7. Further documents (if any), listed in the Contract Agreement or in the Letter of Acceptance.

The parties are allowed to rearrange the priority of documents or stipulate that no priority or order of hierarchy will apply to the contract. This can be done in Part II of the contract.

Dispute resolution of FIDIC

FIDIC contracts adopt a multi-tier dispute resolution process. The emphasis in recent years has been on the amicable settlement of disputes. The process usually provides as a first step, for disputes to be submitted for adjudication before an Engineer or a Dispute Board. If one (or both) of the parties is dissatisfied, a period is allowed for amicable settlement. If the parties are not able to settle the dispute during the “amicable settlement” period, the final stage is to proceed to arbitration. FIDIC contracts provide as a default position that the arbitration rules of the International Chambers of Commerce should apply in the arbitration of disputes arising from the contract.

FIDIC has also arranged many training courses every year to help project managers, owners, contractors, etc. to understand for selecting the appropriate FIDIC contract for different types of projects.

The project management team needs to have a contract specialist to assist the tender team in monitoring and advising on the contract form to reflect all the agreements during contract negotiation and to protect both the client and contractor in the contract equally.

2.8 Team Structure in Contract Management

A construction contract is a legal bidding document to reflect all terms and conditions of the execution/construction to be specified in tender process between the Client and selected contractor. During construction period, the construction contract is a guideline for all legitimate rights of all related parties in construction of the project. It is very difficult to change or modify the contract as it is legal agreement for execution for construction (Abdelhamid and Everett, 2000). However, in reality, during the construction period of construction, there are many variations in construction cost, replacing materials and extension of construction time, etc., to solve these problems, a contract management specialist is needed to be included in a team structure as a key person of the team to perform a specialty function to have solution quickly on any type of dispute to ensure no delay on the construction of the project (Andi at el., 2004). It is important that the contract management specialist has to coordinate with all disciplines of the team to analyze the perform-in-depth of contractor and to act quickly on all necessary corresponding countermeasures.

Key issues need to have closely management by the project management team to ensure the successful delivery of project in accordance with signed contract to be:

Contract Administration and Record Keeping

In construction project, correspondences between stakeholders of the project are the evidences on contract execution in association with the signed contract. All records of submitted specifications on all materials and workmanship which are also subjected of claim and dispute need to be kept carefully to compare with the original tendered set of drawings and specifications of the contract.

Roles and Responsibilities of Contract Management Team

Due to the complexity of construction project, especially in contract management to involve with legal system, knowledge in construction and construction materials, so the contract management team should have a contract manager to comply with the signed contract and all variations and disputes together with the Procurement Manager to comply with commercial value of the contract. Table 2.6 illustrates procurement and contract manager roles.

Table 2.6 – Procurement and Contract Manager Roles

Area of Responsibility	Contract Manager Role	Procurement Role
Supplier Management	<ul style="list-style-type: none"> Day to day management of the supplier Perform regular operational meetings with supplier Resolve operational issues as they arise Monitor performance data and Address non-conformance 	<ul style="list-style-type: none"> Ensure signed contract is in place between both parties Monitor spend and compliance to approved contract
Invoicing and Payment	<ul style="list-style-type: none"> Ensure invoices comply with contracted rates Ensure payment is made to supplier within payment terms Invoice disputes and dispute resolution 	<ul style="list-style-type: none"> Ensure invoices are compliant and paid according to the terms of the contract Manage contract related payment disputes
Contract Administration	<ul style="list-style-type: none"> Participate in the establishment of and understand the operation of the Contract and Supplier Management Plan Place purchase requisitions Organise work requests Advise the Procurement Team of any changes in scope/product/service supplier 	<ul style="list-style-type: none"> Establish and reconfirm the Contract and Supplier Management Plan Process purchase requisition and issue PO Ensure a contract file is maintained that meets audit requirements Negotiate changes in scope/product/service and associated terms and pricing in consultation with the contract manager
Compliance and Monitoring	<ul style="list-style-type: none"> Comply with contract terms Engage with Procurement and or supplier to resolve supplier/end-user generated complaints regarding contract compliance 	<ul style="list-style-type: none"> Ensure two-way communication with the supplier. Facilitate resolution of unresolved issues that occur in between review meetings by: <ul style="list-style-type: none"> Bringing the Business Owner & Supplier together to solve issues Ensuring agreement on action plans between the Business
Continuous Improvement	<ul style="list-style-type: none"> Formulate, implement and monitor improvement plans stemming from regular contract review meetings and noncompliance issues to ensure supplier is performing at expected levels/KPI's 	<ul style="list-style-type: none"> Facilitate improvement plans stemming from regular contract review meetings to ensure Supplier performing at expected levels/KPI's
Contract Review – Lessons Learnt	<ul style="list-style-type: none"> Participate in strategic contract review to determine future of contract at expiry 	<ul style="list-style-type: none"> Facilitate strategic contract review meetings to determine future of contract at expiry (e.g.: contract extension, new tender process etc.)

Source: Jorgensen (2018)

Performance Management

The contract management responsibility for this issue is associated closely with engineers and construction supervision to assess the performance of the contractor in quality, time and agreed cost to be assigned in the contract. Any assessment of nonperformance of contractor needs to have closely monitoring by management team to reverse the situation quickly.

Negotiating Contract Variations

Any construction project has allowed for reasonable contract variations in practice. However, the management team needs to assess on the circumstances to accept or not to accept the variations and if it is accepted, the management team needs to evaluate the variation and to obtain agreement by all stakeholders of the project in accordance with the terms in accordance with the signed contract.

Managing Contract Dispute

During the construction, many disagreements and disputes were raised due to construction method, construction practice on-site to compare with design on drawing board, replacement of material, understanding of the applied specifications, etc., the contract manager has to be able to arrange meeting with concerned parties to solve all disputes based on the signed contract. All disputes need to solve quickly in order to avoid the delay of the project and to have a fair commercial impact to concerned parties. Table 2.7 illustrates Dispute Resolution Process.

Table 2.7 – Dispute Resolution Process

<p>Negotiation</p>	<p>Negotiating between the Council and the Supplier is the most common approach to resolving disagreements and disputes. The intention of the negotiation is to reach a mutually acceptable solution, where both sides consider they have gained the best possible result in the circumstances. It is important that one party does not consider they have been unduly pressured to agree to a particular solution as a result of the negotiation as this can lead to an escalation or reappearance of the dispute at a later stage.</p>
<p>Mediation</p>	<p>Mediation involves the use of a neutral third party to assist in resolving the dispute. The mediator does not impose a decision on the parties in the way a court or arbitrator does, but instead seeks to help the parties resolve the dispute themselves. Mediation is usually regarded as a faster, less formal and less costly process than court proceedings or arbitration.</p>
<p>Arbitration</p>	<p>The aim of arbitration is to obtain a final and enforceable result without the costs, delays and the formalities of litigation. Arbitration proceedings are private, can be held at a mutually convenient time and the actual proceedings are less complex than litigation.</p>
<p>Litigation</p>	<p>Litigation is the act or process of contesting a lawsuit or seeking redress through the courts. It can be an expensive and time consuming procedure and is generally taken when other avenues of dispute resolution have not been successful or are not available. Other approaches to resolving disputes or Supplier defaults should therefore be considered prior to litigation.</p>

Source: Jorgensen (2018)

Contract Completion

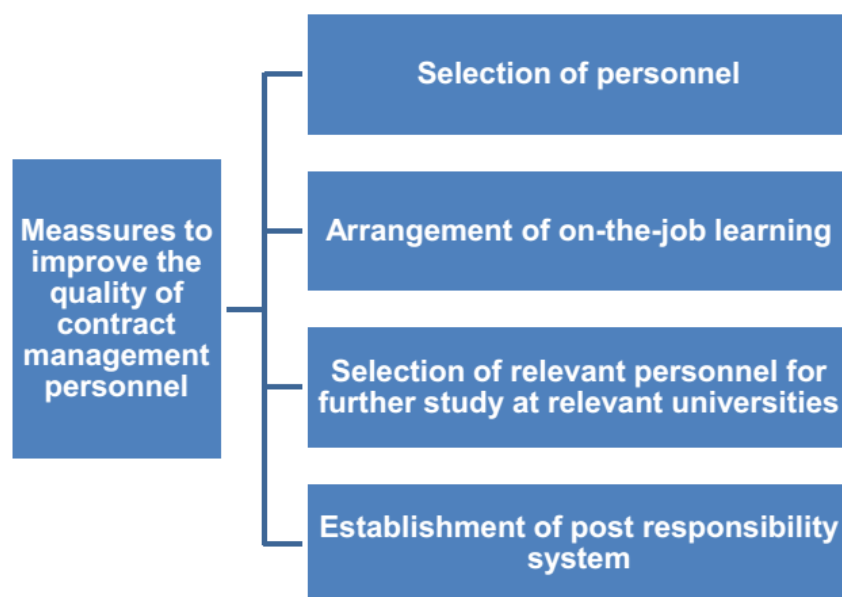
The project management team is still on the job after construction is completed because the contract could only be discharged after the certification of satisfactory quality of the performance of the contract and all commercial of the contract is agreed and signed off by all concerned parties. The completion time of the contract is around 3-6 months after the construction completion; therefore, the project management team needs to have available personnel for contract completion to stay on the project.

Staff Requirement for Contract Management

To be considered the key role in project management scope, contract management needs to be implemented throughout the project and the contract management should be divided into different stages with different kinds of tasks and priorities such as pre-contractual, contractual and post-contractual stages (Van Weele, 2013). Understanding of requirements and status of each stage is vital for contract management to identify problems and have solutions related to the next stage for the successful delivery of the project (Liu et al., 2014).

Contract management function is described to be a vital function of project management; therefore, the selection of appropriate personnel is a difficult task. Figure 2.8 illustrates Personnel for contract management.

Figure 2.8 – Personnel for Contract Management



Source: Liu, 2015

2.9 Team Structure in Health Safety Environmental (HSE) Management

Health and Safety Management

To be considered as the most risky and accident-prone industry, the project management for construction projects now needs to have a qualified member of comprehensiveness of the management of Health and Safety for the project, including the workers and the public (Hughes and Ferrett, 2008).

Recently, Health and Safety of a project is classified as the successful factor of the performance of the project beside the three traditional key issues of cost, time and quality. The good management of Health and Safety could save a lot in cost during the construction and could create a good reputation for the project management team on the accident-free project.

One of the tasks of the Health and Safety Manager is to produce the Health and Safety Plan to be implemented by all the stakeholders of the project during construction (Hinze, 2008). The implementation of the Health and Safety Plan is compliance with the labor regulation and safety acts of the project country location. The coordination between the project owner, the contractor, the design engineer and project manager on the agreement of the Health and Safety Plan is vital for preventing the accidents and injuries at the construction site.

Another important task is to provide the training and the regular inspection on the safety issues as many studies have shown that the attitude of the stakeholders on the ignoring of the safety management plan, the requirement of protection gear and incompliance with the safety regulation are the most cause for accidents in the construction projects (Abdelhamid and Everett, 2000; Toole, 2002 and Hinze, 2008).

The success of the management of health and safety requires the support from the Project Director and all team members as the strictly application of health and safety measures may delay the construction schedule by stopping the workers to come to site without the protection gears or stopping the construction due to the unsafe procedure or equipment.

Experiences on the HSE management in the construction industry show that Health and Safety management could be considered as the investment with the high return for every stakeholder in the construction projects. The focus of the Health and Safety management during the construction is depended very much on

the selection of the ability of the HSE manager in the team to take care of the compliance of the Health and Safety measures (National Safety Council, 2013).

Environmental Management

Construction projects are classified to be the main reason to create the environmental pollution (Shen et al., 2005). To be aware of this problem, the team structure for the management of construction project is now including the environmental specialist to follow the regulations of the environmental management (Lam et al., 2011). The environmental management should include the on-site mitigation for the potential impacts on ecosystem, natural resources and public (Li et al., 2010). The environmental specialist has to co-ordinate with other team members during the construction to ensure that the mitigation of the impact will not give effect to the cost, the construction schedule and the quality. For each project, the environmental specialist has to determine the kind of the environmental impacts and the information will be shared with other team members for preparing the Environmental Management Plan (EMP) before commencing the construction to reduce predicted impacts.

The construction industry is now applied widely the EMP to point out clearly the required activities during the construction but the mitigation of the EMP is not strictly implied due to the catch-up in the construction schedule, the cost-incurred in the green products, etc. (Von Malmborg, 2002).

The support of all team members on the application of the EMP is another important issue, it may require to have the strict application of the EMP order from the Project Director to all team members (Ravasi and Schultz, 2006). The environmental impact at construction site is not only happened on the dust, noise but also on the traffic and access, borrow site, ecology, hazardous materials and waste management. Therefore, the compliance with the EMP is essential to the construction site and the surrounding public areas.

The co-ordination of the environmental specialist in the team structure with the local authority on the environmental impact prevention frameworks, the contractor, the public, etc., during the construction is essential to prevent the environmental impact as it also produces the cost reduction in preventing the accidents and injuries related to the environmental impact (Christini et al., 2004 and Campos et al., 2013).

2.10 Team Structure in Ethical Management

To be considered as the most fraudulent industry (Transparency International, 2005), the construction industry especially on the project management for construction projects with the team structure remote from the head office is the perfect environment for the ethical testing (PMI, 2004).

The Organization for Economic Co-operation and Development (OECD) report in 2014 estimated up to USD 2.6 Trillion or approximately 5% of global Gross Domestic Product (GDP) being bribes annually in construction industry. Defining of corruption or unethical conduct in construction industry is to abuse the assigned authority to make a benefit on the expense of construction project (Le et al., 2014). The result of bribery in construction industry has made a big impact on the shorter lifespan of project, the collapse of project and claiming of human life (Lewis, 2003 and Hui, 2009). Many organizations in construction industry have developed and contributed management manual on preventing corruption such as ISO 3700 to manage and prevent bribery in construction issued by International Organization for Standardization (ISO) or Code of Ethics and Conduct issued by Project Management Institute (PMI).

In project management of construction projects, the Code of Ethics and Conduct stated by the Project Management Institute and the legal frameworks on fraud and bribery of the local authorities are the guidelines for all team structure in project management but in fact, in the construction industry, there is poor governance or framework on the management of ethical issues with very limited control and the strict management on ethical issues on the team structure to operate on the construction projects.

The lacking of the governance and regulation has generated the growing demand on the strengthening of the legal system on the correct ethical practice and professional behavior for each individual and the industry.

The un-ethics and dishonesty on the professional behavior of the project management team members creates the bad quality impact on the project (Rahman et al., 2007) and adds up the average of 25% of cost increase (Transparency International, 2005).

The common unethical behaviors in project management during the construction period are fraud and bribery. A person in a team could pass the quality of materials to receive a bribe or another person could approve a variation of the change order to receive a kickback on the approval. These unethical activities on getting a pass

of the material or approval of invalid claim could be covered as professional mistake when these activities are found. The receiving of bribery or kickback is more difficult to be found or witnessed. Therefore, the bribery activities in construction are more on ethical issues than legal issues (Powpaka, 2002). It should be noted that all the described unethical activities are not happened during the working hours so the control and management of the Project Director or Department Manager on team members are ineffective and eliminated.

The promotion of professional integrity of each team member in the team structure is another measure to prevent the unethical activities especially with the team members who have come to the project from different countries and backgrounds (Pearl et al., 2005). In many countries, unethical conduct may receive more severe punishment such as professional sanction or criminal conviction (Stansbury, 2009) in order to tackle various forms of corruption in construction industry directly on any involved team members of project management team.

2.11 Application of Project Management Software (PMS) on Project Management Team Structure

Information Technology (IT) has been applied for Project Management by introducing much PMS in order to assist the project management team that delivers the project in construction within the boundaries of key factors of time, cost and quality.

All available PMS make significant improvement on communication of project management, monitoring the status of the project, controlling project cost and project risk analysis (Izetbegovic et al., 2003).

In the relevant phases of project, application of software assists to project management significantly such as:

Design phase

With Computer-Aided Design and Drafting (CADD), the producing and reviewing of design are mostly depended on the input of design data from engineers on a design subject to give a result of the design (Lalit, 2008).

The design from software is much quicker for huge structure with software not only provides the optimized design but also gives the behaviors of structure to make long live of the structure (Screenivasa and Sitaram, 2014).

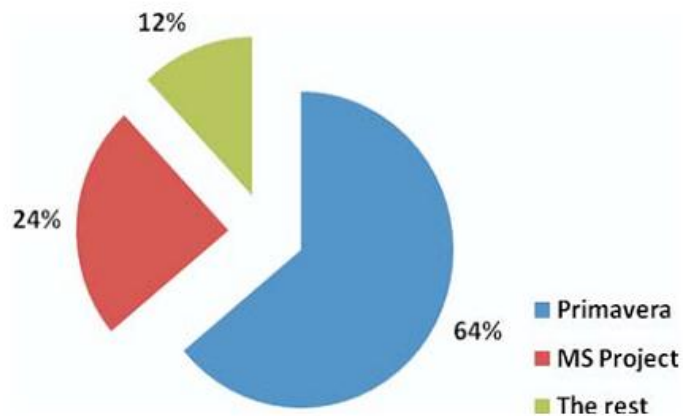
Tender and cost estimation

In preparation for tender and cost estimation, the software package has reduced the extensive work by producing the templates for each different kind of project with the market rate for each component of the project (Bhoseker and Vyas, 2012). The software also provides reviewing the required qualification for each tender to assist the acceptance of a tender bid.

Construction management phase

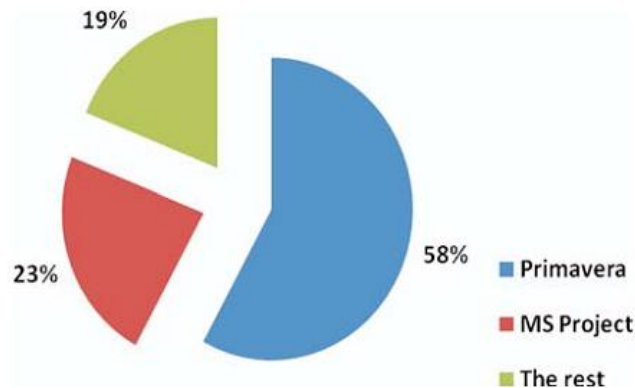
Primavera and MS Project are the most popular ones in application for project management in comparison with more than other dozen PMS which are available on the market. A survey on the usage of PMS is applied in both the US and Asia to show that Primavera and MS Project account for around 90% of the usage of PMS. Figure 2.9 and figure 2.10 show the usage of PMS in the US and Asia.

Figure 2.9 – The usage of PMS in the US



Source: Bechor et al. (2010)

Figure 2.10 - The usage of PMS in the Asia



Source: Bechor et al. (2010)

The application of PMS is now common practice for Project Director/Team Leader and all team members to eliminate the lack of communication between project team members. On other technical issues, PMS application still requires the team members to have specialty discipline to operate (Palvia et al., 2007). However, it should be noted that all software for engineering and project management demand the user to have full understanding and qualification in their technical field on the applying of these software. It means that the design software can only be applied by engineers to have qualification and to have design experience or the cost estimation software can only be applied by the qualified engineer to have qualification in cost control experience.

Therefore, the PMS application for Project Management for construction project still depends very much on the professional skill of all team members on its operation and the legal practice experience of the assigned team member on contract management. Even though the application has given all team members the status of the overall of the project, the monitoring of cost control and controlling of material on-site but it is vital to have an appropriate team member to solve other issues on design and construction.

2.12 Coordination between Project Management Team and Contractor

Beside the performance of project management team to provide project management for construction project, the successful delivery of construction projects are closely related to the performance of a selected contractor (Odeh and Battaineh, 2002). During tender period, the project management team makes the qualification screening in order to select a suitable contractor for the assigned project with key qualifications as follows (Salter & Torbett, 2003):

- Financial standing – Proven record of financial stability with a surplus of their own funds for support to the awarded project.
- Technical ability – Able to complete the project based on project experience, available plant and equipment, and available personnel.
- Management Capability – Capable to handle quality management, performance management with workmanship and management knowledge according to

construction requirements.

- Current project in hand – Ensure to have the personnel to handle the project without backlog or financial problem from other projects.

However, in the modern time of project, in which the fund for the development project is contributed from many sources; therefore, it is not uncommon to see a contractor being selected directly from the project owner without any proper tender process due to various reasons such as being shareholders, providing construction finance or providing delay payment to the development project. Therefore, the project management team needs not only to provide the routine function of project management in all phases of the project but also to provide close coordination to ensure to have a clarification on the construction process from a contractor and to avoid any conflict of interest from the contractor of being part of the owner of the project and contractor to undertake the construction work of the project. It is important for the project management team to set up co-framework with the contractor to define clearly the qualification requirements to be submitted to project management unit for approval. In case, some qualification requirements are not met, the project management team has to report to the project owner for approval to proceed with the construction (Leung et. al., 2004).

It is clear that miscommunication between the project owner, team project manager and contractor is the main reason to contribute to the cause of delay; therefore, coordination between project management team and contractor to ensure communication line and obstacles during the construction should be transparency and closely for the benefit of the success of the project.

**III. THE CONTEXT - PROJECT
MANAGEMENT OF CONSTRUCTION
PROJECT AND TEAM STRUCTURE
COMPOSITION**

III. THE CONTEXT – PROJECT MANAGEMENT OF CONSTRUCTION PROJECT AND TEAM STRUCTURE COMPOSITION

3.1 Introduction

The literature review in Chapter 2 has produced a theoretical and conceptual framework for the study of project management team structure in construction project. The proposed team structure needs to cover management of all elements of project in order to make the assigned project management successfully in each phase of the project. The team structure composition has to include the strong team leader to take leadership and competent team members to contribute their disciplines and to coordinate with other team members to provide the project management process for construction project.

This chapter provides description and requirement of an appropriate team structure for each phase of a construction project to clarify the composition of project management team structure. Even this study focuses on team structure rather than project management process but it is also important to understand the process of project management in order to compose the structure of team with the suitable team leader and competent team members of the assigned project in every phase.

Therefore, this chapter of the study will focus on the context of the role of leadership and contribution of the assigned team member in different phases of the project. The correct replacement and staff planning of the assigned team members in different phases of the project is vital for project management of construction project as it would ensure the project management team always has right professional skills to monitor the process and complete the tasks in harmony with other team members.

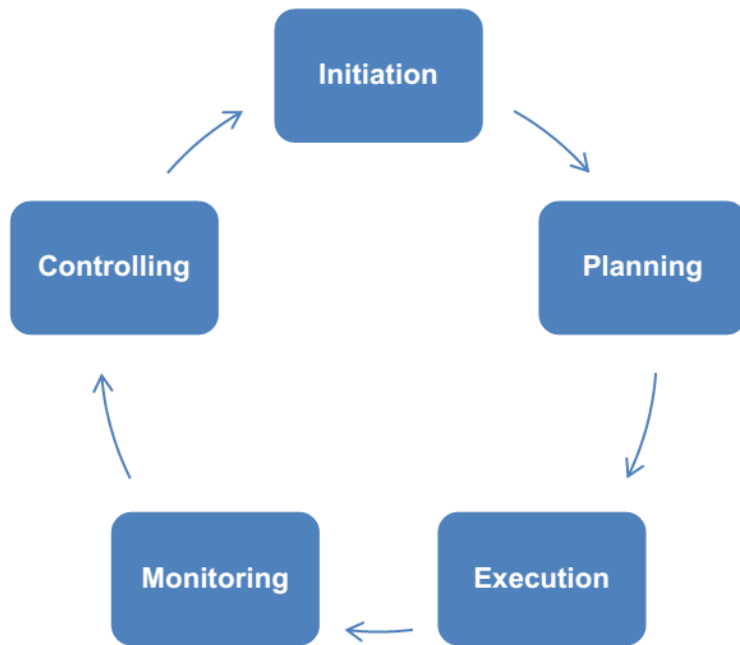
3.2 Understanding Project Management Scope in Construction Project

There are many descriptions of project management in construction project depending on the assigned scope of project management of an assigned project. The traditional approach on project management concepts as described by Kalusche (2012) to be:

- (i) Organization, information, coordination and documentation.
- (ii) Quality and quantity
- (iii) Cost and cash-flow
- (iv) Due dates, capacities and logistics
- (v) Contracts and insurances

But many scholars argue that this approach is so broad and does not make an impact on project management scope (Koskinen and Pihlanto, 2008; Kelly et al., 2014; and Del Pico, 2013). The Project Management Institute (PMI) describes Project Management as the application of knowledge, skills, tools and methods for execution of any assigned project. PMI divided a project into five process groups such as initiation, planning, execution, monitoring and controlling. Figure 3.1 illustrates Process Group of Project.

Figure 3.1 - Process Group of Project



Source: PMI (2014)

The mentioned process is applying along the lines of costs, time and quality to be called “Iron Triangle” in construction project (Atkinson, 1999). Figure 3.2 illustrates “Iron Triangle” in project management concept.

Figure 3.2 – Iron Triangle of Project Management



Source: Atkinson (1999)

On the tradition of cost, time and quality, today project management team has to take care closely of social responsibility, environmental issue and economically viable impact not only to the stakeholders of the project but also to the society. The above issues are now regulated and must need approval from authorities in the most countries for proceeding with a construction project. Figure 3.3 illustrates Today Project Management Concept.

Figure 3.3 – Today Project Management Concept



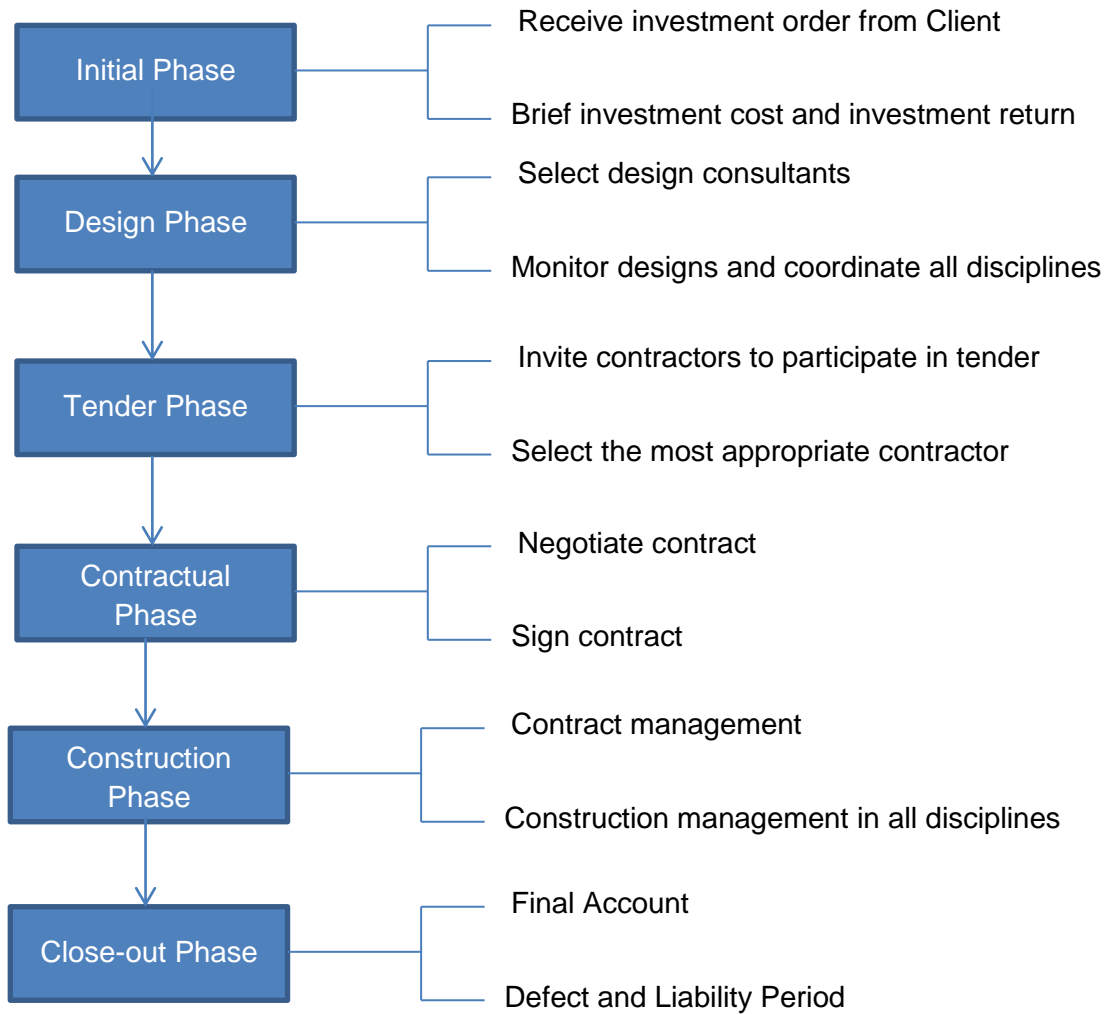
Source: Jennifer Russell

Project management for construction project today also needs to contribute a transfer of knowledge and could be the main factor to mobilize professionalism in execution of knowledge in the assigned project (Kelly et al., 2013).

3.3 Understanding the key phase of Project Management in Construction Project

A typical and traditional phase of a construction project is divided into four phases of Initiation Phase, Planning Phase, Execution Phase and Closing Phase (PMI, 2008). However, the required phasing for a construction project in project management should be divided into six phases: Initial Phase, Design Phase, Tender Phase, Contractual Phase, Construction Phase and Close-out Phase. Figure 3.4 illustrates the Phases of Construction Project.

Figure 3.4 - the Phases of Construction Project



Source: Modification from PMI

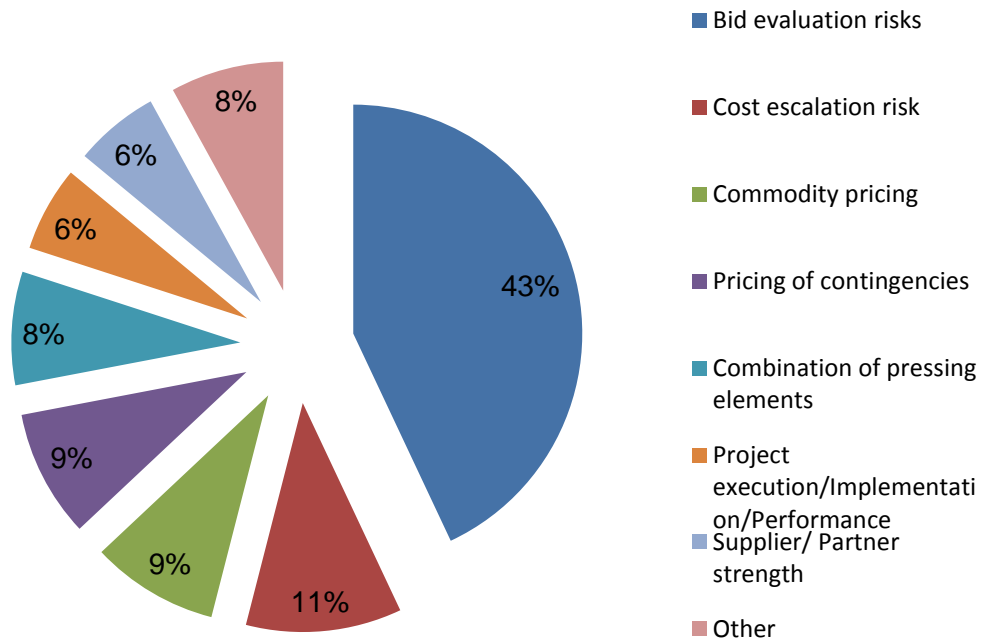
In every different phase, the project management team has to handle different tasks; therefore, the different team structures with appropriate disciplines to handle the required tasks are vital for the success of project management for the construction project.

The change in professional of different disciplines is necessary to suit each phase of the project as some team members only need to contribute their discipline in limited time; for example, the professionals in architectural, structural, mechanical and electrical designs only require contributing their professional expertise in monitoring the design in design phase only.

3.4 Risk Management in Project Management for Construction Project

Risk management is another task of project management team and it is usually handled by Project Director/Team Leader of project management team. The risk management focuses on the “Iron triangle” - cost, time and quality - of project management. Global Survey of KPMG in 2009 has highlighted that the Bid Evaluation is the main risk of project management that leads to select the wrong contractor among other elements of risks. Figure 3.5 illustrates the most pressing elements of project risk management.

Figure 3.5 – Most pressing elements of project risk management

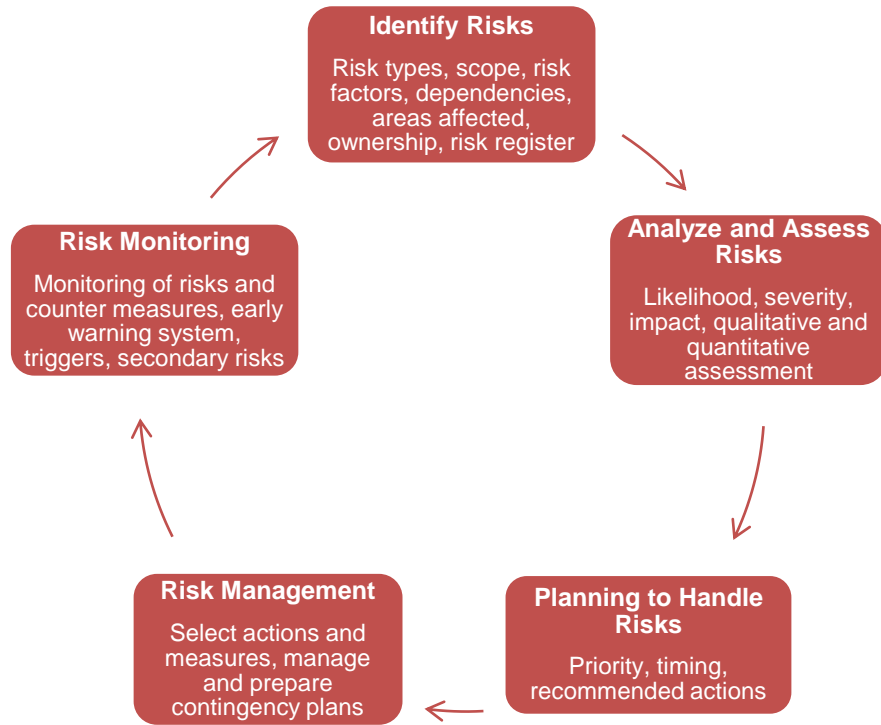


Source: KPMG International (2010b)

Today, construction projects become more and more complex with many sources of fund to one project; therefore, project management for construction project should look closely at legal structure, political issues and socioeconomic of each project to recognize the possible impact of these factors to the project (Bu-Qammaz, Dikmen and Birgonul, 2009).

The Project Director – Team Leader of project management team together with team members should proceed with the Risk Management Process to identify and categorize main risk areas (Gimscheid and Bush, 2008). Figure 3.6 illustrates the risk management process according to Project Management Institution (PMI).

Figure 3.6 – the Risk Management Process according to PMI

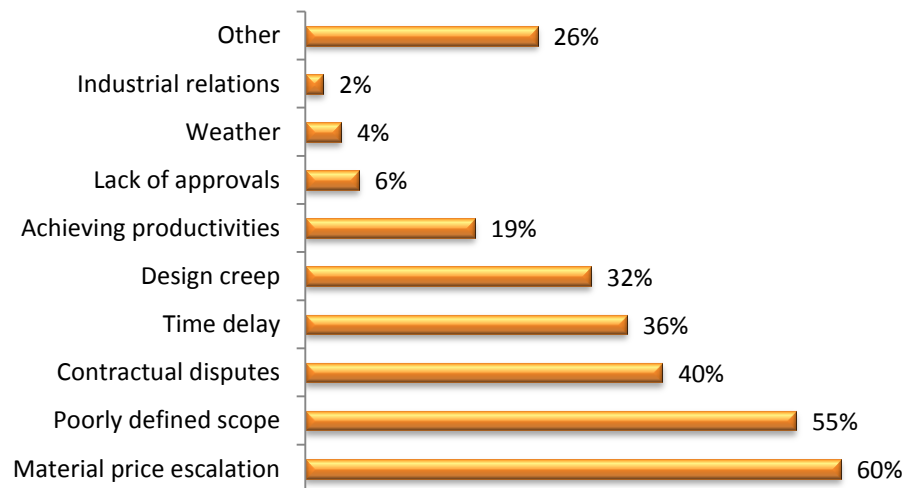


Source: PMI (2014); Tah and Carr (2001)

Based on the “iron triangle” of project management, risk of cost overrun, risk of time delay and risk of low quality of the project are looked at closely from every phase of the project.

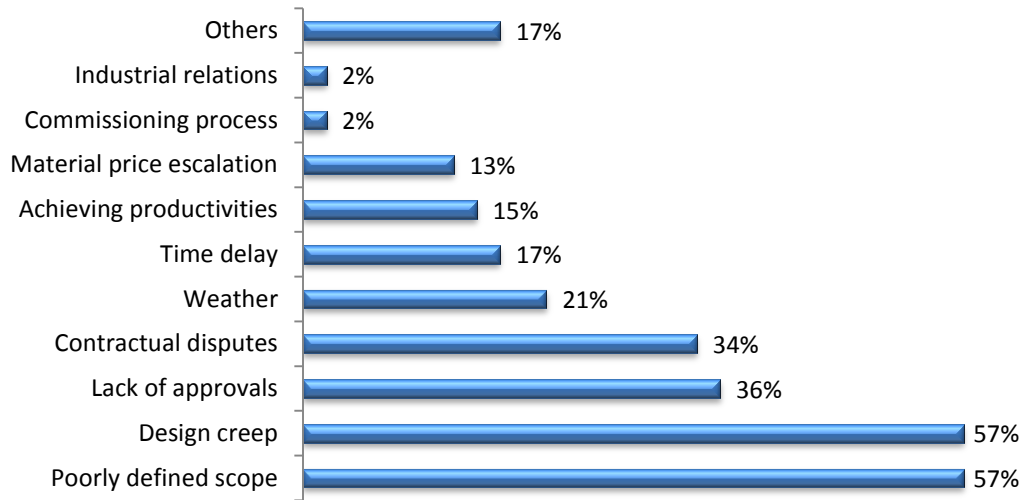
Global Construction Survey 2008 gives the reasons for cost overrun and time delay in figure 3.7 – cost overrun and figure 3.8 – Most common causes of construction delays.

Figure 3.7 – Cost overrun



Source: KPMG International (2009)

Figure 3.8 – Most common causes of construction delays



Source: KPMG International (2010b)

The risk of low quality happens mostly in lacking construction supervision of construction works on-site and in controlling the specified materials. These problems are related to the composition of the appropriate team structure of project management team in construction phase.

All above-mentioned risks would be able to be avoided and reduced with careful management to have right team members to monitor all activities of every phase of the project together with carrying out Risk Management Process (Gutjahr, 2009).

3.5 Understanding Main Type of Contract in Construction

Traditional Construction Contract

A contract is established based on the tender document consisting of design document, design specifications and guidelines for costing. The contract could be on lump sum which all the risks are designated to the contractor in accordance with the above-mentioned tender document or it could be calculated based on the submitted unit price from a contractor.

The term “traditional contract” means that the tender procedure could only be proceeded with after the completion of design with all the required details of a proposed construction project. With sufficient information on the project from tender document, the contractor could easily estimate the cost of a project and method of construction within the defined time and quality scope.

During the construction period, if any change from the design or specifications against the tender document, a contractor has the right to make a claim for extra cost due to the changes.

For the traditional contract, the project management team should cover all activities in management from design, tender, contract negotiation and establishment of contract before proceeding to the construction phase.

Guarantee Maximum Price (GMP) Contract

A contract is also established based on the tender document consisting of design document, design specifications and guidelines for costing. But to price the cost of a project, a contractor has to cover all risks of overrun in the submitted cost as maximum price for the project. Any “value engineering” – changing the design to have the same project scale, but saving cost – from a contractor to save the cost of the project could be shared with the Client to be additional profit of the contractor.

In short, this GMP contract provides the incentive for the contractor to take full responsibility for the construction and to give them opportunity to look closely on providing better technical aspects to save the cost and time, but the same quality of the project.

For the GMP contract, the project management team needs to have a good technical team to provide the assessment on any proposed changes of technical design or method of construction from the contractor in order to save the cost or time of the project.

Design – Build Contract

A contract is established based on the conceptual design of a project in which the awarded contractor takes responsibility for undertaking the design function as well as construction of the project. This contract allows the Client – Project Owner – to have to deal with on source only rather than dealing with various parties to avoid the debating of responsibility between design consultant and contractor during the construction.

In order to arrange tender for Design – Build contract, the project management team needs to confirm on behalf of the Client on the conceptual with the determine scale of the project together with specifications on construction components. Cost estimate of the project which is established by the contractor could be negotiated during the contract negotiation period, depending on the budget of the Client (same scale of the project but quality of material making a bid difference on cost of the project).

For the Design – Build contract, the project management team needs to have a good technical team to review design to ensure to match with the required specification from the Client during design period and project management team needs to have good supervision on site to ensure the construction to completely comply with the design.

Engineering – Procurement – Construction (EPC) Contract

A contract is established to a contractor based on engineering, procurement and construction to perform the required works. This type of contract is applied for projects required to have a lot of supplied equipment such as manufacturing factory project, water supply project, waste-water supply project, etc. The reason for

including procurement components into a contract is to ensure the uniformity of design and installation of equipment during construction. For example, in the water supply project, equipment component contributes major cost of the project; therefore, the design and supplied equipment for the project are demanded to match on the same standard to ensure performance of the plant.

For EPC contract, the project management team has to have a technical team to review the design and more importantly to review equipment to be procured to match with the design before proceeding to the construction. When the construction completed, the project management team has to coordinate with the contractor to make the commission of the plant.

3.6 Team composition for Project Management – Project Director/Team Leader

Team composition for Project Management for construction project is based on project-based structure. With this team structure, the Project Director/Team Leader is a central person to take the leadership role on every activity, including the selection of appropriate team member on each phase, taking decision on every occasion to ensure the smoothly proceeding of the project, coordinating with all technical experts for any issue related to the project and taking complete responsibility for the performance of the team (Robinson et al., 2013).

The Project Director/Team Leader is the contact point for all stakeholders of the project, all communications and correspondences are considered the official statement of the project. The Project Director/Team Leader is the one to establish a project plan for every task and to monitor the execution of each task. In case, the project is fallen behind schedule or increase of budget, the Project Director/Team Leader would need to coordinate with team members to take immediate action to revert the situation and to report to all stakeholders of the project (Del Pico, 2013a).

The main tasks of the Project Director/Team Leader according to (Kalusche, 2012):

- (i). Planning project within time and the required workloads.
- (ii). Defining tasks and work packages.
- (iii). Selecting appropriate methods of construction.
- (iv). Coordinating and supporting team members.
- (v). Monitoring and controlling the project in term of cost, schedule and quality.
- (vi). Taking necessary action and decision to proceed with the project.
- (vii). Assisting and performing technical tasks.
- (viii). Controlling documentation and reporting.

Moreover, Project Director/Team Leader also takes significant responsibility on the transfer of knowledge to the project.

3.7 Team composition for Project Management – Team members

Beside the competence of professional skill of each team member on the assigned task, each team member of team structure needs to participate in teamwork to be motivated to handle the task in accordance with the required time schedule, to be consistent and to have adaptability to work with different team members for the success of the project.

Many scholars have studied on the effective of team member by having multiple skills in management on project management (Spatz, 1998; Shanahan, 2001; Rasker et al., 2001; Blendel et al., 2002; Adam et al., 2002, Parker, 2008; and Ross et al., 2008). Table 3.1 illustrates comparison of elements of effective/high performing team from different researchers.

Table 3.1 – Comparison of elements of effective/high performing team from different researchers

Authors Elements of effective/high performing team	Spatz (1998)	Shanahan (2001)	Rasker et al. (2001)	Blendel et al. (2002)	Adam et al. (2002)	Parker (2008)	Ross et al. (2008)
Individual factors:							
a) Skills		X	X				
b) Personality				X			
c) Status							
d) Knowledge		X	X	X			
e) Abilities							
f) Attitudes		X	X			X	X
g) Mental Model							X
h) Training		X					
i) Experience				X			
Team factors:							
a) Structure		X	X			X	
b) Norm/procedure		X		X			
c) Size			X				
d) Effort on task							
e) Composition		X	X	X		X	
f) Homogeneity							
g) Climate				X	X	X	
h) Cohesiveness	X		X				
i) Organization						X	
j) Leadership	X	X	X	X		X	
k) Team Building		X					
l) Team training		X					
Task:							
a) Strategies							
b) Performance							X
c) Organization/ structure			X			X	
d) Complexity			X				
e) Type							
f) Accomplishment							
g) Work/load		X	X				
h) Interdependency			X				

Authors							
Elements of effective/high performing team	Spatz (1998)	Shanahan (2001)	Rasker et al. (2001)	Blendel et al. (2002)	Adam et al. (2002)	Parker (2008)	Ross et al. (2008)
i) Synergy		X					
j) Characteristics							
Process:							
a) Coordination/ collaboration	X	X			X		
b) Communication	X			X	X	X	X
c) Conflict Solving					X	X	X
d) Decision making						X	
e) Problem solving					X	X	
f) Boundary spanning							
g) Compatibility	X	X					
h) Quality and satisfaction				X			
Others:							
a) Material Resources	X					X	
b) Objectives and goals	X	X		X	X	X	X
c) Motivation			X				
d) Assessment/ feedback/audit/ monitoring	X		X		X	X	
e) Mutual trust & commitment/shared values	X			X	X	X	
f) Clear roles and responsibility	X			X	X	X	X
Situational factors:							
a) Reward structure/ organization support		X				X	
b) Level of environmental stress		X					
c) Educational system							
d) Information system	X						
e) Resource scarcity							
f) Management control							
g) Organizational climate			X	X			
h) Inter-group relations							
i) Competition							
j) Environmental uncertainty							

Source: Azmy (2012)

There are much knowledge and many skills that need to be developed and implemented by all team members for the success of project management in construction project.

Each team member has not only required to take responsibility and limitations on the assigned task but also acted in the interest of the project by ensuring the assigned task to complete in sequence and in association with other people tasks in accordance with project plan.

IV. RESEARCH METHODOLOGY

IV. RESEARCH METHODOLOGY

4.1 Introduction

It is important to define the research methodology in which the research philosophy together with the research design are to address in detail the process of the research with the aim to have all the answers for this study on the team structure in project management for construction projects.

It is described that research methodology is a combination technique (Easterby-Smith et al., 2001) to make enquires on various methods for reaching a result. The researchers have to find an appropriate method to shed data from critical investigation on the subject and to make an analysis to have a valid conclusion (Tayie, 2005).

On the research philosophy, the comparison of positivist and naturalist-constructionist is conducted to find the suitable paradigm to apply for this research. On the research design, one of the major strategies of surveys, experiment, grounded theory, action and case study is to be selected for the strategic approach for the research with the full clarification on the selection. The method for the application of the approached strategy on the gathering data and analysis of the available data to give the result of the research are also determined to ensure the logic, reliability and validity of the research.

The fulfillment of the requirement of ethical issues for conducting the research on the selected method is also explained together with the clarification to ensure the reliability and validity of this research.

In accordance with the research problem statement described in Chapter One, the literature on theoretical on team structure in project management and related conceptual and framework are presented in Chapter Two, then a comprehensive scope of team and project management in construction and required team structure in each different phase of a project are identified for understanding the function of team members in project management. This chapter presents the research methodology, including research philosophy and research design adopted in order to justify the reason for choosing the selected methodology.

4.2 Research Philosophy

It is important to understand the philosophical thinking on the research methodology in order to clarify research design and to describe the method to collect and interpret the collected data. There are three (3) philosophical thinking that provide the reality method to make research implication which are named the positivistic, post-positivistic and constructivist of research paradigm (Easterby-Smith et al., 2001). Table 4.1 illustrates research paradigms and their major characteristics.

Table 4.1 – Summary of research paradigms and their major characteristics

Paradigm	Positivism	Post-positivism/ Relativism	Construction
Ontology (basic assumption)	Realism: Reality is external, objective and is driven by immutable natural laws	Critical realism: A real world driven by natural laws but due to the limitedness of human cognition, imperfect sensory and constrained intellectual mechanism, exploring and perceiving into the true nature of reality is impossible.	Social constructivism: Reality is socially constructed and therefore our understanding of it is subjective, varied across situations and cultures and is conscious ideological.
Epistemology	Objectivism: Enquirer should behave objectively in an effort to explore reality and unravel universal laws that govern causal relationships through non-value laden means.	Modified objectivism: Reasonable objectivity of enquirer by trying to be as neutral as possible and articulating interferences and value laden characterizations.	Subjectivism: Given that reality is a human mind construct, subjective interaction between enquirer and enquired is the best way of constructing it.
Major methodology	Manipulative methodologies that both curb from inquirer bias and meticulous enough to penetrate into the characteristics of the issue under scrutiny.	Critical multiplism of methodologies (triangulation of multiple data, source, investigators, theories, methods, etc.) to achieve the	Approaches that properly gauge the hermeneutics and dialects aspects of an enquiry.

Paradigm	Positivism	Post-positivism/ Relativism	Construction
		commitments for critical realism and modified objectivism.	
Major aim of enquiry	Discovery of the natural laws of nature.	Exposure into and 'estimating' reality through multiple perspectives.	Invention/construction of 'reality'.
Major designs	Experiment/observation.	Triangulation.	Reflexivity.
Analyses/interpretation	Verification/falsification.	Probability.	Sense-making.
Outcomes	Causality.	Correlation.	Understanding.

Source: Easterby-Smith et al. (2001)

The selection of the research philosophy is conducted on the comparison between the two (2) main research paradigms on a qualitative research which are positivist and naturalist-constructionist (Atkinson and Delamont, 2011).

The Positivism was described as the observer of recurrent theme from the past to the present day to understand the behavior and to explain the proceeding on the scientific descriptions (Cohen et al., 2007). The approach of Positivism had to be on the logic of the cause and the result based on the known theories (Creswell, 2007).

The Naturalist was described as the learner from the experience of others so it was also constructionist on the natural happen in the external world of experience (Atkinson and Delamont, 2011). Naturalist-constructionist was focused on theme which was happened during the activities on studied subject.

The aim of this research is to seek the answer for the behavior of a group of professionals to compose a team to provide the professional services. The positivist focused on the set-up of theories based on the observation of the activities of the project evaluation and the participant performances. In contrast, the naturalist-constructionist paradigm focused on the importance of the context and the clarifying of the complexity of the subject with all the related factors based on the interviews. Therefore, the Positivism is not suitable for the research and the Naturalist-Constructionist paradigm is selected for this research.

There are also different approaches on the application of naturalist-constructionist such as critical emphasizing on the discovery and remediation of problems (Kincheloe & McLaren, 2000), feminist emphasizing on the non-dominance during the interview (Hooks, 1989), and postmodernism emphasizing on not to find out the full truth of the issues (Atkinson, 2002). The feminist method with the gentleness

and un-expectation of the misinterpretations of the interviews is also the applied approach to the research.

It is to conclude that the naturalist-constructionist paradigm with the feminist approach is chosen for the philosophy of this research.

4.3 Research Design

Research Strategy

Research design is a necessary process in collecting, analyzing and interpreting data from research strategy. It is a logical step linking data in research question and the conclusion of the research (Yin, 2003) as it requires critical review of research questions to suit the problem statement.

Research strategy could be developed from one of the five (5) major strategies of surveys, experiment, grounded theory, action and case study. With the limited time and available case studies related to the subject of team structure in project management for construction projects, case study strategy is the choice for this research.

All case study projects are real and reliable for the research of the application of team structure in project management for construction projects. All case study projects were typical construction projects in both infrastructure and building with the full assigned project management team and projects were publicly published in the web site.

The in-depth interview method is chosen for the collection data on the interviews with the participants directly involved in the case study projects.

Multiple Case Study Project Approach

On the research design, multiple case study projects are approached because the case study projects provide the practical activities in accordance with the theories on the construction subject of the research (Yin, 2009).

The multiple case study projects could also provide the following essential issues for the research:

- Providing the practical contribution to the research subject.
- Collecting plenty of data which would be helpful for the analysis of the research.
- Offering the multiple layers on the concept of the research by analyzing the qualitative data.
- Generating the platform to the finding of the problem statement of the research by pre-prepared questions related to the research subject.

Therefore the multiple case study projects are chosen for the research through the in-depth interviews with the selected participants.

The brief details of the four (4) projects to be facilitated for the case studies are briefed in the table below. The full details of the case study projects are presented in Appendix B.

Table 4.2 – Case Study Project Brief

01. HO TRAM ENTERTAINMENT AND RESORT PROJECT		
Brief description of the project	The project covers an area of 169 ha in Xuyen Moc Commune of Ba Ria – Vung Tau Province. Construction of the Project 1 (phase 1 and 2) – including the two five-star hotels, Vietnam’s first Las Vegas-style casinos and the specially designed Greg Norman golf completed by 2011. The entire 169 hectares of the Ho Tram Strip, featuring five Las Vegas-style integrated resorts, is scheduled to be completely developed and operational within ten years.	 
Type of project	Building	
Type of contract awarded	Multiple contract packages	
Total of construction cost (USD)	450 Million	
Construction Period (month)	55	
02. SP-PSA (SAIGON PORT – PORT SINGAPORE AUTHORITY) INTERNATIONAL PORT PROJECT		
Brief description of the project	The project is located at Thi Vai area in southern Vietnam (Phu My Town, Tan Thanh District, Ba Ria-Vung Tau Province) The SP-PSA has total berth length of 1,200m, the total area of 56.40ha, handling capacity of 1.2 mil TEU/year and 1.25 mil tons of general cargoes per year is able to receive vessels up to 6,000 TEU (it is equivalent to 80,000 DWT). The new port is expected to serve as an international hub port in the long term.	 
Type of project	Infrastructure	
Type of contract awarded	Multiple contract packages	
Total of construction cost (USD)	350 Million	
Construction Period (month)	32	

03. VINHOMES LANDMARK RESIDENTIAL COMPLEX PROJECT		
Brief description of the project	Vinhomes Landmark Residential Complex Project is constructed on the total area of 43.91 ha. The project comprises 11 towers (every tower with from 36 storeys to 50 storeys). The project is located in Tan Cang area, one of the most prime locations in the heart of Ho Chi Minh City.	 
Type of project	Building	
Type of contract awarded	Multiple contract packages	
Total of construction cost (USD)	800 Million	
Construction Period (month)	24	
04. EXPANSION OF THU DUC WATER PLANT PROJECT – PHASE III CAPACITY OF 300,000M³/DAY		
Brief description of the project	The objective of the project is to build Thu Duc Water Supply Plant – Phase III with the capacity of 300,000m ³ /day connecting to clean water pipeline D2400 of Thu Duc Water Supply Plant to meet the demand of water consumption in Ho Chi Minh City. The project includes Raw Water Pumping Station with the capacity of 315,000m ³ /day; Water Treatment plant with the capacity of 300,000m ³ /day.	 
Type of project	Water Supply	
Type of contract awarded	Multiple contract packages	
Total of construction cost (USD)	120 Million	
Construction Period (month)	25	

Even all the projects were developed in Vietnam but the management of the project was conducted by international developers and international consultants. Therefore, most of the findings of this research and the discussion could also be applied to all projects with the similar conditions in any other part of the globe.

Sampling Technique and Sample Size

The data collection is based on the interviews with participants involved directly in the case study projects, so the sampling technique on the selection of the participants depends on the convenient sampling technique with the non-probability

sampling in which the case study projects generate the boundary of the population for the participants to undertake the interviews.

The sample size - the number of interview participants is selected enough to provide the reliable data with total 16 samples for four (4) case study projects. The sample that was part of team to provide the project management for the case study projects could also provide the real status of each project as they could be project director, project manager or senior specialist in the assigned team structure.

If a selected participant refuses to undertake the interview, another team member of the assigned project will be approached for the consent to take part in the study. In order to provide the variability of the sample, interviewees are also selected with different genders, age groups, education levels and employment types to provide the different views in the perspective of the research subject. Full details of positions and demographic profiles of the participants (nationalities) who undertake the interviews are presented in the next Chapter – Results and Analysis. Other details on proposed gender, age group, education level and type of employment of participants are illustrated in Table 4.3 – Proposed Participant Group Variableness.

Table 4.3 – Proposed Participant Group Variableness

No.	Project	Gender		Age		Education Level		Employment	
		M	F	<40	>40	U	HU	FT	C
1.	Ho Tram Entertainment and Resort Project	3	1	1	3	3	1	2	2
2.	SP-PSA International Port Project	2		2	2	2		1	1
3.	Vinhomes Landmark Residential Complex Project	4	2	3	3	4	2	4	2
4.	Expansion of Thu Duc Water Plant Project – Phase III, Capacity of 300,000m ³ /day	2	1	1	2	3		1	2

Notes:

- M: Male
- F: Female
- <40: Under 40 years old
- >40: Over 40 years old
- U: Degree qualification
- HU: Higher than Degree qualification
- FT: Full time with the company
- C: Contract Staff

Questionnaire Preparation and Interview Procedure

A set of questions to be interviewed is prepared for the arrangement of the interviews. All prepared questions directly focus on the subject of team structure issues on the project management of each construction project case study.

In order to have a successful interview process, McNamara (2009) advised to follow the procedure of:

- (i) Selecting the good ambient place for the interview.
- (ii) Clarifying the objective of the interview.
- (iii) Confirming the confidentiality of the interview.
- (iv) Defining the format of the interview.
- (v) Expecting the time to complete the interview.
- (vi) Advising the means of communication.
- (vii) Clarifying any misunderstanding issues.
- (viii) Taking notes of everything in the interview.

To ensure the questions are reliable and covering the entire subject of team structure in project management, a pilot test with the leader of one of the projects will be undertaken. If the pilot test shows the weakness of the prepared questions, on the focus of the subject, the questions could be revised to collect better answers from the interviews (Kvale, 2007). After the pilot test is done successfully, the interviews with all consent participants will be proceeded and completed within the appropriate time to suit the study program.

Data analysis

It is important to select the method to analyze the data on qualitative research as it is a key to open all the hardwork on the interviews. The Qualitative Content Analysis is selected for the data analysis on this study due to the flexibility to apply inductive approach in the analysis based on the results of the interview and the inductive analysis based on theories (Kondracki, Wellman and Amundson, 2002). This method of Qualitative Content Analysis was presented as a good analytic

strategy for qualitative study (Sandelowski, 2000) and the system to describe the finding of the qualitative research (Schreier, 2012).

The data analysis on the selected Qualitative Content Analysis should follow the required process:

- (i) Selecting the sample analysis in the five selected projects.
- (ii) Establishing categories and themes in the five selected projects.
- (iii) Analyzing and providing the result of the finding.

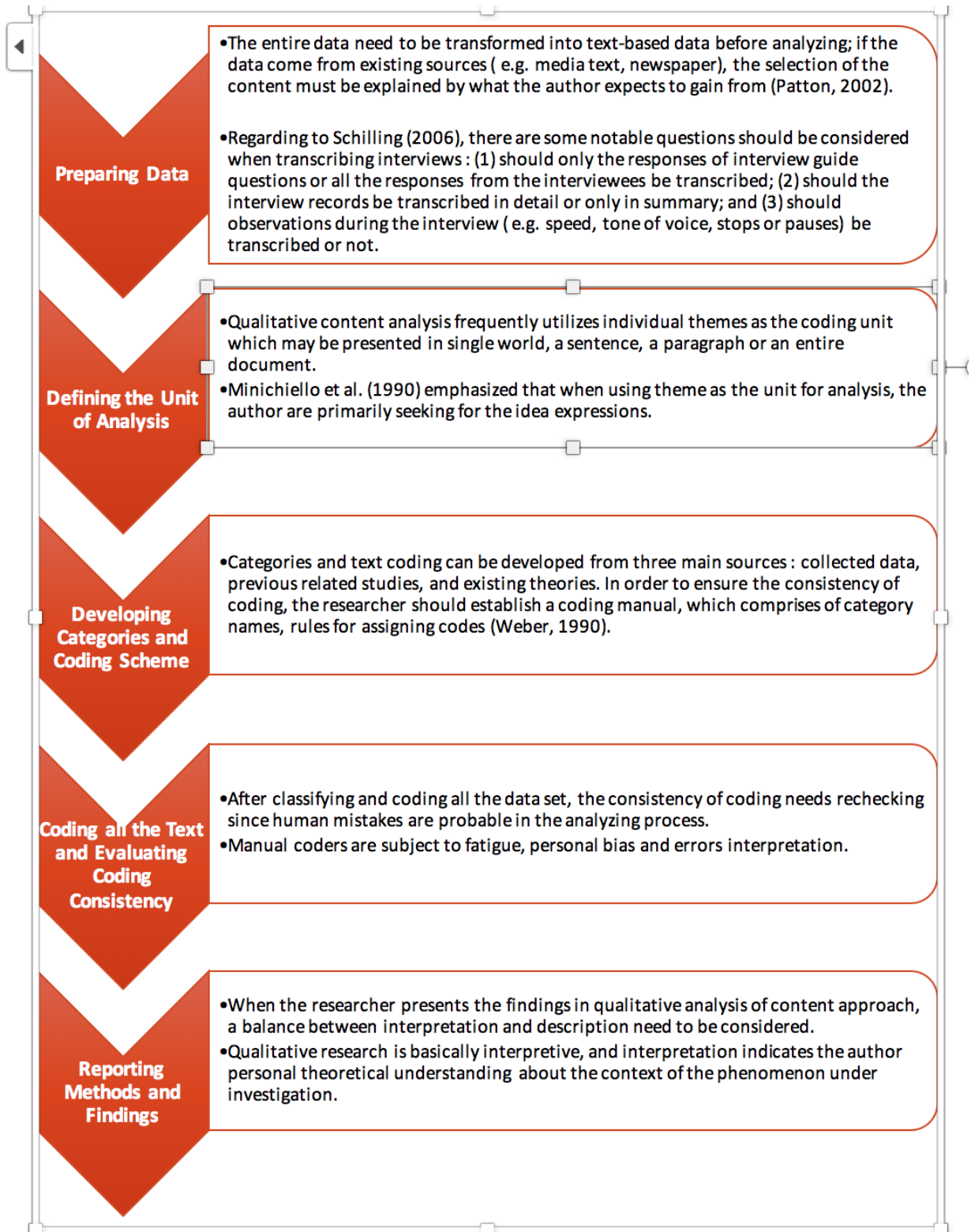
By combining the literature review and finding in the result of the analysis, the discussion on the team structure in relation to the performance of project management in construction focuses on the three components of cost management, quality management and time management.

The full method and process data analysis after the data are collected from the interviews are presented in detail in the next Chapter – Results and Analysis.

Pattern of the inductive approach on Qualitative Content Analysis

In general, the Qualitative Content Analysis can be developed in the following stages that are presented in the below figure 4.1 – Procedures of Qualitative Content Analysis Approach (Zhang and M.Wildemuth, 1966).

Figure 4.1 – Procedures of Qualitative Content Analysis Approach



Source: Zhang and M. Wildemuth (1966)

4.4 Research Questions

The well-prepared questionnaire is essential for the participant to provide all the details for the subject of the study, so the questionnaires for the interviews are carefully prepared for the most effective way to collect the required data.

The eighteen (18) questions including three (3) questions on the background of the participants and another fifteen (15) questions from the assigned projects related directly to the arrangement of team structure, the assignment of team members in project management for construction projects are prepared for the in-depth interviews with all participants who have consented to take part in the studies.

The completed set of questions for interviews is presented in the Appendix A.

4.5 Data Collection Methods

The interview questions are issued to the interviewees in advance. The transcript for the interview based on the prepared questions is ready for the interview. Audio tape is also requested to record during the interview and notes of interview are taken on the conversation of each question.

The replies of the interview are written for each question then sent back to the interviewees for reviewing and accepting. Summary of the key issues of the interview of each project is conducted to show the similarity of difference from each interviewee on the evaluation of the related project.

4.6 Ethical issues: Reliability and Validity

Ethical requirement

The acceptance for facilitating the case study projects and the approval for staff to take part in the research by the project owners were obtained. The consent to undertake the interview of each participant was also collected before proceeding the research.

The owners of the projects and all participants clearly understood the aim and objectives of the study which was one of the factors to satisfy the ethical issue of the study by the University. The documents related to the interviews are also kept confidentially.

Reliability

The reliability of the research reflects the true indication of the subject which would be given the same result by other researcher. The data for the study is gathered through the interviews with different levels of the team members in different projects to provide the credibility of the study (Hendricks, 2006). The in-depth interviews with all participants from four (4) case study projects ensure that the results of collected data could be consistent upon any repeat interviews to provide the reliability of this research (Golafshani, 2003).

Validity

The case study projects are on different scales and different types of construction to provide the data from various sources for the research and all four (4) case study projects are approached independently to ensure to have the finding on the highest level of credibility on the researched subject.

All the interviews are conducted independently without any force or guidance to affect the results of the interviews (Haller and Kleine, 2001). The internal and external validity of the data collections are also satisfied not to cause any variable outcome of the study by any means to intervene the participants (internal) or population, personological and ecological (external) to the study (Haller and Kleine, 2001).

4.7 Summary and Conclusion

4.7.1 Summary of research methodology

General information on the study – Chapter 1

The aim of this chapter is to recognize problems in construction industry in delivering a construction project related to key characters of construction project of time, cost and quality. This chapter also defines the role of project management which so much depends on the assigned human resources and composition of project management team.

Based on the mentioned problems and role of project management team in providing successful project management for delivering a construction project, this chapter sets out problem statement and objective proceeding with the study in order to find the answer on the composition of team structure of project management to cope with the mentioned problems.

Review literature – Chapter 2

The aim of this chapter is to revisit and examine closely the problem in construction project in order to identify solution to solve the problem on the concept of team structure of project management team in previous research. Review of previous context and research is to provide the determination of position of this study in relation to other similar studies on the subject. It also provides reference on similarity or dissimilarity of the context of project management team on the result of data collection against the previous studies.

The context – project management of construction project – Chapter 3

This chapter provides the context explanation for understanding the project management role in construction project, the concept of project management, and key phasing of a construction project. It also clarifies risk management, understanding of main type of contract in construction project and lastly the role of team composition for project management.

This chapter gives further knowledge on requirement of construction project together with the related concept of contract to deliver a project between the project owner and contractor in which project management team has to take responsibility for establishing after tender and managing during the construction. This knowledge is essential for composition of team member structure and the required qualification of each team member to undertake the assigned duty in the team structure.

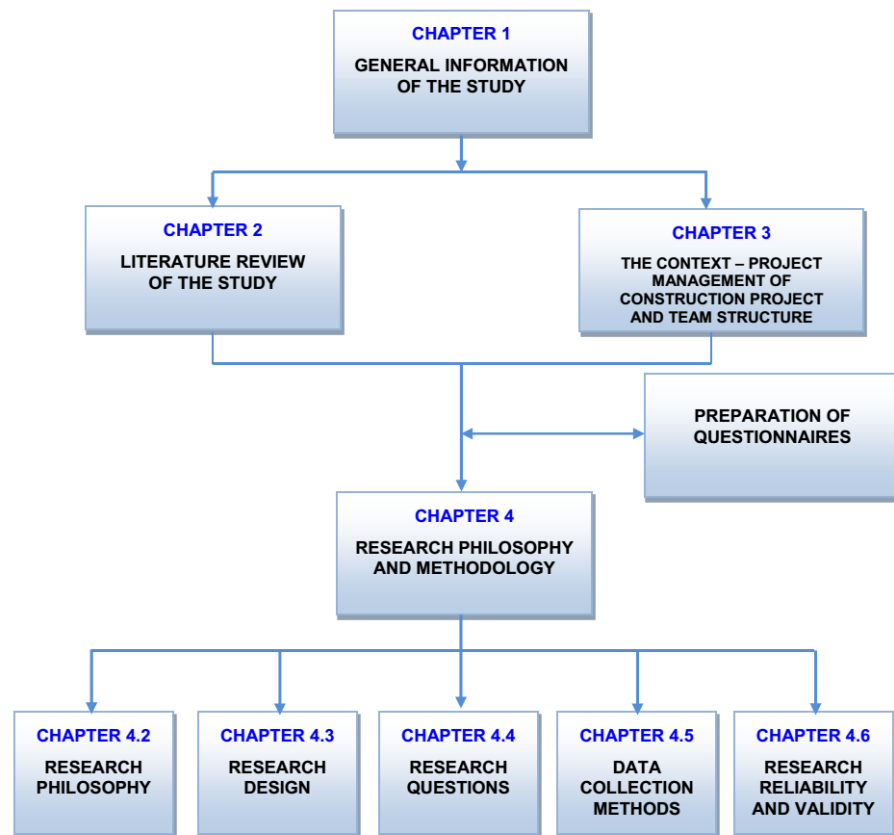
Research methodology – Chapter 4

This chapter defines research methodology and research philosophy on the researched subject. Based on selection of research methodology and research philosophy, an appropriate research design on multiple case studies approach for the study of team structure of project management for construction project is proceeded to collect data for analysis to have the result of the study.

Flowchart of Research Procedure

The flowchart of the methodology of the study in relation to formation of Chapter 4 – Research Methodology of the study is summarized and illustrated in Figure 4.2.

Figure 4.2 – Flowchart of Research Methodology



4.7.2 Conclusion

Based on the selection of the four (4) case study projects and the acceptance to take part in the study of the selected project team members of the mentioned projects, the study is carried out using the qualitative research method with the in-depth interview technique. The collected data then are analyzed based on the qualitative content analysis method to provide the findings of the study.

The ethical issues of the study are satisfied by obtaining the agreement from the project owners and the consent to participate of the interviewees. The reliability and validity of the study are also considered to ensure the true reflection of the results of the study.

V. RESULTS AND ANALYSIS

V. RESULTS AND ANALYSIS

5.1 Introduction

In accordance with the procedure described in Chapter 4, data was collected from each case study project from the in-depth interviews with the selected participants involved in the selected project. The analysis of the available data provided the findings on the preferred type of team structure and the appropriate arrangement of the team members on the successful management of construction projects in relation to cost, time, quality, HSE and ethical conduct.

Each selected project had different scopes of work on the provided project management tasks and the composition of team structure in each case study project had been structured differently to suit the demanded tasks of each project. Results from the interviews of each case study project present the key issues to show the similarity and contrast in arrangement of the team structure and the effectiveness of the selection of each case study project. The full context of data from the interviews is presented in Appendix B.

Analysis from the available data from the multiple case studies to provide the result of the findings follows the Qualitative Context Analysis Method. The analysis procedure on inductive approach is also presented in detail to describe the process to obtain the result. The findings from the analysis are summarized and referred back to literature review on each issue of the findings (Konracki Wellman & Amudson, 2002). The objectives of the research of three (3) questions on the model of team structure, effectiveness of composition of team members and whether team structure to be the key factor of successful project management are also provided in this Chapter.

5.2 Details of the Participants in the Interviews

To ensure the reliability and validity of the research, the interviews have been conducted directly with the related personnel of project management teams of the case study projects. Table 5.1 illustrates the details of position, gender, nationality and qualification of the participants to undertake the in-depth interviews in each case study project in the interviews.

Table 5.1 – The Details of the Participants in the Interviews

No.	Coding	Position	Gender	Nationality	Qualification
1.	P1	Ho Tram Entertainment and Resort Project			
	P11	Project Director	M	British	Master of Project Management
	P12	Document Controller	F	Vietnamese	Bachelor's Degree
	P13	M&E Team Leader	M	Filipino	Engineering Degree
	P14	Structural Team Leader	M	Australian	Engineering Degree
2.	P2	SP-PSA International Port Project			
	P21	Project Director	M	Japanese	Engineering Degree
	P22	Technical Team Leader	M	Australian	Engineering Degree
3.	P3	Vinhomes Landmark Residential Complex Project			
	P31	Project Director	M	German	Master of Project Management
	P32	Resident Manager	M	Australian	Engineering Degree
	P33	Design Management Team Leader	M	British	Master of Engineering
	P34	Contract Management	F	Vietnamese	Quantity Survey Degree
	P35	Document Controller	F	Vietnamese	Bachelor's Degree
	P36	Technical Manager	M	British	Engineering Degree
4.	P4	Expansion of Thu Duc Water Plant Project – Phase III, Capacity of 300,000 m³/day			
	P41	Project Director	M	Netherland	Engineering Degree
	P42	Construction Team Leader	M	Filipino	Engineering Degree
	P43	Document Controller	F	Vietnamese	Bachelor's Degree

Notes: M: Male F: Female

5.3 Characteristic of Team Structure of Case Studies

5.3.1 Ho Tram Entertainment and Resort Project

The scope of works of this project consists of Design, Tender, Contractual, Construction Phases and Close-out Phase Management. The composition of team structure had divided the main group of team members into three (3) groups of Design, Tender and Construction Groups. The Design Group handled Infrastructural, Mechanical & Electrical (M&E) and Structural design phases, the Tender Group handled tender and contractual phases and Construction Group handled the construction and close-out phases. All three groups had a different team leader for operating their functions and all under a Project Director of the project. Team members of Design Group

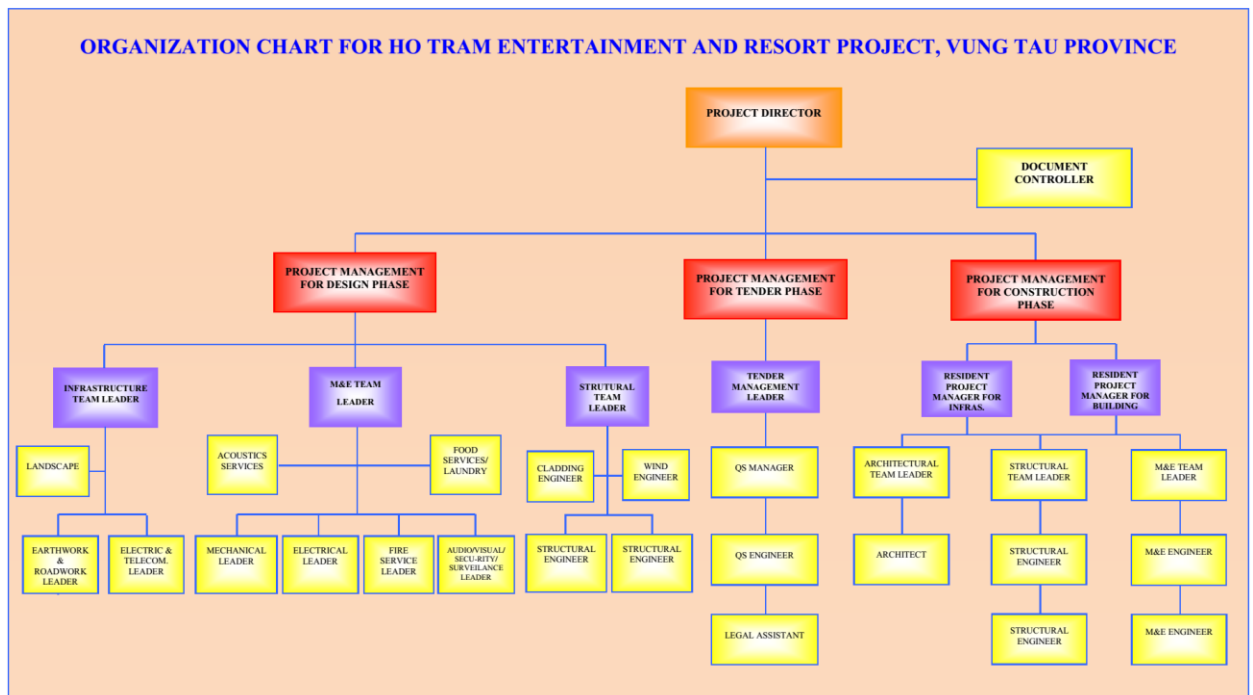
and Tender Group were released after completion of the design phase and tender phase, but their team leader stayed on to provide coordination of design and contractual matters up to close-out phase of the project.

Each team leader of their group had to create the planning schedule of their phase and to monitor their team members to perform the function under the leadership of the Project Director, and to follow the master plan of the project.

In contractual phase, the Project Director had to cooperate closely with the Client’s representative in order to have the final decision on terms and conditions of the contract.

Figure 5.1 illustrates the organization chart of Ho Tram Entertainment and Resort Project.

Figure 5.1 – Organization Chart of Ho Tram Entertainment and Resort Project



5.3.2 SP-PSA International Port Project

Due to the design phase had been handled directly by technical staff of Clients, the scope of works of this project only consists of Tender Phase, Contractual Technical Construction Phase, and Close-out Phase Management. The composition of team structure had divided the main group of team members into two (2) main groups of Tender Group and Technical Construction Group.

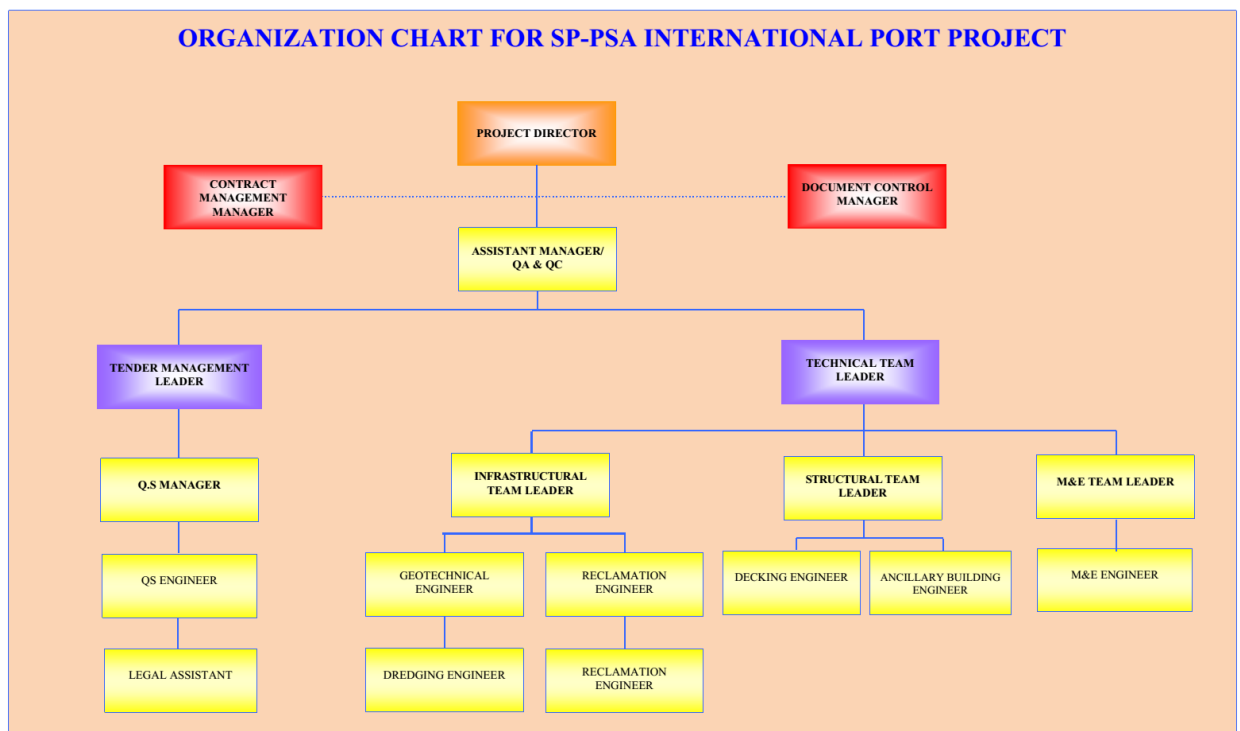
The Tender Group handled tender and contractual phases and the Technical Construction Group handled construction and close-out phases. Due to the technical complexity of construction port project, the technical construction was divided into three (3) sub-groups of earthwork, structural, and M&E sub-groups. The reason for dividing into three sub-groups was that the construction of earthwork consisting of dredging, reclamation, pilling, etc., which is required much heavy equipment and completed quite early in the construction phase; the construction of port structure and the installation of M&E components were started at the completion of earthworks till the completion of whole project.

A Project Director took responsibility for coordinating with design team of the Client to ensure the design suitable for a scale of the project and to have suitable equipment before delivering a design document to the contractor.

In the Close-out phase, the Project Director and equipment team had to perform a commissioning test together with equipment suppliers to ensure the installed equipment to be performed in accordance with the required specifications.

Figure 5.2 illustrates the organization chart of SP-PSA International Port Project.

Figure 5.2 – Organization chart of SP-PSA International Port Project



5.3.3 Vinhomes Landmark Residential Complex Project

The scope of works of Project Management of this project consists of Construction and Close-out Phases as the tender phase to select a contractor and the design phase had been handled by the Client. This project has a similar eleven (11) buildings with 50-storey height, and due to the construction of eleven buildings were mobilized the same time with the completion almost the same time; therefore, the composition of team structure had a core team to handle the overall contract management, document management and group team manager to assist each resident manager. Beside the core team, each separate building had a resident manager and full team to handle the construction of each building.

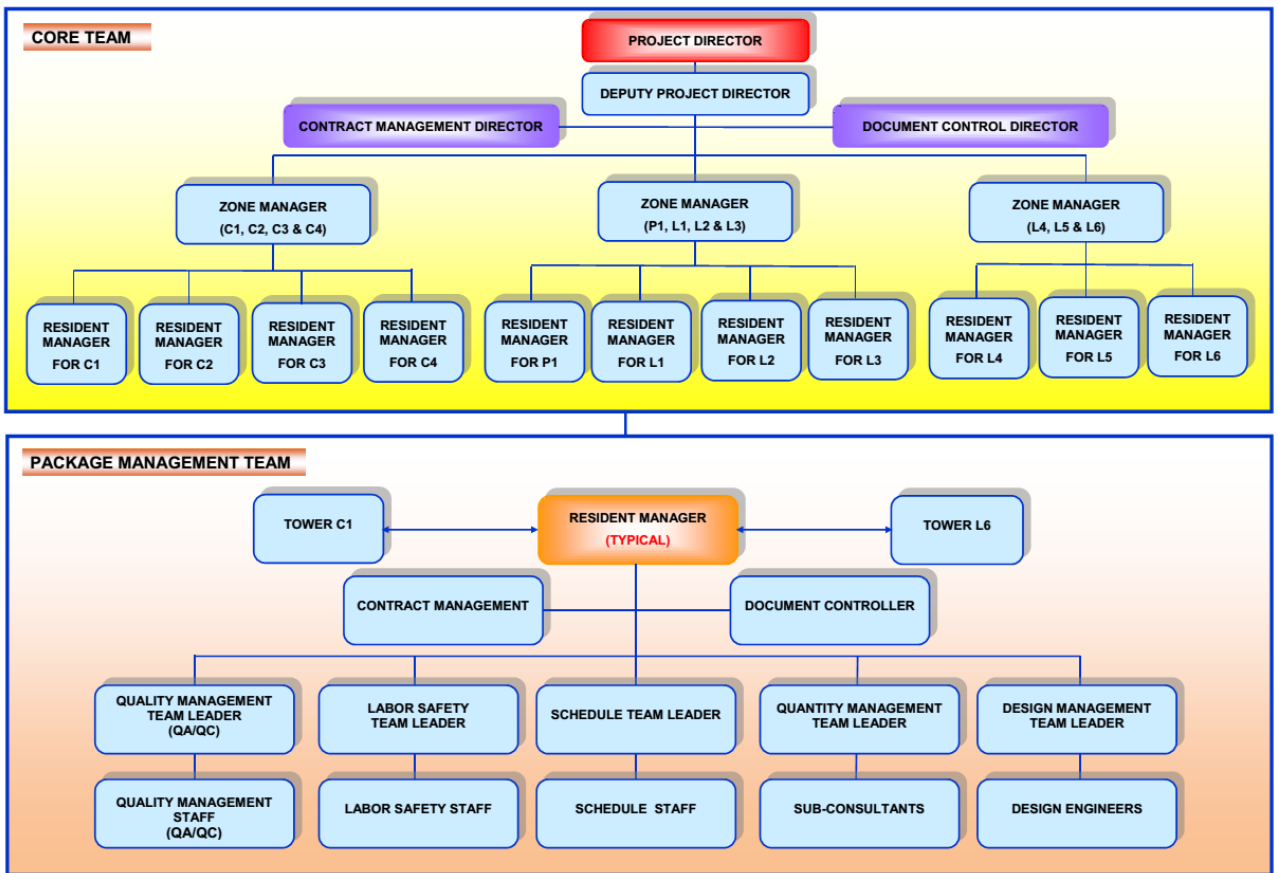
Each resident manager had to take full responsibility to create a planning schedule and monitor their team members to perform their function to ensure the completion of each building to be completed in accordance with the master schedule of this project.

The Project Director and his core team had to assist each resident manager in correspondences with the Client's team in clarification of the contract management and design management to ensure all eleven (11) buildings to have similar terms and conditions with all contractors and to have the same design and specifications on the design coordination with design consultants.

The Project Director and his Resident Managers had to coordinate with project management team of the Client to coordinate all discrepancies in the design and to finalize the final account (final construction cost) with each contractor and to receive the hand-over of each building from the contractor.

Figure 5.3 illustrates the organization chart of Vinhomes Landmark Residential Complex Project.

Figure 5.3 – Organization chart of Vinhomes Landmark Residential Complex Project



5.3.4 Expansion of Thu Duc Water Plant Project – Phase III, Capacity of 300,000 m³/day

The scope of works of Project Management of this project consists of Tender, Design Review, Contractual, Construction Phases and Close-out Phase Management. The Client of this project had decided to call tender on EPC (Engineering – Procurement – Construction) Contract to ensure the design and construction with the majority of works involving in the installation of equipment to be handled and taken responsibility by the contractor.

In order to complete the task of selection of EPC contractor in the Tender Phase, technical team including equipment specialists and construction experts had to be coordinated closely with the contractual team to select the right contractor not only on the construction cost, but also on the assessment of suitable equipment to match with the existing plan and the construction method to ensure the non-disturbance of the operation of the existing plan. The establishment of EPC contract was also required the

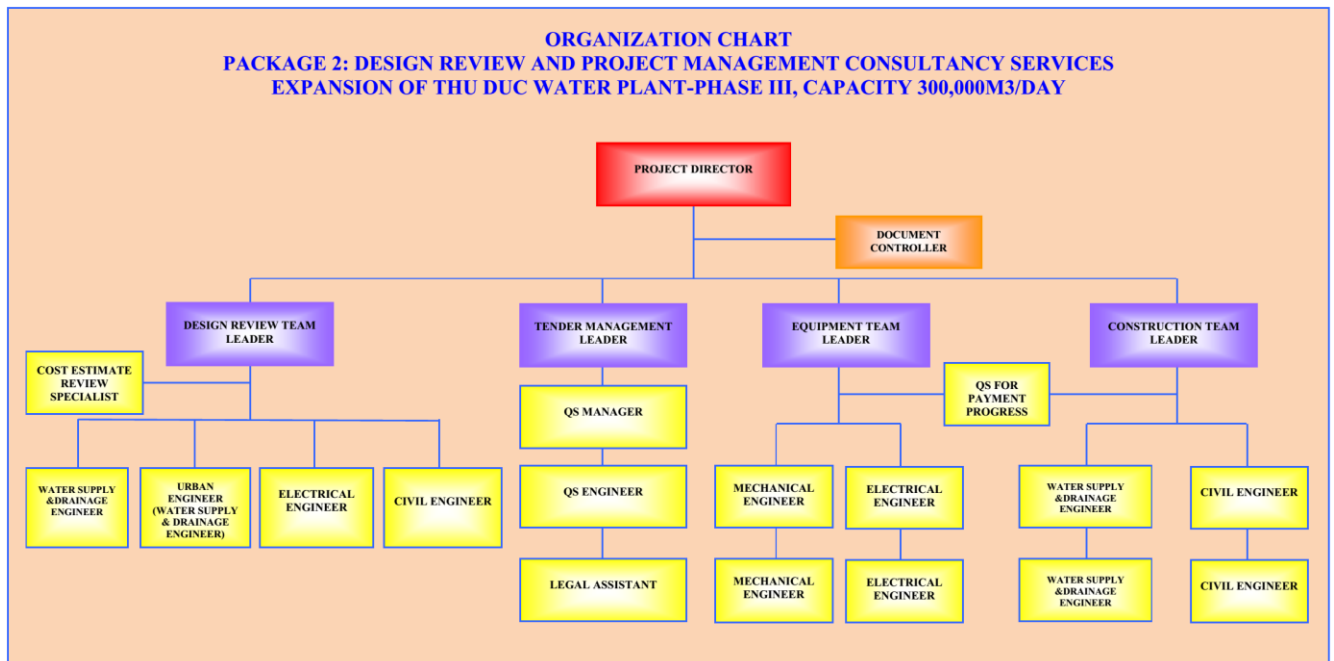
heavy involvement of the technical team to define and clarify clearly the supplying of suitable equipment, installation of equipment and construction.

On EPC contract for this project, the contractor had taken full responsibility for the design and submitted to Project Management team for reviewing and issuing approval for the design before the construction; therefore, the team of design review was occupied actively in the design phase (pre-construction period) and completed their tasks after issuing the design approval. The construction team consisting of equipment team and structural team had taken over from the design review team to ensure all approved designs to comply strictly during the construction period. In the Close-out Phase, the equipment team had an important task of commissioning the plant to ensure the performance of the plant to be satisfied and ready for operation.

The Project Director was the leader throughout implementation of the project to coordinate with project owner, EPC contractor and all requirements of each phase and to link all phases of this project.

Figure 5.4 illustrates the organization chart of Expansion of Thu Duc Water Plant Project – Project III, Capacity of 300,000 m³/day.

Figure 5.4 – Organization chart of Expansion of Thu Duc Water Plant Project – Phase III, Capacity of 300,000 m³/day



5.4 Data Analysis

Based on the collected data from the interviews of four (4) case study projects (Detail of key issues in data collection of four case study projects is attached in Appendix C), the analysis of data is conducted by applying Qualitative Content Analysis technique with the inductive approach. The procedure for data analysis including open coding, set-up categories and abstraction is implemented and presented herein (Neundorf, 2002).

Open Coding

Open coding is established in accordance with key data in which the contents were repeated by all participants on each case study project collected from the four (4) projects (Hsieh and Shannon, 2005), the table 5.2 illustrates the open coding from interview data for the research.

Table 5.2 – Open Coding for the Research

Coding No.	Description	Project A	Project B	Project C	Project D
1.	Type of team structure was Project-based structure with the centralized authority of the Project Director.	✓	✓	✓	✓
2.	The Project Director was the most important position in team structure for the success of the project management.	✓	✓	✓	✓
3.	Professional discipline department was set up to suit the scope of the project.	✓		✓	
4.	There was no problem on the nationalities or organization of team members on contribution to the success of the project management.	✓	✓	✓	✓
5.	The previous Project Director from German had problem with the adaptation to the operational culture of the project.			✓	
6.	All positions in the composition of project management team were essential for the successful delivery of the project if team members were correctly assigned with appropriate qualifications.	✓	✓	✓	✓
7.	The team members should have the appropriate qualification and experience.	✓	✓	✓	✓
8.	The lack of appropriate team members generated a lot of problems on the management of the contractors.			✓	
9.	The project leader should recognize early the potential issues to correction of team members.			✓	
10.	Project management software was useful to save time for monitoring the project, but most of the applied software required the users to have appropriate qualification to operate.	✓	✓	✓	
11.	It was helpful to have software for monitoring and comparing the construction schedule of all eleven (11) buildings at the same time.			✓	

Coding No.	Description	Project A	Project B	Project C	Project D
12.	Software for project management in infrastructure project only provided administration work but not technical solution.				✓
13.	Human resource is a successful key for project management in construction projects, software cannot replace human resource.	✓	✓	✓	✓
14.	Responsibility for the design review of project management in EPC contract was essential for the progress of the project.				✓
15.	It is important to coordinate with sub-contractors of EPC contractor for supplying, installing and commissioning the equipment of the plant.				✓
16.	The management of cost (by QS), time (by scheduler), quality (by QA/QC) and HSE (by HSE manager) was conducted by the assigned staff for each component.	✓	✓	✓	✓
17.	Project performance of cost, time, quality and HSE was depended on each managerial position to undertake the responsibility for the task with the full support in technical and management issues for the Project Director (Leader).	✓	✓	✓	✓
18.	Understanding of construction procedure was essential in the arrangement of construction tender and construction package implementation.	✓	✓		✓
19.	There was no core team set-up but the Deputy Project Director was set up to act as Resident Manager.		✓		
20.	Core team which was set up to assist eleven (11) resident managers was helpful to manage contractors with same treatment and to facilitate team members of project management team.			✓	
21.	Support from the head office of project management team on the coordination with the Supplier or any third party such as Hotel Operator should be set up early and controlled by the project management team.	✓			
22.	Support from the head office of project management team for the design review was essential for the support in technical, management and resource issues.		✓	✓	✓
23.	Mix-up responsibility of the Technical Department and Interior Fit-out Department on the approval of material created the delay of the construction schedule.	✓			
24.	Quick respond on technical issues was critical on the construction progress of the project.		✓		✓
25.	Technical issues related to the specifications had to be checked by technical team.				✓
26.	The supply procedure of imported equipment/ material needs managing by the scheduler.				✓
27.	Assisting contractor in applying construction method on other buildings to ensure the contractor to keep construction schedule was essential for this project.			✓	
28.	It is vital to coordinate with contractors to ensure they comply with all necessary procedures to deliver successfully the assigned project.	✓	✓	✓	✓
29.	The Document Control Manager needed to coordinate with the Technical Manager to update the construction drawings.		✓		

Coding No.	Description	Project A	Project B	Project C	Project D
30.	Document control had to be divided into administration document control and technical document control.		✓		
31.	Monitoring project management team to avoid any wrongdoing was also a duty of Project Director and team leader of the project to avoid corruption.	✓	✓	✓	✓
32.	Input from hotel/casino operators in the design phase was essential for the successful delivery of the project.	✓			
33.	Ethical conduct was the issue on the approval of materials on site.	✓	✓	✓	
34.	Ethical conduct was the issue on the approval of materials and acceptance of works.		✓		

Set up Categories

In order to determine similarity or dissimilarity of the coding, group of the coding is set up to provide the understanding of the research subject in detail of each studied component (Neundorf, 2002). The categories of the mentioned open coding are presented below:

- CAT 1**
Team Structure Type
 - Coding 1 – Project-based structure.
 - Coding 3 – Professional Department set-up.
 - Coding 19 – Deputy Project Director set-up.
 - Coding 20 – Core team set-up.
 - Coding 21 and 22 – Support from head office.

- CAT 2**
Team member selection
 - Coding 2 – Important role of Project Director.
 - Coding 5 – Inappropriate Project Director to be replaced.
 - Coding 6 – Important roles of team members.
 - Coding 7 – Team member experience and qualification.
 - Coding 8 – Inappropriate team members generating problem.
 - Coding 13 – Role of Human Resources compared to Software in project management
 - Coding 23 – Clarification of team member responsibilities.
 - Coding 29 – Clarified tasks to team members.
 - Coding 30 – Clarified tasks to team members.

CAT 3
Team structure on
task assignment
management

- Coding 4 – Team member demographic.
- Coding 9 – Reassignment of responsibility needed if required.
- Coding 10 – Role of software in project management
- Coding 11 – Helpfulness of software in monitoring and comparing the construction schedule.
- Coding 12 – Software only provided administration work but not technical solution in infrastructure project.
- Coding 14 – Technical responsibility for review design.
- Coding 15 – Coordination with sub-contractors of EPC contractor for supplying, installing and commissioning the equipment.
- Coding 16 – Assigned team members on required tasks of cost, time, quality and HSE.
- Coding 17 – Assigned team members on required tasks.
- Coding 18 – Professional knowledge needed.
- Coding 24 – Cohesiveness of team members.
- Coding 25 – Technical clarification needed.
- Coding 26 – Assigned team members on required tasks.
- Coding 27 – Assistance to contractor in applying construction method to keep construction schedule of the project.
- Coding 28 – Coordination with contractors to ensure completion of procedures of the assigned project.
- Coding 32 – Role of Input from hotel/casino operators for project success

CAT 4
Team structure on
ethical conduct

- Coding 31 - Project Director monitoring team members
- Coding 33 – Ethical conduct problem on materials
- Coding 34 – Ethical conduct problem on acceptance of works

Data abstraction

Abstraction is a process in the Qualitative Content Analysis to formulate full meaning of each category from the back-up coding (Neundorf, 2002). In this research, coding was established on the context of key issues from the in-depth interviews with participants from each case study project and then the coding was categorized into headings to describe the findings of the subject of the research.

Abstraction in accordance with the category of the coding from the interviews is as follows:

(i) Cat 1 – Team structure type

- Type of structure for project management for construction projects should be the project-based type structure.
- The project-based type structure should have the support from the head office with executive personnel in order to provide any required technical backup during the execution of the project.
- On the complicated project which is divided into multiple similar contract packages, core team should be established to assist the management in technical and implementation of all contract packages.

(ii) Cat 2 - Team member selection

- Selection of the qualified team leader – Project Director – is essential for operation of the team for project management.
- Each selected team member should have appropriate experience and qualification to undertake the assigned tasks.
- Unsuitable selected team member should be replaced with the suitable and qualified member.
- There is no problem on the composition of team structure coming from different organizations or nationalities.
- New team member should be added to the team to handle the demanded tasks.

- Assigned tasks should be clear and within ability of the selected team members.
- Software in project management is helpful to make the monitoring of all components of project a lot quicker than traditional method.
- Software in project management requires qualified personnel to operate on their specialist components.
- Selection of human resource for project management should be prioritized over software.

(iii) Cat 3 – Team structure on task assignment management

- Tasks and scope of works on cost, time and quality should be divided into different departments for undertaking.
- Technical Department is very important in project management for construction projects on providing technical backup to the project.
- Tasks should be re-assigned to the appropriate department or to coordinate with other department for completion.
- Support from head office on technical issues is helpful for project management team.
- Coordination with external consultant/operator of the designed facilities is helpful for project management team.
- In some specialist contract such as EPC, knowledge of construction procedure and technical knowledge on the design of structure and equipment are essential for project management team.
- Cohesiveness between team members is important in the delivery of tasks.

(iv) Cat 4 – Team structure on ethical conduct

- The ethical conduct in project management for construction projects is a problem to be taken care of.

- Members of project management team are required to be monitored on their duty to avoid any unethical conduct.
- Professionalism is the way to control the unethical conduct in construction management.

5.5 Key Findings

The key findings of this research on the subject of team structure in project management for construction projects based on the collected data and the analysis are presented with each of the finding to refer back to the literature review for comparison with the related theories of the subject. The findings also gave the reply to all the research questions putting forward as the objectives of this research.

The data collection and the analysis have provided the key findings of the research as follows:

➤ **To identify the preferred arrangement of team structure in project management for construction projects**

The arrangement of the team structure for project management for construction projects should satisfy the requirements of the concept of the successful completion of different disciplines of the scope of works to ensure the delivery of the project on cost, time, quality and HSE. The project-based structure for project management for construction projects which fulfilled all the mentioned requirements should be the team structure type with the support of the head office and the core team should be set up for the large project with the similarity of tasks for the multiple contract packages.

The finding of this item also gave the affirmative reply of the research question of **“What is the typical model of arrangement of team structure in project management of construction projects?”** as the project-based structure should be the model for project management for construction projects regardless of the type of the development in infrastructure, building or industrial projects.

The finding of the arrangement of the team structure on the project-based structure for construction projects with the logic and constraint of the technical involvements together with the demand of the prompt responses on the onsite

decision was almost identical to all of other previous studies on the subject by Chitkara (2014), Cooke (2014), Fewings (2012), Winch (2009) and Loosemore and Uher (2003).

➤ **To identify composition requirements of team structure**

The composition of the team depended very much on the type of the project contract awarding, however, the responsibility for the cost, time, quality and HSE should be undertaken by each department of the team. Therefore, the most effective team composition in project management for construction projects should be the centralized project director with the managers to undertake the different departments to cover responsibility for cost, time, quality and HSE of the projects.

The project management team structure needed to include the technical department in case the contract is procured on the Engineering Procurement Construction (EPC) or Design and Build (DB). The technical department's responsibility was to ensure that the design of the project is compliant with the scope of work of the contractor and fits with the allowed budget.

The finding of this item also gave the affirmative reply of the research question of **“How to have the most effective team composition in project management for construction projects?”** as the most effective team composition should include the required departments in the team to undertake the responsibility for each demand scope of technical to assure the management of key concept of project management on cost, time, quality and HSE of the construction projects.

The finding of the composition of the divided department in the team was rarely discussed in the previous studies but in the sample of the structure of the project-based type, the different departments of the team of construction, contract, HSE, AC/QC, project control and technical were given by many previous studies such as Hillson and Simon, 2007; Winch, 2009 and Chitkara, 2014). The literature review indicated clearly that the composition of the team should have the ability to adapt to the working environment and to suit the working culture to maximize the performance of the team supported by the previous studies such as DeRue et al., 2008; Gibson and Vermeulen, 2003; and LePine, 2003.

➤ **To determine the selection of qualified team members including the team leader**

The project management for construction projects which was so different on the complication of the scope of works of each type of project requires the qualified team members to undertake the managed disciplines. It was essential for the success of the team on the performance of project management by having the experienced and competent team leader – project director – to manage and to assign appropriate team members to solve any technical demand of the project.

The term “qualified team members” was repeated in every interview on the subject of the arrangement of team members. It emphasized the importance of the required technical background of each team member in the team to provide the project management for construction projects. The finding of this item also gave the affirmative reply of the research question of “**How to have the most effective team composition in project management for construction projects?**”. It also indicated that the technical background of team members is far more essential than the management skills which could be the most important issue on project management of other industry.

The finding of the qualified team member selection or the requirement of technical skills of team members and the team leader is very much supported by the literature review of the previous studies on the subject by PMBok Guide (2013), Burke (2006), Chitkara (2014), Andi et al. (2004), Toor and Ofori (2008), Liker (2004), Slevin and Pinto (2004), and Galbraith and Lawler III (1993).

➤ **To identify task assignment to team members for the successful performance of project management team**

The recognition of the responsibility for the completion of the task of scope of works in the project management for construction projects to each department manager and team members was the essential factor to decide the success or failure of the project. The main components on the concept of construction project of cost, time and quality should be undertaken with the full responsibility by the assigned team members. The same should be applied with the HSE and ethical conduct management.

In contrast with the functional type structure and matrix type structure sharing the responsibility between team members, the project-based structure type required the full responsibility of each team member on the tasks within the assigned department. The tasks of each team member needed to coordinate with other tasks in different disciplines for completing the performance of the project.

In order to fulfill a duty of each team member in project team, software in information technology (IT) has provided helpful in communication, design, tender and project management tasks; however, it was clearly mentioned that the application of these software required the operator to be qualified in the assigned duties. The finding of this item also gave the affirmative reply of the research question of **“How to have the most effective team composition in project management for construction projects?”**.

The finding of the responsibility to complete the tasks assigned to team members for the success of the project is rarely mentioned in the literature review. Instead, most of the previous studies discussed on the responsibility to complete the scope of works of the project management tasks between team members and the coordination of team members for management of cost, time and quality by Dlakwa and Culpin (1990), Kaming et al. (1997), Koushki et al. (2005) and Hillson and Simon (2007) or the importance of management of HSE and ethical conduct by all team members by Hinze (2008), Hughes and Ferrett (2008).

➤ **To recognize the problem in ethical conduct of team member in project management for construction projects**

Unethical conduct was still the concern in three (3) of the four (4) case study projects. There was no evidence of the wrong-doing in these projects as the activities of the suspect of the approval of variations on site or approval of the replacement of the materials were described negligence activities.

The implementation practice to avoid the unethical practice in team structure was to have the strong action and warning system in place by the Representative of Head Office, the Project Director and Department Manager on the issues. The elimination of all forms of the unethical conduct in construction industry was strictly implemented with the compliance of the Code of Ethics and Conduct by all team members. The punishment of all

unethical activities was not only on the dismissal but also on the punishment of the legal framework by local authorities, on the public releasing of the individual entity to violate the code of conduct in ethical behaviors. Beside the punishment, the integrity and the professionalism of each team member and the strict procedure to be applied on the acting of each team member on the performance of the assigned tasks was monitored thoroughly.

The prevention of unethical conduct by punishment or by promotion of the professionalism was fully supported by the previous studies of PMI (2004), Pearl et al. (2005) and Transparency International (2005).

The above mentioned key findings of “to determine selection of the qualified team members including the team leader”, “to identify task assignment to team members for the successful performance of project management team” and “to recognize the problem in ethical conduct of team member in project management in construction project” with fully support in many authors in previous studies gave the affirmative reply to the research question of **“is the right composition of team structure of project management team to be the key factor to deliver the successfully construction project?”** as the project management, regardless of the type and scale of the project, depends entirely on human resources from the Project Director to the technical staff who undertake the different functions and scope of works to ensure the completion of the project on the requirements of cost, time, quality and HSE. Therefore, it is certain that the team structure is the key factor for the success of project management for construction projects. However, the success of the team structure is depended very much on the competence team leader and the technical background to suit the assigned tasks of each team member, the understandable of the working environment, cooperation between team members and the compliance with the ethical conduct by all team members are another practical requirements to bring the success for the team structure.

VI. CONCLUSIONS AND RECOMMENDATIONS

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6.1 General

This research has been conducted in accordance with the naturalist – constructionist paradigm with the in-depth interview technique of the multiple case study projects. Data collection from the interviews with 15 key team members of the four (4) case study projects were analyzed on the qualitative content analysis with the inductive approach to provide the findings for the research.

The research has provided the good findings on the subject of the team structure and team members from many perspectives of the case studies with different scope of work and has given the reply to the main objective of the research on the composition of team structure being the successful factor of project management for construction projects.

The research has also provided additional information which was related to the team structure issues but these findings were outside of the boundary of the research and needed to have further study to be described in the recommendations of this research.

6.2 Conclusions

6.2.1 The Key Finding Issues

The data collection and analysis process which focused on the only subject of team structure – the key factor of project management for construction projects has provided the comprehensive findings such as: the project-based structure which was selected as the typical type structure would be more effective with the requirement of the competent team leader and qualified team members on the assigned discipline; The basic concept of project management for construction projects of cost, time and quality which was considered as the key criteria for management components would be a completed fundamental for the project management by including the criteria of Health Safety Environmental (HSE) and Ethical Conduct management; The management of each component of cost, time, quality, HSE and Ethical Conduct which was evaluated as the key task of the project management team would be more effective by assigning the task of each component to each department manager and team member; The monitoring system and

the regulation guidelines on the violation of ethical conduct which were considered as the precaution and warning approaches would be more successful by setting up early to avoid the unethical conduct in the construction projects. All the mentioned key findings were compared with the related literature review on the subject of project management for construction projects, the comparison gave the results to confirm the full support of the previous studies on the findings. Some of the previous studies did not focus directly on the finding subject such as the selection of each team member or the accurate number of team member but it still provided the general guidelines on the studied issues.

The key findings were also given the clear answers for the three (3) questions put forward in the objectives of this research. The objectives for the research are now fulfilled by the conclusion of the selection of the project-based type structure to be the model for all project management for construction projects, the composition of the team to include the departments to provide the management of the key concepts of time, cost, quality and HSE together with the technical issues, and the team structure to be the key factor for the success of project management in construction.

There were other issues which were not in the boundary of this research such as the importance of the team leader – project director – of the project, the coordination system between the team members and the requirement of additional skills on the cooperation between the team members have been discovered in this research as well.

All the findings which were presented in this research gave the affirmative answers of team structure – being the key factor of project management for construction projects and indicated the importance of the human resources not only in the composition of the team but also the competence to perform the required tasks of each individual in the team.

6.2.2 Limitation of the Research

The findings of this research were totally based on the data collection and the analysis from the four (4) case studies of the projects to be developed in Vietnam with the scale of the projects to be classified as big projects in the construction industries. Hence, the findings were limited to the general project management for construction projects by the following reasons:

- All case studies were located in Vietnam with the international blended team structure to handle the project management. Therefore, most of the team members including the team leader lacked the experience of the local regulation and local culture to result in the requirement to replace some of the key members during the implementation period the project.
- All the case study projects were in the large-scaled construction projects (more than USD 150 Million) to be developed in the weak construction industry area (Vietnam) to make the delivery of project management to be more involved with the technical issues than in the developed countries with the strong backup of the strong construction industry.
- All the case study projects did not establish the relation of other consultants involved in the delivery of a construction project such as designer, quantity surveyor, etc. with the project management team for the project. Because the employment of another consultant to provide the technical backup or costing backup may reduce significantly the required departments for the team structure of project management for construction projects.

6.2.3 Proposed Application for Team Structure

In accordance with the findings of the research on the subject of team structure of project management for construction projects, the application of team structure regardless of the project type or scale of the project, the project-based type structure should be implemented for all project management for construction projects. Application of team structure should follow the below procedures:

- (i) Preparation of the project-based structure organization.
- (ii) Selection of the suitable team leader – project director – to have the technical and management ability for the project.
- (iii) Selection of the suitable department manager for each required department in the team structure.
- (iv) Selection of the suitable team members to fulfill the required tasks of each department under the leadership of the department manager.

- (v) Providing of the guideline on the coordination and the communication system within the team for the completion of the scope of works of project management services.

6.2.4 Proposed Implication on Team Structure

The tradition of the concept of project management on cost, time and quality is now not good enough for the construction projects because the mentioned concept is trying to cut cost and to step up the construction schedule without caring to the society of other issues such as Health Safety Environment (HSE). The quality of the construction is easily dented by the unethical conduct by educated professional team members.

Therefore, the HSE and Ethical Conduct should be treated as one of the important criteria issues of project management for construction projects. Beside the framework for the legal system on the application of HSE and Ethical Conduct to the project management activities, the heavy penalty on the non-compliance with HSE and Ethical Conduct should also be implemented on the organization and individual related to these violated activities.

6.3 Recommendations

6.3.1 Team Structure Arrangement and Team Member Selection

- The team arrangement and selection for project management for construction projects should be treated differently to the project management for other industry due to the complexity of technical demand of construction industry in high-rise building, or infrastructure facilities of highway, metro, airport, etc. to require having the qualified personnel to suit the project.
- Arrangement of team structure and selection of team members for project management for construction projects should be carefully considered in terms of the experience and qualification of each individual in the team, including the team leader – project director – to ensure the success of the management of the project.
- Performance of the project is not only evaluated on cost, time and quality but also on the HSE management of the project, therefore, the

assignments of the personnel to take care of HSE in project management for construction projects are essential for every project.

- Ethical conduct is a big issue in monitoring corruption in construction project. Corruption could happen in any phases of a project such as to design a mentioned product in the project to receive a commission, to select inappropriate contractor to receive a kickback on value of the project and to accept a non-quality component to receive a big fee, etc. Therefore, selection of team members for project management team is not only based on qualifications and skills, but also based on the history of ethical conduct of each and every team member. It is recommended that strong action on discipline of unethical conduct from organization is required on ethical conduction to every member of the team.
- Coordination with the contractor who takes full responsibility for executing the construction project is very important on facilitating all instructions from the project management team to deliver the project regardless the role of the contractor is just independent organization to provide construction or shareholders of the project. Therefore, project management team not only needs to coordinate closely with a contractor, but also needs to act appropriately within duty of project management tasks.

6.3.2 Further Required Study

- Data collection and analysis have shown the importance of the team leader – project director – role on team structure of project management for construction projects. The team leader role should be elaborated further in the study on this subject.
- Data collection and analysis have shown the team members who may come from different organizations, different nationalities. Therefore, the cohesiveness between team members was essential for the success of the project management. The cohesiveness and operation of the team by each team member should be studied further to present the formula for operation of the team.
- Data collection and analysis have shown cooperation between the team members and the additional skills of team members to blend in with the

team environment were vital for the success of the delivery of the project. Therefore, requirement of addition skills to suit the team environment should be further studied.

- Data collection and analysis have shown coordination between a project management team and contractor is essential for the success of the project as the contractor's role is very important in executing all construction works. Therefore, the coordination between a project management team and contractor should be further studied in facilitating the strength of project management in construction project.

6.4 Contribution of this research

This study will hopefully contribute the context of appropriate team structure to the field of project management in construction, especially in the concept of team structure selection and team members in project management team. The team selection has been rarely researched previously but practically the team selection and qualified team members are essential for project management team to deliver successful construction projects.

The research is based on case studies of international projects located in Vietnam with consulting teams including project management team to be combined international individual experts to have experience in other projects in other countries; therefore, the findings of this study subject can still apply in other countries.

The strength of this study is to discuss on the concept of project management in construction industry in which there are many problems on project failure such as time delay, overrun of cost estimate, unacceptable quality to shorten the life of project or even project collapse and corruption issues in construction project due to many factors consisting of the essential factor of inadequate of team composition and nonqualified team member.

The collected data to provide the result of findings come from the participants who were directly involved in the case study projects. Therefore, the findings of this study are practical experience in conducting project management with careful selection of the composition structure and team members of project management in construction industry.

This research could be the springboard for conducting further study to examine the critical success of project management based on the composition of team structure and the selection of appropriate qualification of team structure and selection of appropriate qualification of team members in construction project. This study has also provided the important factor of delivering successful projects in capacity of human resources in qualifications and skills in comparison with information technology (IT) in providing project management in construction industry.

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APPENDIX A

INTERVIEW QUESTIONS

APPENDIX A

INTERVIEW QUESTIONS

A. BACKGROUND OF THE PERSON TO BE INTERVIEWED

1. What are your position and responsibility in the assigned project?
2. How many projects similar to the assigned project have you been managed or been involved in any component of the project?
3. What is your role in the assigned project?

B. TEAM STRUCTURE

1. Was the project-based team structure with the centralized authority set up for project management for your assigned project?
2. Were job descriptions distributed to all team members to describe the scope of works of a project and the detailed duty of each team member?
3. What were the main problems on the performance of project management in your assigned project?
 - (i) from team leader?
 - (ii) from team manager?
 - (iii) from team member?
4. What were the qualification requirements for the team leader, team manager and other team members in your assigned project? Did qualification of each team member match job description of the assigned project?
5. Did the project management need team to have the assistance from the head office?
6. In your project management team structure, did the team members come from the same organization? What is the impact of project management team if team members do not come from the same organization?
7. What was the result of the management of cost, schedule and quality (key issues) with the project management team structure of your assigned project?
8. What was your measure in project management team structure when the team failed to manage any of three key issues of cost, time and quality?

9. In your opinion, what is the essential position in the composition of team structure for the successful project management?
10. Was any software in project management applied in your assigned project? Do you think that the applied software could reduce team members in project management?
11. With many software packages for project management on the market, who was responsible for selecting appropriate software to apply in your assigned project? And what was the base of selection of the appropriate software to apply to your assigned project?
12. How did your project management team handle the Health, Safety and Environmental (HSE) issues from the team structure in the assigned project?
13. How did your project management team handle the corruption issues from forming the team structure in the assigned project?
14. Did you experience any problem on the different nationalities with different backgrounds of team members with different cultures on the performance of project management in your project?
15. The contractor takes full responsibility for the delivery of the project, what is the solution for project management team to ensure the successful delivery of the project if the contractor does not perform on your assigned project?

APPENDIX B

RESEARCH PARTICIPANT CONSENT FORM

APPENDIX B

RESEARCH PARTICIPANT CONSENT FORM

Title of Project: Selection of Team Structure – the Essential Factor of Project Management for Construction Projects

Name of Researcher: Dat Chau

(Delete as appropriate)

➤ I confirm that I have read and understood the information sheet for the above study and what my contribution will be.	Yes	No	
➤ I have been given the opportunity to conduct face to face.	Yes	No	
➤ I agree to take part in the interview.	Yes	No	NA
➤ I agree to the interview being tape recorded.	Yes	No	NA
➤ I agree to digital images being taken during the research exercises.	Yes	No	NA
➤ I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason.	Yes	No	
➤ I agree to take part in the above study.	Yes	No	

Name of participant:

Signature:

Date:

APPENDIX C

SUMMARY OF FOUR CASE STUDY PROJECTS

APPENDIX C

SUMMARY OF FOUR CASE STUDY PROJECTS

C1. HO TRAM ENTERTAINMENT AND RESORT PROJECT



Ho Tram Entertainment and Resort Project is a world class integrated resort facility being developed in phases situated on 169 contiguous hectare of pristine beach front property located in Ho Tram, Ba Ria – Vung Tau Province, 127km Southeast of Ho Chi Minh City, Vietnam's largest city which attracts the majority of Vietnam's 5M tourists each year.



Construction of the Project 1 (phase 1 and 2) – including the two five-star hotels, Vietnam's first Las Vegas-style casinos and the specially designed Greg Norman golf completed by 2011. The entire 169 hectares of the Ho Tram Strip, featuring five Las Vegas-style integrated resorts, is scheduled to be completely developed and operational within ten years. Beside two five-star hotels with 541 luxury guest rooms and a spectacular gaming area consisting of 90 live table games, 500 electronic games, the project still includes world-class conference facilities, a variety of recreational activities and beach facilities. Featuring luxurious amenities in a breath-taking oceanfront location, the project is sure to attract guests from throughout Asia.



The total investment capital of the project is worth of US\$ 4.2 billion (phase 1 and 2 of US\$ 600 Million), the biggest FDI project of its kind in Vietnam.



Number of storey: 21 storeys (including the roof storey).

Client: Ho Tram Project Company Limited

Start year: 2008

Completion year: 2013

C2. SP-PSA INTERNATIONAL PORT PROJECT



The project is located at Thi Vai International Port in Thi Vai River at Cai Mep area in Southern Vietnam (Phu My I Industrial Zone, Phu My Town, Tan Thanh District, Ba Ria – Vung Tau Province). The project is divided into 2 stages, each stage of 28.2 ha. The first stage (stage 1) with the following building items:

- Dredging, Reclamation, back-filling and soil improvement works.
- Wharf: berth having trestle bridge with wharf accessories
- Embankment and corrosion protection.
- Yard: foundation, pavement, internal roads, container yards facilities.
- Systems of water supply and drainage, electrical supply, sewerage treatment, fire protection, lighting, communication
- CFS warehouse, maintenance workshop, customs and immigration office, sub-station of water, electricity, fuel, etc, Utilities.
- Access to the port; setting up of equipment

The purpose of the project is to construct container and general cargo terminal and to develop infrastructure related to the terminal, in order to accommodate increasing demand of cargo in Vietnam, thereby supporting economic growth not only of southern part of Vietnam but also of the whole country.

The SP-PSA has total berth length of 1,200m, the total area of 56.40ha, handling capacity of 1.2 mil TEU/year and 1.25 mil tons of general cargoes per year is able to receive vessels up to 6,000 TEU (it is equivalent to 80,000 DWT). The new port is expected to serve as an international hub port in the long term.

Client: SP-PSA International Port Co., Ltd.

Start year: 2007

Completion year: 2010

C3. VINHOMES LANDMARK RESIDENTIAL COMPLEX PROJECT



Inspired by the Central Park in the world-famous New York City, with a total area of 43.91 hectares and a facade stretching over 1km alongside Saigon River, the Vinhomes Landmark Residential Complex project is a large world class project which is progressing on a fast track program. Construction of the project has been commenced in 2014 and has been managed since then up to now by the Client's in house project management team. Due to changes in the Client's project development strategy, the Client has decided to engage external expertise to carry out Project Management services for 11 tower projects (every tower with from 36 storeys to 50 storeys).

The project is a modern urban complex comprising more than 10,000 condominiums and villas. With the height of over 460m, the Landmark 81 is expected to be the city's iconic building.

The Project is a landmark project within District 2 and close proximity to the Central Business District of Ho Chi Minh City, Vietnam, which is destined to become the new metropolitan centre of Ho Chi Minh City. Located in one of the most prime locations in the heart of Ho Chi Minh City, the project is an integral part of Tan Cang area and a stop on the Ben Thanh – Suoi Tien metro line. Its frontage faces the beautiful Saigon River, stretching along the riverbank.

GFA: 1,341,201 m²

Client: Tan Lien Phat Construction Investment JSC (Member of Vingroup)

Start year: 2015

Completion year: 2017

C4. EXPANSION OF THU DUC WATER PLANT PROJECT – PHASE III CAPACITY OF 300,000 M³/DAY



The objective of the project is to build an expansion of Thu Duc Water Supply Plant – Phase III with the capacity of 300,000m³/day connecting to clean water pipeline D2400 of Thu Duc Water Supply Plant to meet the demand of water consumption in Ho Chi Minh City.

The project scale consists of two main items as follows:

Raw Water Pumping Station with the capacity of 315,000m³/day (with the components of the works designed for increasing the capacity up to 630,000m³/day in the future). Main work items include: water collection and pumping station, pumping and controlling station, chemical building, and transformer station. And other work items include: internal water supply and drainage system, technical ditch, enclosure and security station, internal road and green area.



Water Treatment Plant with the capacity of 300,000m³/day (with the components of the works designed for increasing the capacity up to 600,000m³/day) and other components. Main work items include: capacity division tank, mixing chamber + reaction tank + sedimentation, filtration tanks and clean water pumping station. And other items include: chemical building and storage (chlorine, lime, alum, etc.), technical pumping station, administration and controlling area, treated water piping, drainage system, technical ditch, internal road and green area, transformer station.



Client: Saigon Clean Water Business and Investment Joint Stock Company

Start year: 2012

Completion year: 2015

APPENDIX D

KEY ISSUES IN DATA COLLECTION OF FOUR CASE STUDY PROJECTS

APPENDIX D

KEY ISSUES IN DATA COLLECTION OF FOUR CASE STUDY PROJECTS

Table D1 – Key issues in data collection of Ho Tram Entertainment and Resort Project

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4
1.	Type of team structure was the project-based structure with centralized authority of the Project Director.	✓	✓	✓	✓
2.	The Project Director was the most important position in team structure for the success of the project management.	✓	✓	✓	✓
3.	Professional discipline department was set up to suit the scope of the project.	✓		✓	✓
4.	There was no problem on the nationalities or organization of team members on contribution to the success of the project management.	✓	✓	✓	
5.	All positions in the composition of project management team were essential for the successful delivery of the project if team members were correctly assigned with appropriate qualifications.	✓	✓	✓	✓
6.	The team members should have the appropriate qualification and experience.	✓	✓	✓	✓
7.	Project management software was useful to save time for monitoring the project, but most of the applied software required the users to have appropriate qualification to operate.	✓	✓	✓	✓
8.	Human resource is a successful key for project management in construction projects, software cannot replace human resource.	✓	✓	✓	✓
9.	The management of cost (by QS), time (by scheduler), quality (by QA/QC) and HSE (by HSE manager) was conducted by the assigned staff for each component.	✓	✓	✓	✓
10.	Understanding of construction procedure was essential in the arrangement of construction tender and construction package implementation.	✓	✓	✓	
11.	Support from the head office of project management team on the coordination with the Supplier or any third party such as Hotel Operator should be set up early and controlled by the project management team.	✓	✓		
12.	Mix-up responsibility of the Technical Department and Interior Fit-out Department on the approval of material created the delay of the construction schedule.	✓	✓	✓	
13.	Project performance of cost, time, quality and HSE was depended on each managerial position to undertake the responsibility for the task with full support in technical and management issues for the Project Director (Leader).		✓	✓	✓

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4
14.	Ethical conduct was the issue on the approval of materials on site.	✓		✓	✓
15.	Monitoring project management team to avoid any wrongdoing was also a duty of Project Director and team leader of the project to avoid corruption.	✓		✓	✓
16.	Input from hotel/casino operators in the design phase was essential for the successful delivery of the project.	✓		✓	✓
17.	It is vital to coordinate with contractors to ensure they comply with all necessary procedures to deliver successfully the assigned project.	✓	✓	✓	✓

Notes:

Interviewee 1 - Project Director

Interviewee 2 – Document Controller

Interviewee 3 – M&E Team Leader

Interviewee 4 – Structural Team Leader

Table D2 – Key issues in data collection of SP-PSA International Port Project

No.	Description	Interviewee 1	Interviewee 2
1.	Type of team structure was Project-based structure with the centralized authority of the Project Director.	✓	✓
2.	The Project Director was the most important position in team structure for the success of the project management.	✓	✓
3.	The team members should have the appropriate qualification and experience.	✓	✓
4.	There was no core team set-up but the Deputy Project Director was set up to act as Resident Manager.	✓	✓
5.	Support from the head office of project management team for the design review was essential for the support in technical, management and resource issues.	✓	✓
6.	Quick respond on technical issues was critical on the construction progress of the project.	✓	✓
7.	There was no problem on the nationalities or organization of team members on contribution to the success of the project management.		✓
8.	Human resource is a successful key for project management in construction projects, software cannot replace human resource.	✓	✓
9.	The management of cost (by QS), time (by scheduler), quality (by QA/QC) and HSE (by HSE manager) was conducted by the assigned staff for each component.	✓	
10.	The Document Control Manager needed to coordinate with the Technical Manager to update the construction drawings.	✓	✓
11.	Document control had to be divided into administration document control and technical document control.	✓	✓
12.	Project performance of cost, time, quality and HSE was depended on each managerial position to undertake the responsibility for the task with full support in technical and management issues for the Project Director (Leader).	✓	
13.	Understanding of construction procedure was essential in the arrangement of construction tender and construction package implementation.	✓	✓
14.	All positions in the composition of project management team were essential for the successful delivery of the project if team members were correctly assigned with appropriate qualifications.	✓	✓
15.	Project management software was useful to save time for monitoring the project, but most of the applied software required the users to have appropriate qualification to operate.	✓	
16.	Ethical conduct was the issue on the approval of materials and acceptance of works	✓	✓
17.	Monitoring project management team to avoid any wrongdoing was also a duty of Project Director and team leader of the project to avoid corruption.	✓	✓
18.	It is vital to coordinate with contractors to ensure they comply with all necessary procedures to deliver successfully the assigned project.	✓	✓

Notes:

Interviewee 1 - Project Director

Interviewee 2 – Technical Team Leader

Table D3 – Key issues in data collection of Vinhomes Landmark Residential Complex Project

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6
1.	Type of team structure was the project-based structure with centralized authority of the Project Director.	✓	✓	✓	✓	✓	
2.	The Project Director was the most important position in team structure for the success of the project management.	✓	✓		✓	✓	✓
3.	Professional discipline department was set up to suit the scope of the project.	✓	✓		✓	✓	✓
4.	The team members should have the appropriate qualification and experience.		✓		✓	✓	✓
5.	Support from the head office of project management team was helpful on the design review.	✓	✓	✓		✓	✓
6.	All positions in the composition of project management team were essential for the successful delivery of the project if team members were correctly assigned with appropriate qualifications.	✓	✓	✓	✓	✓	✓
7.	Core team which was set up to assist eleven (11) resident managers was helpful to manage contractors with same treatment and to facilitate team members of project management team.	✓		✓	✓	✓	✓
8.	Project management software was useful to save time for monitoring the project, but most of the applied software required the users to have appropriate qualification to operate.	✓	✓	✓		✓	✓
9.	It was helpful to have software for monitoring and comparing the construction schedule of all eleven (11) buildings at the same time.	✓	✓	✓		✓	
10.	Assisting contractor in applying construction method on other buildings to ensure the contractor to keep construction schedule was essential for this project.	✓	✓	✓		✓	✓
11.	There was no problem on the nationalities or organization of team members on contribution to the success of the project management.	✓	✓	✓	✓		
12.	Human resource is a successful key for project management in construction projects, software cannot replace human resource.	✓	✓	✓	✓	✓	✓
13.	The management of cost (by QS), time (by scheduler), quality and HSE (by QA/QC and HSE manager) was conducted by the assigned staff for each component.	✓	✓	✓		✓	
14.	The lack of appropriate team members generated a lot of problems on the management of the contractors.		✓	✓	✓	✓	✓

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6
15.	The project leader should recognize early the potential issues to correction of team members.	✓		✓	✓	✓	✓
16.	The previous Project Director from German had problem with the adaptation to the operational culture of the project.		✓	✓	✓	✓	✓
17.	Project performance of cost, time, quality and HSE was depended on each managerial position to undertake the responsibility for the task with full support in technical and management issues for the Project Director (Leader).	✓		✓	✓	✓	✓
18.	Ethical conduct was the issue on the approval of the hand-over onsite.	✓	✓	✓	✓	✓	✓
19.	Monitoring project management team to avoid any wrongdoing was also a duty of Project Director and team leader of the project to avoid corruption.	✓	✓	✓			✓
20.	It is vital to coordinate with contractors to ensure they comply with all necessary procedures to deliver successfully the assigned project.	✓	✓	✓	✓	✓	✓

Notes:

Interviewee 1 - Project Director

Interviewee 2 - Resident Manager

Interviewee 3 – Design Management Team Leader

Interviewee 4 – Contract Management

Interviewee 5 – Document Controller

Interviewee 6 – Technical Manager

Table D4 – Key issues in data collection of Expansion of Thu Duc Water Plant Project – Phase III, Capacity of 300,000 m³/day

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3
1.	Type of team structure was Project-based structure with the centralized authority of the Project Director.	✓	✓	✓
2.	The Project Director was the most important position in team structure for the success of the project management.	✓	✓	✓
3.	Responsibility for the design review of project management in EPC contract was essential for the progress of the project.	✓	✓	✓
4.	Quick response on technical issues was critical on the construction progress of the project.	✓	✓	✓
5.	Understanding of construction procedure was essential in the arrangement of construction tender and construction package implementation.	✓	✓	
6.	The team members should have the appropriate qualification and experience.	✓	✓	
7.	Support from the head office of project management team was essential for the support in technical, management and resource issues.		✓	✓
8.	There was no problem on the nationalities or organization of team members on contribution to the success of the project management.		✓	✓
9.	Software for project management in infrastructure project only provided administration work but not technical solution.	✓	✓	✓
10.	Human resource is a successful key for project management in construction projects, software cannot replace human resource.	✓	✓	✓
11.	The management of cost (by QS), time (by scheduler), quality (by QA/QC) and HSE (by HSE manager) was conducted by the assigned staff for each component.	✓		✓
12.	All positions in the composition of project management team were essential for the successful delivery of the project if team members were correctly assigned with appropriate qualifications.	✓	✓	✓
13.	The supply procedure of imported equipment/ material needs managing by the scheduler.	✓		✓
14.	Project performance of cost, time, quality and HSE was depended on each managerial position to undertake the responsibility for the task with full support in technical and management issues for the Project Director (Leader).		✓	✓
15.	Technical issues related to the specifications had to be checked by technical team.	✓	✓	✓
16.	Monitoring project management team to avoid any wrongdoing was also a duty of Project Director and team leader of the project to avoid corruption.	✓	✓	
17.	It is vital to coordinate with contractors to ensure they comply with all necessary procedures to deliver successfully the assigned project.	✓	✓	

No.	Description	Interviewee 1	Interviewee 2	Interviewee 3
18.	It is important to coordinate with sub-contractors of EPC contractor for supplying, installing and commissioning the equipment of the plant.	✓	✓	✓

Notes:

Interviewee 1 - Project Director

Interviewee 2 – Construction Team Leader

Interviewee 3 – Document Controller