



NTNU – Trondheim
Norwegian University of
Science and Technology

Relationships between Parties in Public Construction Investments

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Project Management

Submission date: June 2012

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Report Title: Relationships between Parties in Public Construction Investments	Date: 11 st June 2012		
	Number of pages (incl. appendices): 102		
	Master Thesis	X	Project work
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Other external professional contacts/supervisors: None			
<p>ABSTRACT:</p> <p>This study is carried out to examine two public construction projects delivered by traditional approach (Design/Bid/Build) with five issues of (1) formal and informal relationships between key parties involved in detailed design and construction phases; (2) project organization for construction; (3) decision-making process for resolving requests for changes (RFCs) of construction contractors; (4) communication process for reviewing requests for information (RFIs) and submittals of construction contractors; and (5) influences of relationships between key parties on processes of time, cost and quality control during a construction phase.</p> <p>This research includes two main purposes. One of them is to recognize similarities and differences in the five above issues to understand and to learn from this. The other one is to suggest several recommendations to enhance performance of public construction projects that are delivered by traditional method (Design/Bid/Build). To answer the research questions, there are two project-cases formed in the study as foundations for comparison and analysis. One of them is River Nid bridge construction project in Norway and the other one is U Minh bridge construction project in Viet Nam. Furthermore, these two cases were established by using project materials and interviewing with key individuals involved in the projects.</p> <p>Throughout comparison and analysis between the theory and both the Vietnamese and Norwegian cases, and between these two project-cases, this study concluded:</p> <p style="padding-left: 40px;">In the detailed design phase, that the management of the detailed design and review of the detailed design are conducted by two separate individuals in both the Vietnamese and Norwegian cases makes the degree of the functional relationships in both these two cases more complex than in the theoretical case. However, this can bring significant benefits for the project performance because there are potential chances of achieving a more feasible detailed design.</p> <p style="padding-left: 40px;">In the construction phase, hiring the supervision consultants (SC) - the third party for</p>			

supervising the contractors' construction activities makes the functional relationships in both the Vietnamese and Norwegian cases more complex than in the theoretical case. This can bring both advantages and disadvantages for the project performance. There need to have (1) a suitable control system much focusing on the activities of both the third party and the construction contractors, and (2) a system for resolving conflicts to limit these disadvantages to increase the project performance.

The trust and personal relationships can be established before or after the beginning of the project, and bring many benefits for the project performance. However, the trust relationships can have negative influences on the project performance since they cause subjectivity. Good personal relationships, and clear and sufficient contract terms can prevent the negative influences of the personal relations on the project performance.

The level of the authority delegation for decision-making for resolving the requests for changes (RFCs) of the construction contractors in both the Norwegian and theoretical cases is deeper than in the Vietnamese case; and the time of the information exchange between the design consultants (DC) and the construction contractors in both the Norwegian and theoretical cases is less than in the Vietnamese case. This may lead a consequence that the project performance in both the Norwegian and theoretical cases are more effective than in the Vietnamese case.

The positive attitude of the key parties is a decisive factor to achieve the positive influences of the functional relationships on the processes of the time, cost and quality control during the construction phase. The functional relations' negative influences made by significant conflicts are more likely to perform in the processes of the cost and quality control than in the process of the time control. The high level of certain trust and good personal relationships can help to prevent the negative influences of the functional relationships.

The trust relationships may help to increase the project performance since they result in conflict reduction in the processes of the time, cost and quality control during the construction phase. However, there need the high degree of certain trust relationships to achieve the actual positive relations of the trust relations on the processes of the cost and quality control. This is because these two processes are sensitive, so there need the high degree of certain trust relations to create chances for the less control of the construction activities of the construction contractors.

The personal relationships can make the increase of the project performance due to better communication. This benefit is achieved mainly throughout what the personal relationships positively affect the processes of the time and cost control during the construction phase. Meanwhile, the impacts of the personal relationships on the process of the quality control are limited.

Throughout the comparison and analysis, especially recognizing interesting points in both

the Vietnamese and Norwegian cases, there are nine recommendations suggested to increase the performance of the public construction projects that are delivered by traditional approach (Design/Bid/Build). These recommendations address project owners, project managers and construction managers who are responsible for organizing and managing these public construction projects.

Keywords:

1. detailed design phase
2. construction phase
3. relationships between key parties
4. time, cost and quality control

(Signature)

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor - Professor Ole Jonny Klakegg who has provided me with valuable guidance to shape my thesis. I am also thankful for his constructive suggestions and critical comments for improving this thesis.

I would also like to thank Mr Hafstad Leif Arne – the construction manager (CM) who provided me with correct information to complete the Norwegian case.

I would also like to thank Mr Quoc Viet Huynh – the director of Ca Mau provincial Transport and Communication Department (the owner) who introduced the Vietnamese case to me.

I would also like to thank Mr Hoai Nam Duong – the director of the project management unit (PMU); Mr Hai Au Tran – the head of the project management team (PMT); Mr Bao Son Hong – the head of the Engineering Division (ED); and Mr Tien Tung Nguyen – the field commander of the construction contractor (CC) who provided me with useful information to complete the Vietnamese case.

I would also like to thank Mekong 1000 Project, Viet Nam. This organization offered me funds to study this master program at NTNU.

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LIST of ABBREVIATIONS

CC	Construction Contractor (s)
CM	Construction Manager
DC	Design Consultants
DM	Development Manager
GEC	General Engineering Consultants
GM	General Manager
NPRA	Norwegian Public Roads Administration
PL	Project Leader
PM	Project Manager
PMT	Project Management Team
PMU	Project Management Unit
RC	Review Consultants
RFCs	Requests for Changes
RFIs	Requests for Information
SC	Supervision Consultants

1. INTRODUCTION

1.1 Generality

Construction management is considered as an enterprise with involvement of many people with diverse interests, talents and backgrounds. They are owners, design professionals, contractors, subcontractors, material suppliers, bankers and so on, and have diverse relationships to each other according to different project delivery systems and ownerships (Bennett, 2003). These relationships may be both formal and informal relationships, i.e., contractual relations, functional relations, trust relations, personal relations, etc.

Project organization structures relationships between members involved in an organization. Walker (2008) showed that an appropriate organizational structure could provide a framework in which factors that influence effectiveness of project management have the best chance of maximum performance in achieving a project owner's objectives. Particularly, during a construction phase many different organizations work together. Therefore, it is essential to structure their interdependency (Fewings, 2005).

Decision-making and communication processes include interrelations between key parties, and play an important role in successful completion of a construction project. This is because work of construction contractors only goes ahead well when decision-making and information provision are performed in a timely and effective manner. The decision-making process is complex because of contributing of a large number of specialists (Fewings, 2005); and the effective channels of the communication process are necessary since they enable their various components to be conjoined appropriately (Dainty, 2006).

Project control is essential for successful delivery of any construction projects. Three dimensions of control – time, cost and quality that represent specific project efficiency factors. They are managed for satisfaction of project owners' requirements (Fewings, 2005).

It is realized that understanding well above issues as well as influences of relationships between key parties on the processes of time, cost and quality control is necessary. This is because throughout this understanding, organizing and managing construction projects can be performed more effectively to increase opportunities of the successful completion of the construction projects. This is considered as a main reason to conduct this study.

1.2 Purpose of the study

This study is carried out to take a look at two public construction projects delivered by traditional approach (Design/Bid/Build) with five issues of (1) formal and informal relationships between key parties involved in detailed design and construction phases; (2) project organization for construction; (3) decision-making process for resolving requests for changes (RFCs) of construction contractors; (4) communication process for reviewing

requests for information (RFIs) and submittals of construction contractors; and (5) influences of relationships between key parties on processes of time, cost and quality control during a construction phase.

This research includes comparison and analysis between the theory and both the Vietnamese and Norwegian cases, and between these two project-cases. One of the main purposes of the study is to recognize similarities and differences in the five above issues to understand and to learn from this. Another main purpose is that basing on findings from the comparison and analysis, this study will suggest several recommendations to enhance performance of public construction projects that are delivered by traditional method (Design/Bid/Build).

Generally, this research aims to answers following questions:

1. What are similarities and differences between the theory and the practice (two project-cases), and between these two project-cases in
 - * models of relationships between key parties in detailed design and construction phases?
 - * project organizations for construction?
 - * decision-making processes for resolving RFCs of construction contractors?
 - * communication processes for reviewing RFIs and submittals of construction contractors?
2. What are specific reasons for these differences?
3. How do formal and informal relationships between key parties affect processes of time, cost and quality control during a construction phase?

1.3 Structure of the report

The structure of the report includes seven different sections. **Section 1** – *Introduction* focuses on the reason and purpose of the study. **Section 2** - *Methodology* gives brief information on approaches used to collect data and conduct the study. **Section 3** - *Theory and Background* briefly provides information on (1) who key parties involved in detailed design and construction phases are; (2) what formal and informal relationships they have to each other; (3) what project organizations for construction contain; (4) how decision-making and communication processes are organized; and (5) how processes of time, cost and quality control are conducted. **Section 4** - *A Vietnamese Case* describes U Minh bridge construction project in Viet Nam. **Section 5** - *A Norwegian Case* describes River Nid bridge construction project in Norway. **Section 6** – *Comparison and Discussion* comprises comparison and analysis between the theory and the two project-cases, and between the two project-cases. **Section 7** - *Conclusion and Recommendation* provides the results of the study and suggested recommendations.

2. METHODOLOGY

2.1 Selection of research methodology

The selection of research methodology depends on the purposes of the research. It may be qualitative research or quantitative research or a combination of these two approaches. Generally, the researchers also need to concern their interests, time and money available as well as types of required information when choosing the research method.

As quoted in Goethals et al (2004), Shank (2002) defined qualitative research as “a form of systematic empirical inquiry into meaning” (p.5). Where *systematic* regards “planned, ordered and public”, following rules agreed upon by members of the qualitative research community. By *empirical*, he means that this type of inquiry is vital in the world of experience. *Inquiry into meaning* says researchers try to understand how others make sense of their experience. In addition, Denzin & Lincoln (2005) pointed out that “qualitative research involves the studied use and collection of the variety of empirical materials – case study; personal experience; introspection; life story; interview; artifacts; culture texts and productions; observational, historical, interactional and visual texts” (p.3).

In my study, qualitative research method is used to analyze and interpret the subject in the pursuit of answering the research questions. The reason for this is that the main purpose of the study is suitable for the qualitative research approach, i.e., basing on examining two project-cases explains and understands the research problems. In addition, these two project-cases are established by using interviews’. This is an empirical inquiry.

2.2 Case study method

Case study is defined as “an intensive study of a single unit for the purpose of understanding a larger class of (similar) units” (Gerring, 2004) (p.342). This definition shows that the purpose of the case study is to find knowledge from the single case that can be transferred to other cases in the group. Robert (1984) supposed that, a case study research method can be viewed as an empirical inquiry that investigates a contemporary phenomenon within its real-life context.

Soy (1997) evaluated the case study research approach as follows: “case studies are complex because they generally involve multiple sources of data, may include multiple cases within a study, and produce large amounts of data for analysis. Researchers from many disciplines use the case study method to build upon theory, to produce new theory, to dispute or challenge theory, to explain a situation, to provide a basis to apply solutions to situations, to explore, or to describe an object or phenomenon”.

In the context of my study, two specific case studies about relationships between key parties in public construction projects were established. One of them is River Nid bridge construction project in Norway, completed in June 2009 and the other one is U Minh bridge construction project in Vietnam, completed in August 2011.

Additionally, data used to make these two cases was collected from the project materials and relative regulations of government. Furthermore, semi-structured interviews with the key individuals of the projects were employed to collect data.

2.3 Method of data collection

2.3.1 Sources of research data

2.3.1.1 Primary data

Primary data is original information that is collected directly by the researcher for the specific purpose of addressing the problem at hand (Malhotra et al, 2002). The data generated from primary research is recorded by using the knowledge of the researcher. Polonsky & Waller (2005) showed that individual interview is one of useful techniques to collect the primary data when using a qualitative research method.

The primary data, in my study, was collected directly from key parties involved in the public construction projects. This information included (1) what formal and informal relationships they have to each other, (2) project organization for construction, (3) decision-making process for resolving RFCs, and (4) communication process for reviewing RFIs and submittals. In addition, other data informed about influences of relationships between key parties on processes of time, cost and quality control during the construction phase.

In my study, the primary data was collected by using semi-structured interviews with the key individuals involved in the projects.

2.3.1.2 Secondary data

Secondary data is information that is collected for some purpose other than the problem at hand (Malhotra et al, 2002). In my study, main sources of the secondary data were project materials such as design documents and project contracts provided by key parties, and relative regulations of government like a governmental regulation about construction quality management that could be accessed online.

2.3.2 Method of data collection

The primary data collection of my study was carried out by using semi-structured interviews. There were two types of questionnaires prepared to interview key individuals. For the Norwegian case, the questionnaire was prepared in English, but prepared in Vietnamese for the Vietnamese case. In addition, the questions were required to be clear to make ease to answer and chances to gain correct information.

For the Norwegian case, I needed several helps from my supervisor - Professor Ole Jonny Klakegg to restrict difficulties of English language issues during the interview. Moreover, he took note of the conversation, which provided me with useful information to complete the case. To collect the data, I interviewed the construction manager (CM) of the project, and I also recorded a tape about the conversation between my supervisor and me with the interviewee, which helped me to clarify after the interview.

For the Vietnamese case, because I did not have opportunities to contact the key parties in person due to geographical distance, interviews were performed by using phones and emails. I interviewed the head of the project management team (PMT) and the head of the Engineering Division (ED) to get the data. After the interviews, I often contacted with the interviewees until getting relevant information.

All my interviews were conducted in an informal way as daily conversations to ensure that the interviewees could feel comfortable to answer, which resulted in good opportunities to gain complete data. Particularly, these questionnaires were sent to the interviewees in advance so that they could think about the questions before starting the interviews. This made the interviews more efficient, and was also a good way to assure that the interviewees speak about relevant issues.

After the data collection completed, the data was documented on three main issues that were (1) relationships between the key parties in the detailed design and construction phases; (2) project organization for construction, decision-making process for resolving RFCs as well as communication process for reviewing RFIs and submittals; and (3) influences of relationships between the key parties on the processes of the time, cost and quality control during the construction phase.

Finally, in my study, comparison and analysis between both the two project-cases and the theory, and between the two project-cases were conducted.

3. THEORY AND BACKGROUND

3.1 Phases of a construction project

Project Management Institute's "Body of Knowledge" (PMI, 2008) defined a project life cycle as

"a collection of generally sequential and sometimes overlapping project phases" (p.15).

According to the above definition, the project life cycle is divided into several stages; and the work within each phase is quite distinct, requiring different levels of control and skill sets.

There is no agreement about a number of phases of a project life cycle as well as their name on literatures (Kerzner, 2009) . Bennett (2003) identified six phases of a construction project life cycle, which are:

* **Pre-project phase:** The purpose of this stage is to determine which project delivery approaches and types of contract used in the project.

* **Planning and design phase:** This phase may be divided into three stages. The goal of the first stage is to define the project's objectives and identify funding sources. In the second stage, the detailed design of the project is made. Finally, contract documents used for selecting construction contractors are prepared in the third stage.

* **Contractor selection phase:** One or many construction contractors are chosen from tenders or negotiations.

* **Project mobilization phase:** The purpose of this stage is to prepare essential activities before construction work can be started on site.

* **Project operation phase:** The construction contractors perform their construction activities on site.

* **Project closeout and termination phase:** The activities of the construction contractors are completed; and the construction contractors hand over the project to the owner.

Because of overlapping between phases of a project life cycle and these phases may seem unclear in distinction, Samset (2010) divided a project's life cycle into three main phases, which are a front-end phase, an implementation phase, and an operation phase (Figure 1).

* The front-end phase is defined as "from the time initial concepts are conceived until funds are appropriated to the project".

* The implementation phase is viewed as “from detailed planning until agreed outputs (operational objectives) have been produced”. This phase includes detailed design and construction stages.

* The operation phase is “the pay-back period until the results of the project (buildings, roads, software, etc.) are no longer in use” (p.34).

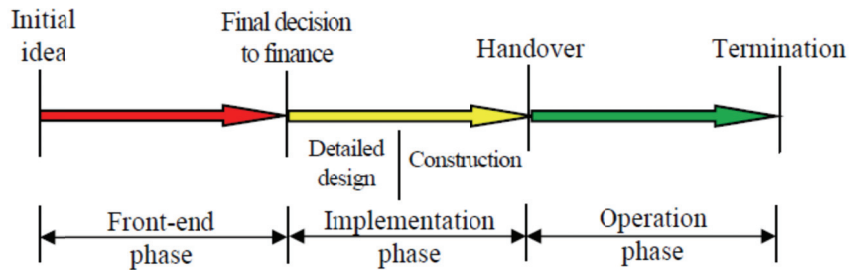


Figure 1: Three main phases in a project

Source: Samset (2010). Early Project Appraisal “Making the Initial Choices”

3.2 Actors of a construction project

Gould & Joyce (2009) defined a construction project as a circle “the idea is defined by the owner, developed by designers, and produced by the contractor, who then turns it over to the owner” (p.24).

Project management theories define the variety of roles of key parties involved in a construction project, consisting of owners, project managers, design and technology consultants, contractors, site managers, supply managers, quality managers, transportation subcontractor, etc. All these key various parties can be jointed in only three main types of actors who are owners, design professionals and construction professionals.

Owners, public owners or private owners, are an “instigating party” where a project financed, designed, and built.

Public owners are public bodies, ranging from federal governments to down through states to a multiplicity of local boards and authorities. Public projects are built to perform defined public functions such as roads and bridges (Forcada Matheu, 2005) and are paid by money from taxpayers (Gould & Joyce, 2009).

Publicly funded projects are usually examined from various agencies, which make special pressure on the team of designing and constructing these projects (Gould & Joyce, 2009). Furthermore, performing public projects must accord with “applicable statutes and administrative directives pertaining to advertising for bids, bidding procedure, contracts and other matters related to design and construction processes”(Forcada Matheu, 2005) (p.16).

Private owners may include “individuals, corporations, partnership and various combinations” (Forcada Matheu, 2005) (p.16). The purpose of privately funded projects is either for personal usage or for economic benefits of investors.

The special type of the private owner is developers who usually own the project only for the construction period with goals of getting money throughout a quick sale or long-term rentals (Gould & Joyce, 2009).

Design professionals, also known as architect-engineer, are parties or firms that design the project. Depending on the nature of the project, an architect or an engineer will be selected by the owner to work as the lead designer. The architect often leads residential sector projects while the engineer usually leads industrial sector projects with heavy engineering (Gould & Joyce, 2009).

Large private owners as well as public bodies often have their own in-house resources to design the project in which “the architect-engineer is the design arm of the owner”. Normally, the architect-engineer, who is private and independent companies, designs the project under the contract with the owner (Forcada Matheu, 2005).

Construction professionals are known as constructors and suppliers.

Generally, constructors take the professional responsibility of all construction activities and they work as general contractors or construction managers. Traditionally, constructors perform their work after the project design is completed. Nonetheless, now they may attend in the early project stages as a part of a design/built team; and they are responsible for delivering the entire project from concept to completion (Gould & Joyce, 2009).

General contractors may gain the supports of specialty, material suppliers, and equipment suppliers as subcontractors to accomplish their construction activities.

The prime contractor’s responsibility depends on the owner’s contract strategy. When a single-contract system used, the prime contractor is completely responsible for the entire construction activities of the project as well as the performance of subcontractors to deliver the project in accordance with the contract documents. However, when separate contracts used, the responsibility of coordinating activities of separate contractors is assigned to the owner (Forcada Matheu, 2005). In this situation, the owner may hire an architect-engineer, or a construction manager, or a prime contractor to do that work (Turner, 2003).

3.3 Relationships between key parties in a construction project

There are many different key parties involved in a construction project, and they have diverse relationships to each other according to different project delivery systems and ownerships (Bennett, 2003). Two main groups of relationships between the key parties are:

- * Formal relationships including contractual and functional relationships, and
- * Informal relationships comprising trust and personal relationships.

3.3.1 Formal relationships between key parties in a construction project

3.3.1.1 Contractual relationships

Bennett (2003) defined the contractual relationships as the relations of the various parties involved in the construction contract”. Furthermore, the construction contract can be defined as “a contract for the construction of an asset or of a combination of assets, which together constitute a single project” (Vijayakumar, 2010) (p.5.10).

The contractual relationships cover the contractual terms within a governing relation, which typically includes “the relationship”, “the risk apportionment”, “the division of responsibilities”, and “the reimbursement mechanism” (p.127). In addition, the contractual relationships must be required to be “fit-for-purpose”, which means that the contractual relations are optimal to deliver desired goals (Cox & Thompson, 1997).

Kay (2010) summarized ways throughout which parties can contract with each other; and some of common relationships are:

- * **Arms length:** This is a traditional buyer/seller relationship characterized by one-off transactions.

- * **Preferred supplier:** This is a much closer, longer buyer/seller relation. Normally, the seller assigns a manager to manage and develop the relationship; and it is often used for the transactions of key goods.

- * **Partnering/Alliancing/Joint Venture:** This comprises a long-term commitment between parties in achieving common objectives.

- * **Turnkey:** This is where a supplier performs the provision of a total solution to a buyer.

Traditional arms length contractual relationships are characterized by the drives of “Value for Money”, which makes relationships between buyers and suppliers adversarial with their

opportunistic behavior (Cox & Thompson, 1997). Thomas & Thomas (2005) showed that these traditional contractual relations usually result in confrontation, a lack of trust, poor communication, problem escalation and a lack of continuous improvement.

Cox & Thompson (1997) assumed that more collaborative contractual relations as partnering are necessary to restrict the opportunistic behavior of parties to optimize desired goals. By contrast, Meng (2012) pointed out that the partnering will not necessarily result in better project performance than the traditional method because it is still an immature collaborative relation. Therefore, adopting long-term strategic partnering is essential to achieve better project performance.

3.3.1.2 Functional relationships

The functional relationships are non-contractual types of relationships between parties involved in a project. They perform their functions or tasks specified in contracts and project organizational structures (Bennett, 2003). For example, design consultants have supervision and inspections responsibilities in connection with the construction activities of contractors. In this study, the functional relationships are considered as formal relations since these functional relations may be recognized from project contracts, documents about task assignment in a project organization, etc.

3.3.2 Informal relationships between key parties in a construction project

Besides contractual and functional relationships between key parties in a construction project, there is an existence of informal relations of trust and personality.

3.3.2.1 Trust relationships

Rousseau et al (1998) defined trust as “a psychological state comprising the intention to accept vulnerability based upon positive expectation of the intentions or behavior of another” (p.395). Zaghoul & Hartman (2003) introduced three types of trust in a construction project. Firstly, competence trust regards on the perception of other’s ability to do the required work. Another type of trust is integrity trust (or ethical trust) based on the understanding of other’s attitudes to protect their counterparts. Finally, intuitive trust (or emotional trust) refers to the parties’ personal prejudice feelings towards their counterparts.

Although trust is individual behavior, trust may exist between key parties in a construction project (Lynda, 2005). The basis of trust is built throughout relationships between key parties over time where they may gain direct, personal experience and information to each other (Kadefors, 2004).

Trust is important since it encourages cooperative behavior (Gambetta, 1988), and reduces conflicts between parties involved in a project (Munns, 1995). Furthermore, trust is necessary for many aspects of project management such as effective communication, contractual relationships, inter-team relations, progress reports, comprehension of the authority of project managers and so on (Hartmann, 2002).

Kadefors (2004) pointed out that there are many potential chances for developing trust in traditional contractual arrangements since “interaction between the client and the contractor staff is often quite close” (p.178) in addition to the long construction period of the construction project. However, the details of the contract documents and the closing supervision of the contractor’s construction activities seem to prevent the cooperative interaction between the client and the contractor. Kadefors (2004) concluded that the higher level of trust seems to enhance project performance in traditional contractual arrangements.

Munns (1995) showed the importance of trust between parties in the successful completion of the project. The project will be unsuccessful, if the parties have the initial untrusting intentions to each other. This is because the untrusting intentions will result from limiting information, seeking concessions from one another, not achieving mutual agreements for the project, etc.

Zaghloul & Hartman (2003) identified that trust relationships between contracting parties in a construction project may result in major saving in construction due to better risk assignment mechanism. This is because “a significant relationship exists between the amount of the premiums associated with the disclaimer clauses and the level of trust between the contracting parties” (p.422). When the owner and the contractor have the high trust relationship to each other, the contractor tends to lower the premiums because of low risk of the disclaimer clauses and vice versa.

3.3.2.2 Personal relationships

The personal relationship is relations between individuals in the environment. This relationship may include family relationships, social relationships, religious relationships, etc.

“Personal relationships are dynamic and often take time to fully develop” (p.1); and may affect project success (Philip, 2011).

Cheung & Rowlinson’s survey conducted in 2005 showed that “personal relationships are an important aspect in managing projects”. This is because when project team members have good personal relations to each other, conflicts between them during work may be minimized. However, “personal relationships need to be sacrificed to ensure a successful project completion and to meet the firm’s objectives”. Furthermore, “the degree of personal acquaintance is found to be low” (p.7).

3.3.3 Models of relationships between key parties involved in detailed design and construction phases

3.3.3.1 A traditional approach (Design/Bid/Build)

Model of relationships between key parties in a construction phase

Masterman (1992) introduced a model of formal relationships (contractual and functional relations) between key parties in a construction phase of a construction project delivered by a traditional approach (Design/Bid/Build) (Figure 2). The traditional method has characteristics of a serial project delivery process. Firstly, the owner hires a design professional to prepare a design. After the design fully completed, the owner either conducts competitive bids or negotiates with special contractors to choose construction contractors who are responsible for delivering the entire project in accordance with the contract documents (Gould F. E., 2002).

This model includes eight actors who are (1) client, (2) design consultants, (3) project manager, (4) quantity surveyor, (5) main contractor, (6) nominated subcontractor, (7) direct management and labor force, and (8) domestic subcontractors.

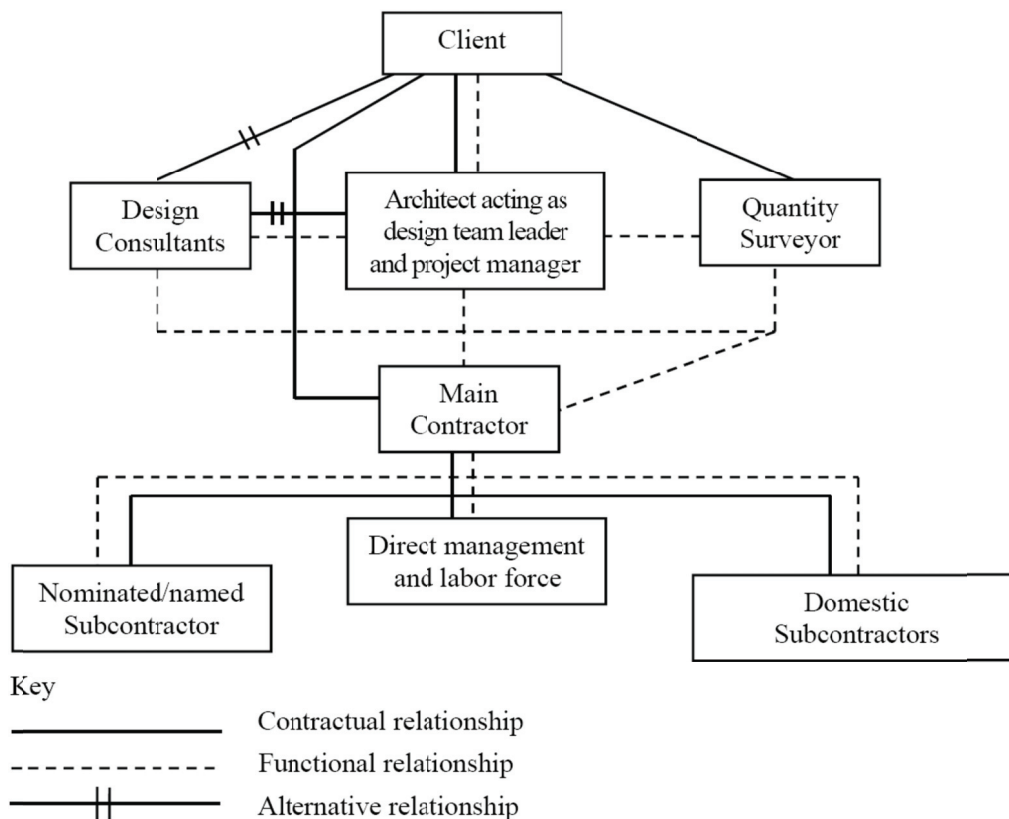


Figure 2: Functional and contractual relationships in a construction phase, Design/Bid/Build (traditional approach)

Source: Masterman (1992). An introduction to building procurement systems

According to Figure 2, the contractual and functional relationships between the key parties in the construction stage may be presented as follows:

* The contractual relationship is a relation between the client and the main contractor. Furthermore, the client and the quantity surveyor also have the contractual relationship to each other.

* The client and the project manager have both the contractual and functional relationships to each other.

* The design consultants, the project manager, the quantity surveyor, and the main contractor also have the functional relationships to each other.

* The relationships between the main contractor and the subcontractors (the nominated subcontractors and the domestic subcontractors) are both the contractual and the functional relationships. Moreover, the main contractor and the direct management and labor force also have both the contractual and the functional relationships to each other.

* The alternative contractual relationships are a relation between the client and the design consultants, and between the project manager and the design consultants. It means that they have or do not have the contractual relationships to each other. If the client and the design consultants have the contractual relationship to each other, the project manager and the design consultants will only have the functional relationship to each other. However, if the project manager and the design consultants have both the contractual and the functional relationships to each other, the client and the design consultant will not have any relationships to each other. This is because communications between the client and the design consultants are performed throughout the roles of the project manager.

Model of relationships between key parties in a detailed design phase

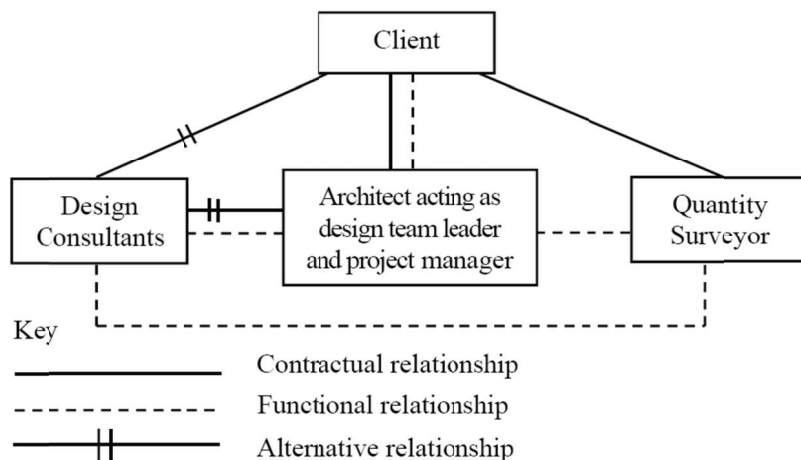


Figure 3: Functional and contractual relationships in a detailed design phase, Design/Bid/Build

Basing on the model of relationships between the key parties in the construction phase, a model of relations between the key parties in the detailed design stage is established (Figure 3). This derives from the principle of the traditional approach, i.e., the construction contractors are selected after the detailed design is fully completed (Gould F. E., 2002). Therefore, there are four actors attending in the detailed design stage, including (1) client, (2) design consultants, (3) project manager, and (4) quality surveyor.

3.3.3.2 Management contracting approach

Model of relationships between key parties in a construction phase

Management contracting is an approach that a contractor, normally a construction contractor hired by an owner, performs the work of management. In addition, this management contractor is appointed as a member of the design team to provide construction expertise to make the project design more feasible. Furthermore, packages contractors, who are employed, coordinated, and administered by the management contractor, carry out the actual construction activities of the project (Masterman, 1992).

The management contracting approach is considered as a traditional one (Design/Bid/Build) since contractors for construction are selected after a detailed design completed fully. Masterman (1992) introduced a model of formal relationships between key parties in a construction phase of a construction project delivered by a management contracting approach (Figure 4). This model includes five key parties who are (1) client, (2) design consultants, (3) quantity surveyor, (4) management contractor, and (5) packages contractors.

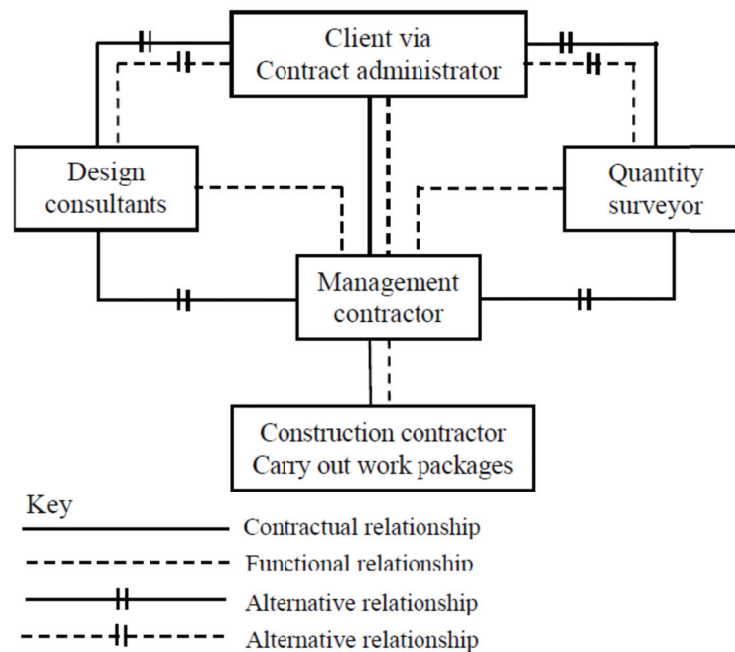


Figure 4: Functional and contractual relationships in a construction phase, Management contracting approach

Source: Masterman (1992). An introduction to building procurement systems

According to Figure 4, formal relationships between the key parties, i.e., contractual and functional relations can be presented as follows:

* The client and the management contractor, and the management contractor and the package contractors have both the contractual and functional relations to each other.

* The alternative contractual relations are a relationship between the design consultants and the management contractor, and between the client and the design consultants. This means that if the design consultants and the management contractor have the contractual relation to each other, the client and the design consultants will not have the contractual relation to each other and vice versa. Similarly, the client and the quantity surveyor, and the management contractor and the quantity surveyor have the alternative contractual relations to each other.

* The functional relationship is a relation between the design consultants and the management contractor. Moreover, the quantity surveyor and the management contractor have the functional relation to each other.

* The client and the design consultants, and the client and the quantity surveyor have the alternative functional relationships to each other. It means that they have or do not have the functional relations to each other.

Model of relationships between key parties in a detailed design phase

Basing on the model of relationships between the key parties in the construction phase, a model of relations between the key parties in the detailed design stage is established (Figure 5). This derives from the principle of the management contracting approach, i.e., the package contractors are selected after the detailed design completed fully (Masterman, 1992). Therefore, there are four actors attending in the detailed design stage, including (1) client, (2) design consultants, (3) management contractor, and (4) quantity surveyor.

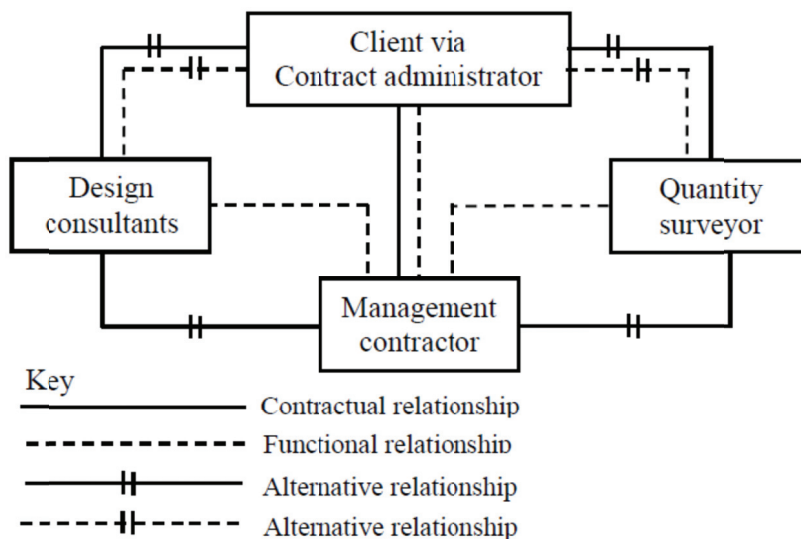


Figure 5: Functional and contractual relationships in a detailed design phase, Management contracting approach

3.4 Project organization, decision-making process and communication process

3.4.1 Project organization for construction

Kerzner (2009) was defined organizations as “groups of people who must coordinate their activities in order to meet organizational objectives” (p.93). According to the above organization definition, coordination function that key parties perform in the organization is very important to achieve the success of the project. Therefore, it is necessary that the key parties understand well their relationships, and have strong communications to each other to conduct the coordination function successfully.

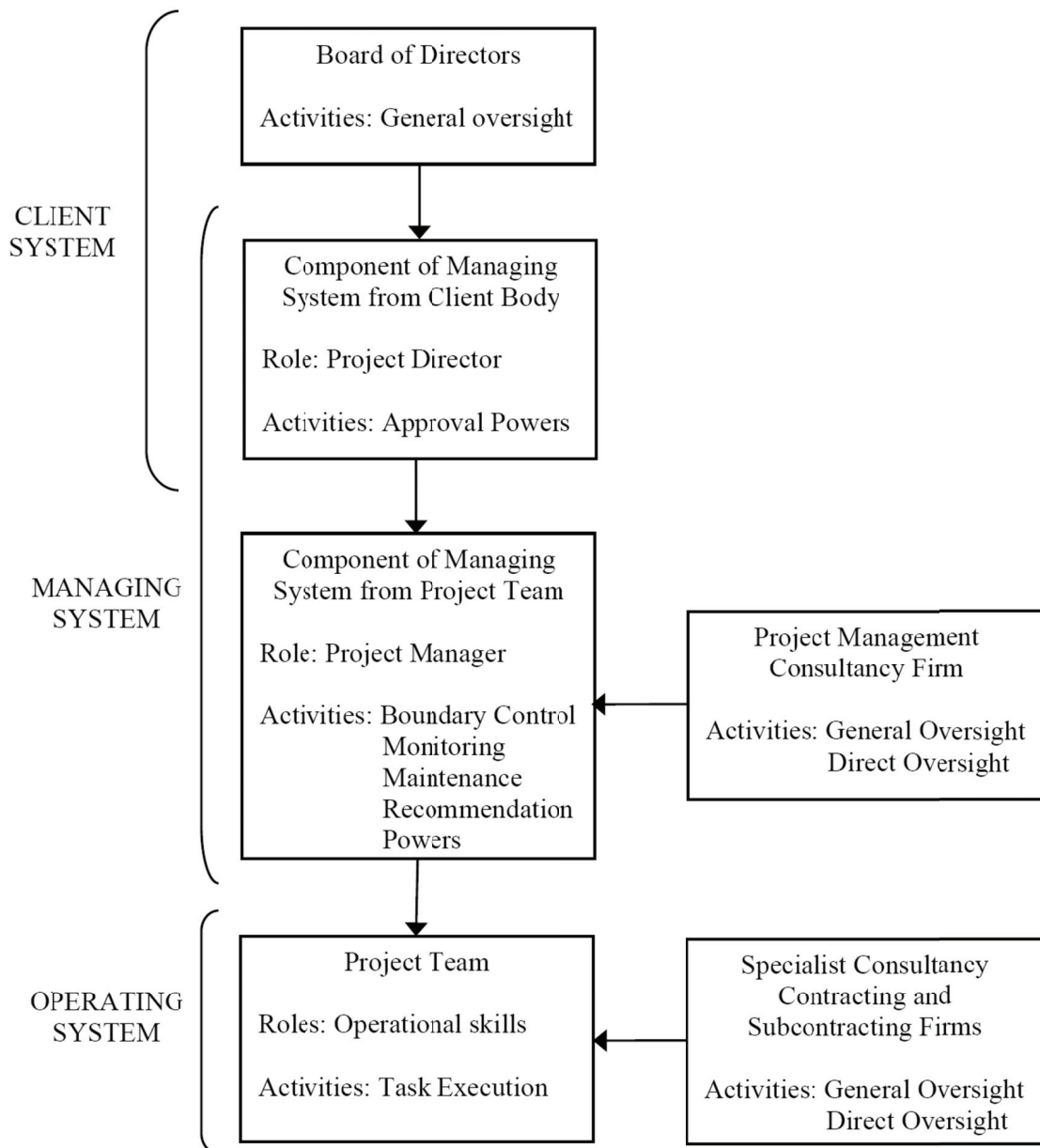


Figure 6: An example of roles and activities distributed in the client system, the managing system and the operating system.

Source: Walker (2007). Project Management in Construction

Walker (2007) introduced a model of a construction process in a project. This model includes three main systems that are a client system, a managing system, and an operational system where each of these systems performs its own functions during construction (Figure 6).

The client system produces key decisions during the construction process based on the recommendations of the managing system. The operating and managing systems perform two main types of work of the construction process, which are management and construction activities respectively (Walker, 2007).

The managing system may contain solely the client’s organization or consist of the client’s representatives and a consultant project manager. This depends on the owner’s in-house resource and delegation. Furthermore, this system takes the responsibilities of the variety of functions such as approval and recommendation, boundary control, monitoring and maintenance, and general and direct oversight to ensure that the project is delivered successfully to meet the planned objectives (Walker, 2007)

The operating system is “the system of activity through which the project is achieved” (p.171). Moreover, it is managed by the managing system because the managing system carries out the decision-making or provides recommendations to the clients for making decisions to keep the operating system going ahead (Walker, 2007).

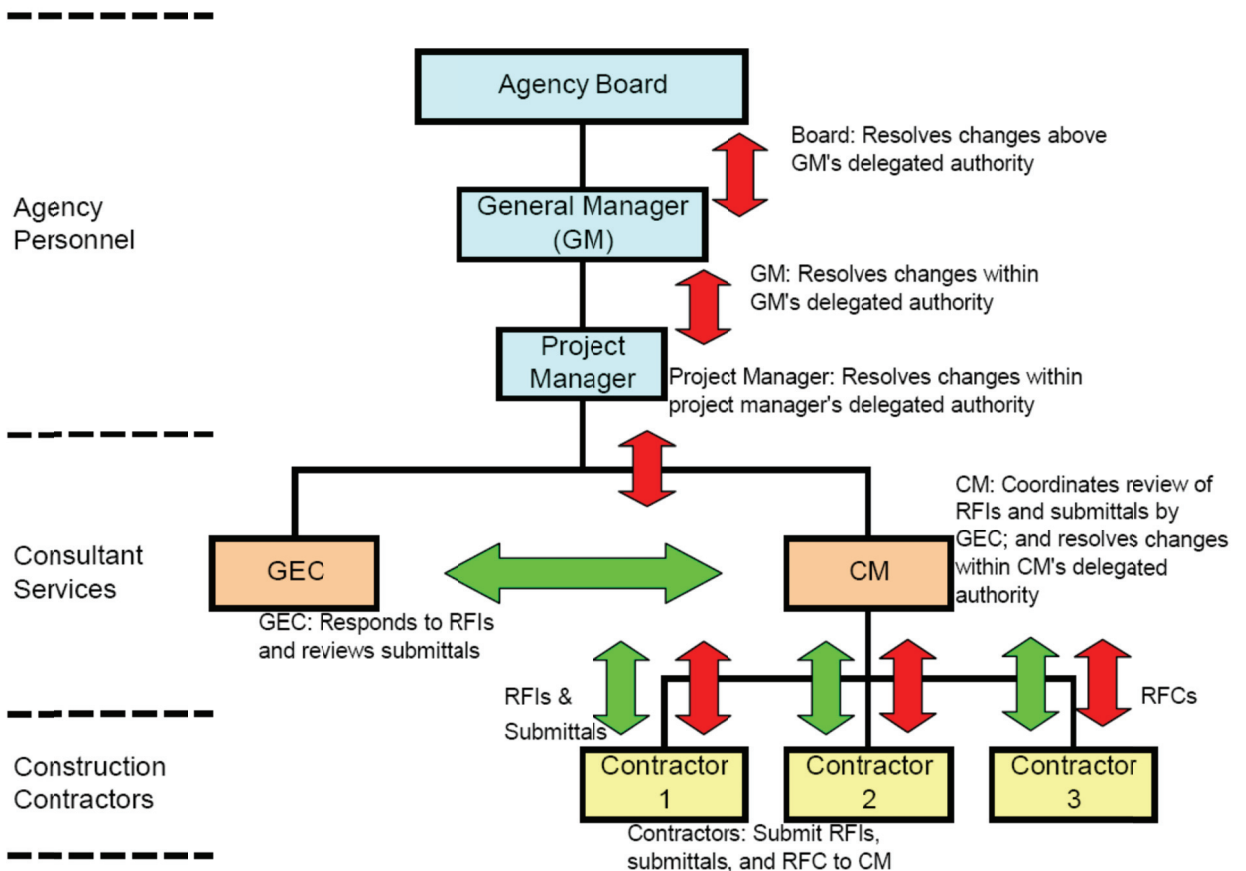


Figure 7: Project organization, assigned authorities, and lines of communications for construction
 Source: Federal Transit Administration (FTA) (2009). Construction Project Management Handbook

Federal Transit Administration (FTA) (2009) introduced the model of the project organization for construction where the owner uses the service of the construction manager (CM) and the general engineering consultant (GEC) (Figure 7). The GEC designs the record, but he continues to provide his services during construction. This organization contains three main systems that are an agency personnel system, a consultant services system and a construction contractors system as follows:

- * The agency personnel system includes an agency board, a general manager (GM), and a project manager (PM).

- * The consultant services system consists of general engineering consultant (GEC) and a construction manager (CM).

- * The construction contractors system includes three constructors.

In addition, establishing an organizational structure requires having the clear assignment of responsibilities and authorities between parties, and lines of communications from the first line supervisor to the top decision-makers. Furthermore, the organizational structure must address interfaces that are interconnected between functional relationships existing during the construction process to ensure that these interfaces may be successfully managed (Federal Transit Administration (FTA), 2003).

3.4.2 Decision-making process resolving requests for changes (RFCs) of construction contractors during a construction phase

As quoted in (Passenheim, 2009), Johansson et al (1993) defined a process as the establishment of links between activities and transformation that occurs within the process. Furthermore, a process has a start point and a finish one.

Decision-making is a cognitive process that results in the selection of a course of action among alternatives. Every decision-making process makes a final choice. Furthermore, decision-making can be regarded as a reasoning process. This is because the process can be rational or irrational, and can be based on explicit assumptions or tacit assumptions (Lu, Zhang, Ruan, & Wu, 2007) (p.5).

Walker (2007) showed that a construction process is characterized by a series of decision points, including key decision and operational decision ones. They act as “pitch points” via which the project team must pass, if progress is to be made. Moreover, depending on the nature of the clients’ organization, the clients will produce the key decisions themselves or assign this function to several members of their own organization. That the members of the project team provide information and advice is significantly basic of making the key decisions. Furthermore, the members of the project team will produce the operational

decisions basing on their professional and technical competence to make progress towards a key decision. “The greater the number of decisions classified as operational, the greater will be the flexibility available to the project team” (p.166).

Decision-making process is very important for the construction process because the delay of this process is the main cause of debates and the construction delay leading to cost overruns (Walker, 2007 & Federal Transit Administration (FTA), 2003). Therefore, an appropriate integrating mechanism for decision-making is essential to ensure that decisions made in a timely and effective manner (Walker, 2007).

Decision-making process resolving requests for changes (RFCs) of construction contractors during a construction phase

The “**red arrows**” in Figure 7 point authority delegation to resolve the requests for changes (RFCs) of the construction contractors during construction. There are usually changes in the work that are not covered the contract documents over a construction phase. Both the owner and the contractors can perform requests for changes (RFCs) by change orders (Federal Transit Administration (FTA), 2009). Borg (2000) introduced four main reasons for issuing change orders, which are “change in scope”, “change in material or installed equipment”, “change in expected conditions” – conditions that are not anticipated by the designers, and “change in omissions”.

Both the owner personnel and the construction manager (CM) are responsible for decision – making for resolving the RFCs of the construction contractors (Federal Transit Administration (FTA), 2009) (Figure 7). This decision-making process can be illustrated as follows:

- * Firstly, the construction contractors are responsible for submitting their RFCs to the CM.

- * Secondly, the CM will review and send then these RFCs to the general engineering consultant (GEC) for reviewing. Next, the CM will make a decision for resolving the RFCs within the assigned authority of the CM. If this decision-making is over the CM’s assigned authority, the CM will provide the project manager with recommendations to produce the decision.

- * Next, the project manager will make a decision for resolving the RFCs within the delegated authority of the project manager or will provide recommendations to the GM to produce the decision, if exceeding the project manager’s assigned authority.

- * Finally, the agency board will make a decision for resolving the RFCs, if this decision-making is over the assigned authority of the GM.

Federal Transit Administration (FTA) (2009) (p.6-8) introduced several management techniques that make the decision-making process for resolving the RFCs timely and effective. These techniques include: (1) assigning command responsibility and financial authority to produce decisions for resolving changes; (2) using a change control board that is made by senior project staff to make decisions for large and complex changes; and (3) building in advance an understanding with the construction contractor about the process of resolving the RFCs.

3.4.3 Communication process for reviewing requests for information (RFIs) and submittals of construction contractors during a construction phase

As quoted in Dainty et al (2006), Axley (1984) defined communication as “a metaphorical pipeline along which information is transferred from one person to another” (p.3). The transfer of information is regarded as a generic term involving meanings such as knowledge, processed data, skills, and technology (Cheng et al, 2001). Furthermore, communication can occur at different levels as individual, team, and corporation degrees (Dainty et al, 2006).

Dainty et al (2006) showed many different types of communication media that can be applied in construction communication. Moreover, the choice of which medium that is most suitable will depend on the nature of the information and the receivers, and the results desired from the communication. The categories of communication media can include: (1) **verbal** – oral communication between individuals; (2) **non-verbal** – using eye movements, facial expressions, body contact and so on to express meaning; (3) **written** – written information provides a permanent record of the communication; (4) **audiovisual** – audio-based media; and (5) **electronic** – communication based on using innovations such as electronic mail.

Communication process for reviewing requests for information (RFIs) and submittals of construction contractors during a construction phase

The “**green arrows**” in Figure 7 show a communication process between key parties involved in the construction phase for reviewing the requests for information (RFIs) and the submittals of the construction contractors.

The construction contractors, during the construction phase, often submit their RFIs to the owner to clarify the design intent of the drawings and the specifications to reduce needs for costly corrective actions (Federal Transit Administration (FTA), 2009).

Submittals are “shop drawings”, “product data”, and “samples” submitted to the owner for approval prior to construction of items they represent. For example, in cases, the drawings

and specifications prepared by the design consultants are not sufficient for construction, so the contractors or the material suppliers will provide supplemental documents with further details (Bennett, 2003).

Communication for reviewing the RFIs and the submittals is the responsibility of the GEC, the CM and the construction contractors (CC) (Figure 7). In addition, the CM acts as a coordinator to link information between the GEC and the CC (Federal Transit Administration (FTA), 2009). The communication process includes several steps. Firstly, the CC takes the responsibility of submitting their RFIs and submittals to the CM. Next, the CM will review and send then these requests to the GEC for reviewing and responding. Finally, the CC will receive responses from the GEC via the CM. In this process, the CM has full power to examine the RFIs and the submittals.

3.5 Time, cost and quality control during a construction phase

3.5.1 Time control during a construction phase

The objective of project time management is to achieve timely completion of the project. Furthermore, the time management can include many processes such as “define activity”, “sequence activity”, “estimate activity resources”, “ estimate activity durations”, and “ control schedule” (Project Management Institute, 2008) (p.129).

Time control is defined as “the process of monitoring the status of the project to update project progress and managing changes to the schedule baseline”. Therefore, the schedule control regards (1) “determining the status of the project schedule”, (2) “influencing the factors that create schedule changes”, (3) “determining that the project schedule has changed”, and (4) “managing the actual changes as they occur” (Project Management Institute, 2008) (p.160).

The schedule baseline is a detailed version of the project schedule. It includes key milestone dates of the project, key material delivery dates and the start and finish dates of subcontractors. Furthermore, these dates are considered as important control points that have remarkable influences on the following work of the project (Gould & Joyce, 2009).

Federal Transit Administration (FTA) (2003) (p.3-29) introduced a variety of tools and techniques that may be applied to control a project schedule during a construction stage as follows:

- * **Master schedule:** The mater schedule is viewed as “a comprehensive comparable scheduling schema”. Normally, this schedule is updated every month and a project manager takes responsibility of developing and updating it.

- * **Construction schedule:** The construction schedule is a detailed schedule that is provided by construction contractors. Normally, this schedule is monthly updated, and is used to assess project progress during construction.

- * **Status report:** The status report includes information about project progress that is basic to make decisions regarding schedule issues.

- * **Monitoring system:** Its function is to oversee activity start, activity completion and accomplishment of other milestones included in the schedule baseline.

- * **Performance measurement system:** Its function is to compare between actual achieved work and scheduled work based on using the data from the monitoring system.

- * **Schedule forecast:** Its function is to provide prediction of the expected time to complete the work packages and the total project.

* **Review and update:** The purpose of the schedule review is to determine whether resource reassignment and corrective actions can be undertaken; and to identify potential problems in the forecasted schedule. Meanwhile, the schedule update is to add new information into the original schedule in comply with approved changes.

The schedule control during construction depends on the size and complexity of the project. For large and complex projects, a scheduler should be assigned to supervise construction progress by using scheduling software. For smaller projects, using hand drawn bar charts worked out directly with resident engineers should be enough to monitor construction progress (Federal Transit Administration (FTA), 2009).

Federal Transit Administration (2009) (p.6-7) introduced ways that help to control effectively a project schedule. These ways are that a project manager should (1) create a high-level master schedule and restrict details to what interface control involves; (2) determine the overall schedule duration based on the critical path activities; and (3) require each contractor to submit (a) a contract schedule baseline for review and approval, (b) monthly updates of project progress against the approved schedule baseline, and (c) a revised schedule baseline for the approved contract changes.

3.5.2 Cost control during a construction phase

The goal of project cost management is that the project can be completed within the approved budget. The project cost management may comprise several processes of “estimate costs”, “determine budget”, and “control costs” (Project Management Institute, 2008) (p.165).

Cost control is defined as “the process of monitoring the status of the project to update to the project budget and managing changes to the cost baseline” (p.179). The cost baseline is an approved time-phased budget at completion. Therefore, the cost control includes much effort of analyzing a relationship between the expenditure of project funds to the physical work connected to such consumption (Project Management Institute, 2008).

The cost control regards: (1) affect factors that make changes to the authorized cost baseline; (2) ensure that all changes are performed on time; (3) manage actual changes when they occur; (4) assure that cost expenditures do not exceed the authorized funds; and (5) act to bring expected cost overruns within acceptable restrictions (Project Management Institute, 2008).

Federal Transit Administration (FTA) (2003) (p.3-37) introduced several principles that should be applied to achieve the effective cost control. These principles are:

* a cost baseline should include contingency funds caused by inflation, changes of site conditions, estimation uncertainties, etc.

* all budget transfers should be documented; and funds should be removed from work under run its budget to other work.

* the selection of suitable contract types should be considered to ensure cost-effectiveness.

* a management team with adequate authority should be assigned to control strictly project expenditures.

The cost control during construction depends on types of contract between the owner and the construction contractors. In several cases, a lump sum fixed price contract is used to deliver the project. It means that the construction contractors are responsible for completing the whole project with the fixed price. Hence, the cost control will come down to management of changes to the contract. As a result, new price of the contract is the sum of the original contract price and the cost of approved changes (Federal Transit Administration (FTA), 2009).

Type of Change	Description	Contractor Compensation
Agency Action	<ul style="list-style-type: none"> - Changing the plans and specifications - Altering the time to complete the work - Changing the contractors' means and methods - Regulatory changes - Third party delays where the Agency is responsible for coordinating the third party work 	Contractor is compensated. If another contractor's non-performance causes the change, the other contractor should be back-charged.
Differing Site Conditions	<ul style="list-style-type: none"> - Subsurface conditions differ from those represented by the Agency - Unusual conditions occur that could not reasonably be anticipated 	Contractor is compensated.
Errors or Omissions	<ul style="list-style-type: none"> - Errors or omissions in the design plans and specifications 	Contractor is compensated. The designer should be back-charged.
VE	<ul style="list-style-type: none"> - Contractor proposes a change that will reduce the project costs 	Agency and contractor share the cost savings.
Contractor Action	<ul style="list-style-type: none"> - Contractor changes means and methods and/or delays project due to their own non-performance - Third party delays where the contractor is responsible for coordinating the third party work 	Contractor is not compensated but may be given additional time for third party delays.

Figure 8: Changes during construction and contractor's compensation
 Source: Federal Transit Administration (FTA) (2009). Construction Project Management Handbook

Variety of types of changes can occur during a construction phase. This derives from change orders that are issued by both the owner and the contractors. Federal Transit Administration (FTA) (2009) introduced principles to determine whether the construction contractor gets compensation for the changes (Figure 8). Moreover, the cost control of the changes depends on a management culture, i.e., whether the RFCs of the construction contractors are resolved in a timely and effective manner.

3.5.3 Quality control during a construction phase

As quoted in Bennett (2003), American Society of Civil Engineering (2000) defined quality as “the fulfillment of project responsibilities in the delivery of products and services in a manner that meets or exceeds the stated requirements and expectation of the owner, design professional and contractor” (p.218). Moreover, project quality management includes the processes of the performing organization to determine quality policies, objectives, and responsibilities so that the project’s outcomes will be satisfied the quality requirements and/or standards (Project Management Institute, 2008).

Quality control is defined as “the process of monitoring specific project results to determine whether they comply with the relevant quality standards and identifying ways to eliminate the causes of unsatisfactory results” (Project Management Institute, 1996) (p.83). Therefore, quality control should require the construction contractors to provide a quality assurance and/or a quality control plan that are approved by the owner (American Society of Civil Engineers, 2000 & Federal Transit Administration (FTA), 2009). In addition, the owner should simultaneously have a quality management plan describing how the quality control is conducted in the project (Federal Transit Administration (FTA), 2009).

Generally, the quality assurance and/or quality control plan include many different elements introduced by American Society of Civil Engineers in 2000 (As quoted in Bennett (2003), p.220). These factors are: (1) recruiting and assigning a skilled workforce; (2) quality control organization; (3) project progress schedule; (4) inspections; (5) quality control testing plan; (6) documentation of quality testing plan; and (7) procedures for corrective action when quality standards are not meet.

Normally, the quality control during a construction phase is connected with: (1) review contract documents to verify quality aspects that have been considered; (2) supervise construction activities in accordance with quality requirements and/or standards; (3) perform quality inspections; and (4) audit consultants, contractors and suppliers quality programs for adequate and compliance (Federal Transit Administration (FTA), 2009) (p.6-14). Hence, achieving project’s outputs with satisfied quality requires responsibility of both the owner and the construction contractors. It means that the owner performs construction supervision and inspections to ensure that the contractors accord with the quality assurance and/or the quality control plan as well as the quality standards. Meanwhile, the contractors control the quality of their deliverables themselves by evaluating and verifying against the criteria specified in the design documents (Federal Transit Administration (FTA), 2009).

Design consultants, who are known as designers of the record, also attend in the quality control during the construction phase. This is because they continue to make period visits on site to assure design compliance (Masterman, 1992 & Federal Transit Administration (FTA), 2009). One of important activities of the quality control is testing on site, which aims at protecting the public, the owner, the design professional, and the contractor. Thus, it is normally performed by independent outside companies. Furthermore, public officials

representing the local authority can be visited to attend in construction inspections to assure compliance with local building codes (Bennett, 2003).

Federal Transit Administration (2009) introduced procedures for resolving the constructors' deliverables with unsatisfied quality. They are: (1) the deliverables with unsatisfied quality should be documented in non-conformance reports; (2) the contractors take responsibility of determining the causes of unsatisfied quality, and performing proper corrective actions; and (3) the owner does not pay for work with satisfied quality, and makes a work stop order until the contractors have a proper plan for the quality problem.

4. A VIETNAMESE CASE: “U MINH BRIDGE CONSTRUCTION PROJECT”

4.1 Overview of the Vietnamese case

A case that has selected to support my thesis is U Minh bridge construction project (Figure 9). This project is a public one, which was completed in August 2011 with the construction cost of 31.212.000.000 VND (~ 1.5 USD millions) and construction period of 450 days.



Figure 9: U Minh Bridge, August 2011

The main goals of the project are to (1) reduce traffic across the current bridge and (2) make convenient traffic in the U Minh town. Its purpose is to encourage the economic, cultural and social development of the U Minh town by linking other areas.

U Minh bridge construction project includes construction of main bridge and approach embankment. The main bridge has length of 231 meters and width of 8 meters; and the road has length of 182 meters.

Owner is Ca Mau provincial Transport and Communication Department that is a responsible department of Provincial Committee in Ca Mau province, Viet Nam. For U Minh bridge construction project, the owner used a traditional procurement system (Design/Bid/Build) to deliver the project. This means that the owner contracted with a design company to complete the design, and then an open competitive bid was conducted to choose a contractor for construction.

The owner established a project management unit (PMU) to manage directly U Minh bridge construction project. The director of the PMU acted as the behalf of the owner in relations with the design consultants (DC), the supervision consultants (SC) and the construction contractor (CC) based on the director of the PMU's power delegated by the owner. Furthermore, the director of the PMU was assigned to make contracts with the DC and the CC as well as the SC.

4.2 Project phases of the Vietnamese case

The life cycle of U Minh bridge construction project included five main phases (Figure 10)

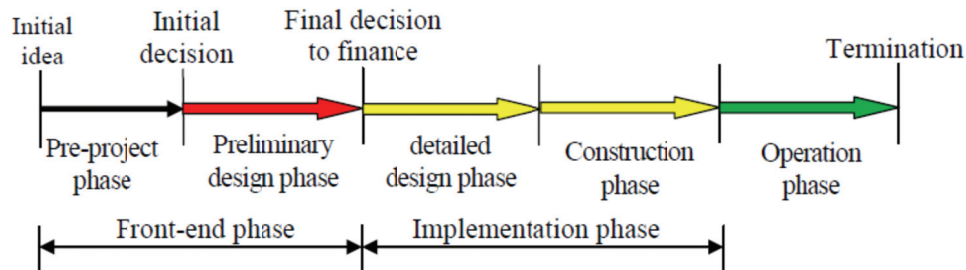


Figure 10: Phases of U Minh bridge construction project

The pre-project phase

This stage was very simple. The ultimate decision-maker (Provincial Committee) and his responsible departments evaluated whether this investment is essential. Finally, the ultimate decision-maker made a decision for approving the investment based on recommendations provided by his relevant responsible departments.

In this phase, the owner – Ca Mau Provincial Transport and Communication Department was recognized and specified in the decision.

The preliminary design phase

The director of the project management unit (PMU) was the behalf of the owner to make a contract with the design consultants (DC) for the preliminary design that comprised three design alternatives, cost estimation, socio-economic analysis, etc.

Finally, the ultimate decision-maker made a decision for selecting the best design alternative and approving the project budget based on the verification of his all relevant responsible departments.

The detailed design phase

The director of the PMU was the behalf of the owner to make a contract with the design consultants (DC) for the detailed design. Finally, the owner made a decision for approving the detailed design. This is different from the previous phases - the pre-project and preliminary design phases where the ultimate decision-maker made decisions for approval.

The construction phase

There were three construction contractors attending in a competitive bid for construction. Finally, one of them was winner for constructing the whole project.

The operation phase

After the project was fully completed, the owner assigned his responsible division to manage the bridge during the operation phase.

4.3 Relationships between the key parties in the detailed design phase

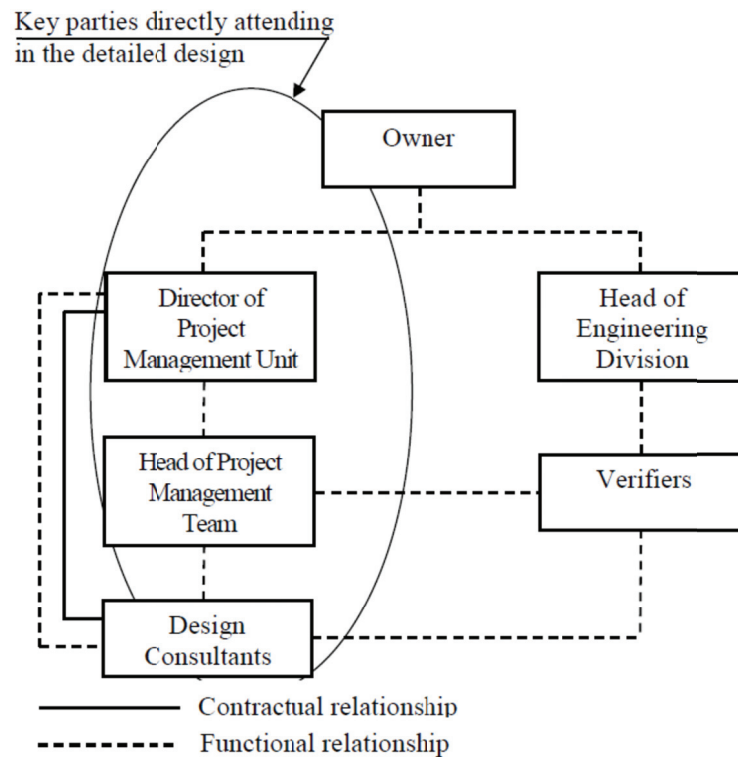


Figure 11: Contractual and functional relationships between the key parties in the detailed design phase (U Minh bridge construction project)

There are four actors directly joining in the detailed design of U Minh bridge construction project (Figure 11). They are (1) the owner, (2) the director of the project management unit (PMU), (3) the head of the project management team (PMT), and (4) the design consultants (DC). After the detailed design completed by the DC, the director of the PMU would review it and then submit it to the owner for verifying and approving the detailed design.

In this case, the owner appointed the head of the engineering division (ED) to review the detailed design. Therefore, six actors attending in the detailed design phase from having the design consultants (DC) until the detailed design approved by the owner are (1) the owner, (2) the director of the PMU, (3) the head of the PMT, (4) the DC, (5) the head of the ED, and (6) the verifiers (Figure 11).

4.3.1 Formal relationships between the key parties in the detailed design phase (contractual and functional relationships)

Two formal relationships between the key parties in the detailed design phase were contractual and functional relations as follows:

* The director of the PMU and the design consultants (DC) had both the contractual and functional relationships to each other. This is because the director of the PMU contracted with the DC for the detailed design. Furthermore, the foundation of the functional relationship is that the director of the PMU performed design inspections, and organized meetings to handle problems of the detailed design, etc.

* The functional relationship was a relation between the owner and the director of the PMU; and the director of the PMU and the head of the PMT also had the functional relationship to each other. This is because they were the owner personnel. The owner assigned the director of the PMU to make the contract with the DC. After the detailed design completed, the director of the PMU had to submit the detailed design to the owner for approval. In addition, the head of the PMT, who performed his tasks assigned by the director of the PMU, oversaw directly the design work of the DC. The responsibility of the head of the PMT was to report all issues regarding the detailed design to the director of the PMU.

* The functional relationship was also a relation between the owner and the head of the ED. This is because the owner assigned the head of the ED to verify the detailed design submitted by the director of the PMU. Then the head of the ED provided the owner with recommendations that were basic so that the owner made a decision for approving the detailed design.

* The head of the ED and the verifiers also had the functional relationship to each other. The verifiers, who were the personnel of the ED, performed their functions allocated by the head of the ED. The responsibility of the verifiers was to report the review result of the detailed design to the head of the ED.

* The head of the PMT, the DC and the verifiers had the functional relationships to each other. This is because during the review process, the verifiers required the head of the PMT and the DC to provide information and explain the calculations, unclear items and so on of the detailed design.

4.3.2 Informal relationships between the key parties in the detailed design phase (trust and personal relationships)

Besides formal relationships, the key parties had informal relationships – trust and personal relationships to each other as follows:

* The owner, the director of the PMU, the head of PMT, the head of the ED and the verifiers had both the trust and personal relationships to each other. This is because they were the owner personnel, and had long time to work together. Therefore, they well understood their ability and experience to each other. This helped to establish trust among them. Moreover, the personal relationships among them were mainly friendship and colleague.

* Both the owner and the director of the PMU and the DC also had both the trust and personal relationships to each other. This is because the DC, who had been hired by the owner and the director of the PMU, designed successfully many projects with high quality, build-ability, and the detailed design completed on time in the past. The personal relationships among them were mainly friendship.

* The head of the ED, the verifiers, the head of the PMT and the DC also had both the trust and personal relationships to each other because they worked together in many successful projects.

In conclusion, all key parties involved in the detailed design phase had both the trust and personal relationships to each other.

4.4 Relationships between the key parties in the construction phase

There were six actors (Figure 12) attending in the construction phase of U Minh bridge construction project, including (1) the owner, (2) the director of the PMU, (3) the head of the PMT, (4) the DC, (5) the supervision consultants (SC), and (6) the construction contractor (CC).

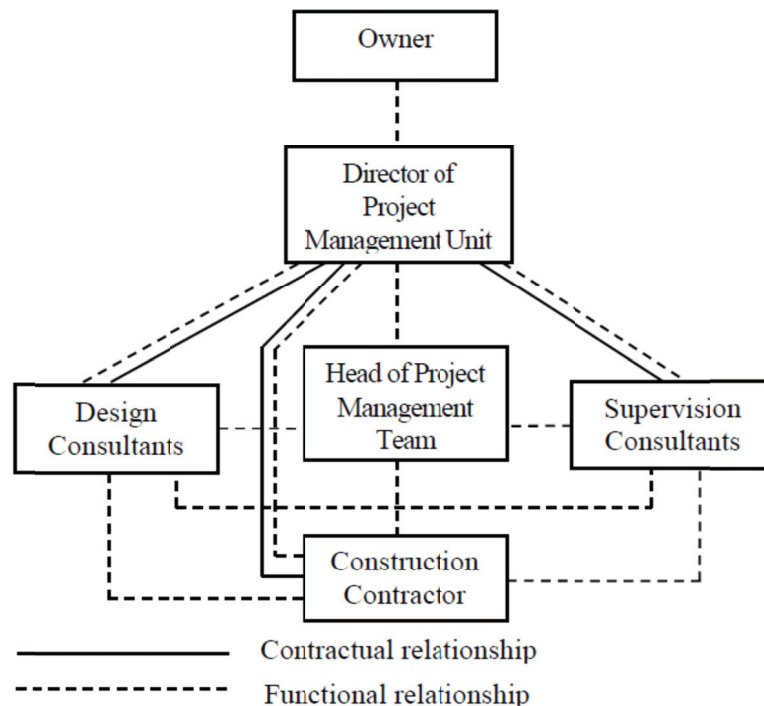


Figure 12: Contractual and functional relationships between the key parties in the construction phase (U Minh bridge construction project)

4.4.1 Formal relationships between the key parties in the construction phase (contractual and functional relationships)

Two formal relationships in the construction phase were contractual and functional relations as follows:

* The functional relationship was a relation between the owner and the director of the PMU; and the director of the PMU and the head of the PMT also had the functional relationship to each other. This is because they were the owner personnel. During the construction stage, the director of the PMU provided the owner with recommendations to make a decision for approval of changes, etc. Furthermore, the head of the PMT provided the director of the PMU with recommendations to resolve issues occurring in the construction phase.

* The head of PMT, the DC, the SC, and the CC also had the functional relations to each other. This is because during the construction phase, the DC continued to provide their services such as inspection responsibilities and information provision. Moreover, the SC performed the supervision of the construction activities of the CC. In addition, the head of the MPT checked the activities of both the SC and the CC; and sent requests for changes (RFCs), information (RFIs) and submittals to the DC for reviewing and responding.

* The director of the PMU and each contractor (the DC, the SC, and the CC) had both the contractual and functional relationships to each other. This is because besides the contract between the director of the PMU and each contractor, the director of the PMU performed construction inspections with attendance of all contractors to determine whether the CC's deliverables was accepted. Moreover, the director of the PMU sometimes visited on site to check the activities of these contractors.

4.4.2 Informal relationships between the key parties in the construction phase (trust and personal relationships)

Besides formal relationships, the key parties had informal relationships – trust and personal relationships to each other as follows:

* The owner, the director of the PMU and the head of PMT had both the trust and personal relationships to each other. This is because they were the owner personnel, and had long time to work together. Therefore, they well understood their ability and experience to each other, which was basic of establishing trust among them. The personal relationships among them were mainly friendship and colleague.

* The owner, the director of the PMU, the DC, the SC, and the CC had both the trust and personal relationships to each other. The trust relationships were formed because the owner and the director of the PMU had hired these contractors to do successfully many projects in the past. Moreover, these contractors were local, and they had worked together in many successful projects. Thus, they well knew to each other. The personal relationships between them were mainly friendship.

* The head of the PMT also had both the trust and personal relationships with the DC, the SC, and the CC because of above reasons.

In conclusion, all key parties involved in the construction phase had both the trust and personal relationships to each other.

4.5 Project organization, decision-making and communication processes in the construction phase.

4.5.1 Project organization for construction

Project organization for construction of U Minh bridge construction project consisted of main three systems (Figure 13) as follows:

(1) Owner personnel system included the owner, the director of the project management unit (PMU), and the head of the project management team (PMT).

(2) Consultant services system contained the design consultants (DC) and the supervision consultants (SC).

(3) Construction contractor system included the only one construction contractor (CC).

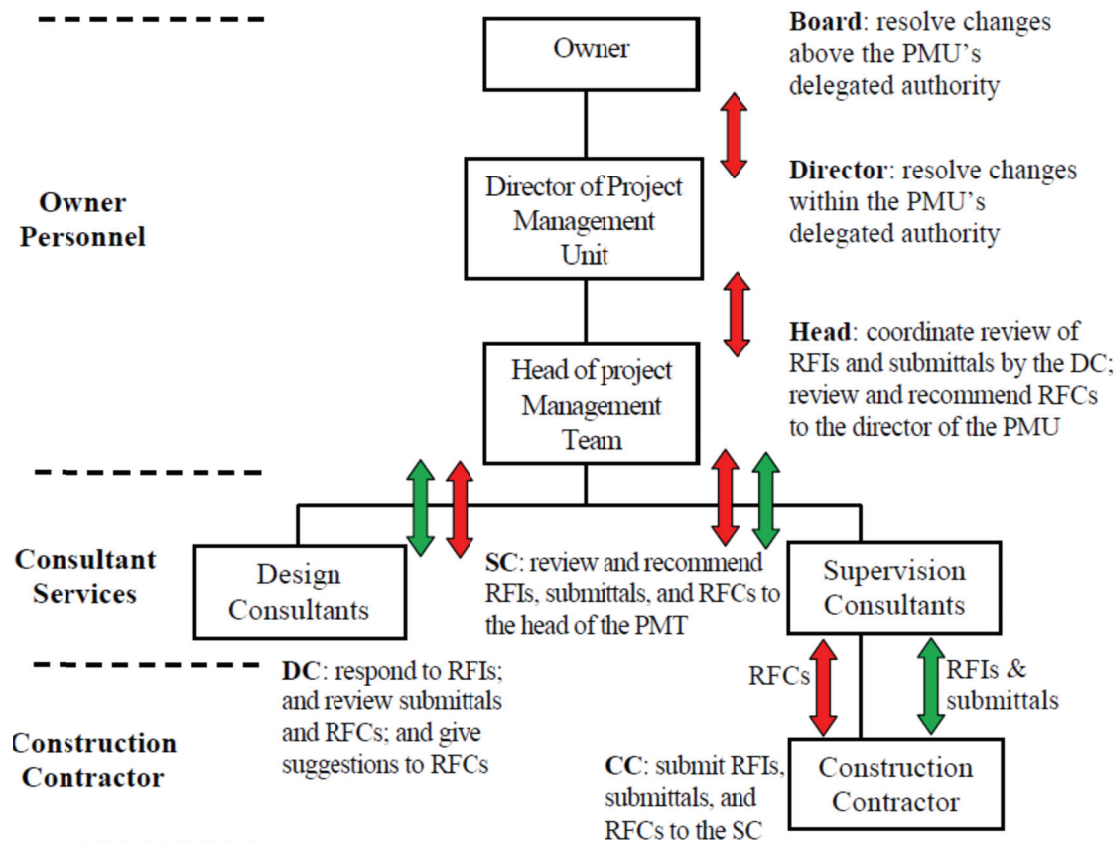


Figure 13: Project organization, assigned authority and lines of communications for construction (U Minh bridge construction project)

4.5.2 Decision-making process for resolving requests for changes (RFCs)

The “**red arrows**” present the decision-making process for resolving the requests for changes (RFCs) of the construction contractor (CC) (Figure 13). This process may include

the attendance of several or all key parties involved in the construction phase. This depended on types of changes that decision-making for resolving these changes was within or over the assigned authority of the director of the PMU.

The decision-making process for resolving the RFCs included several steps as follows:

- * Firstly, the construction contractor (CC) submitted his RFCs to the supervision consultants (SC). Then the SC evaluated these RFCs, and provided recommendations to the head of the PMT.

- * Secondly, after receiving the RFCs from the SC, the head of the PMT reviewed the RFCs and then sent them to the DC. The responsibility of the DC was to review the RFCs to determine whether the RFCs were suitable, and then provided suggestions to solve the RFCs.

- * Finally, the head of the PMT provided the director of the PMU with recommendations to make a decision for resolving the RFCs based on the evaluations and suggestions of both the DC and the SC. If this decision-making were over the assigned authority of the director of the PMU, he would provide the owner with recommendations to make a decision for resolving the RFCs.

4.5.3 Communication process for reviewing requests for information (RFIs) and submittals

The “**green arrows**” illustrate the lines of communications for reviewing the requests for information (RFIs) and the submittals of the construction contractor (CC) (Figure 13).

The communication process for reviewing the RFIs and the submittals was conducted in writing. In this process, the head of the MPT worked as a coordinator to link information between the design consultants (DC) and the construction contractor (CC).

The communication process for reviewing the RFIs and the submittals included several steps as follows:

- * Firstly, the CC submitted his RFIs and submittals to the SC. The responsibility of the SC was to review these requests and then provided recommendations to the head of the PMT.

- * Secondly, after receiving the RFIs and the submittals, the head of the PMT reviewed these requests and sent them to the DC for reviewing and responding.

- * Thirdly, the responsibility of the DC was to respond these requests. Next, the DC submitted their responses to the head of the PMT who would examine these responses before sending them to the CC. Finally, the construction contractor (CC) received the responses of the DC throughout the SC.

4.6 Influences of relationships between the key parties on the processes of the time, cost and quality control during the construction phase

4.6.1 Influences of relationships between the key parties on the process of time control

4.6.1.1 Process of the time control during the construction phase

Time control of U Minh bridge construction project was conducted based on the construction schedule provided by the construction contractor (CC), and approved by the director of the project management unit (PMU).

Updating this schedule was performed every month, and was done by the supervision consultants (SC). The update of the construction schedule was done as follows:

- * The CC monthly provided the progress reports to both the SC and the head of the PMT. Next, the SC performed the review of these reports. After that, the SC monthly provided the head of the PMT with their own progress reports. Furthermore, in the progress reports, both the CC and the SC had to evaluate that the achieving progress of the project affects the time of the remaining works.

- * The responsibility of the head of the PMT was the review and evaluation of the progress reports provided by both the CC and the SC. Then the head of the PMT sent these reports to the director of the PMU for assessment.

- * The director of the PMU monthly provided the progress reports to the owner so that the owner assessed the project progress as overall oversight.

4.6.1.2 Influences of relationships between the key parties on the process of the time control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the time control because of several below reasons:

- * The contracts clearly determined responsibilities of the relevant parties in the time control. This was a legal obligation to assure that the relevant parties had to attend in the process of the time control.

- * Regulations for penalizing the construction contractor when breaking the approved construction schedule positively affected the process of the time control.

Functional relationships: The functional relationships positively affected the process of the time control because in this process, the relevant parties performed their tasks with a

positive attitude. For example, the owner and the director of the PMU clearly perceived the importance of the project. Therefore, they highly concerned the review of the progress reports, and gave suitable solutions to progress problems in a timely manner. In addition, the CC and the SC always provided the progress reports on time with sufficient information.

Trust relationships: The trust relationships had negative impacts upon the process of the time control. This is because the trust relationships resulted in the subjective of reviewing the progress reports leading to mistakes.

Personal relationships: The personal relationships had positive influences on the process of time control because they encouraged communications between the relevant parties. This made information exchange more often, which helped to resolve the progress problems more effectively. Moreover, basing on good personal relationships between the owner and the CC, the owner informally contacted the CC to require the CC to resolve the progress problems without cumbersome formal procedures.

4.6.2 Influences of relationships between the key parties on the process of the cost control

4.6.2.1 Process of the cost control during the construction phase

The cost control process was conducted to ensure that the project expenditures did not exceed the project budget.

The owner used a unit cost contract to deliver U Minh bridge construction project. It means that the owner took responsibility of the risk of the volumes because the construction contractor (CC) was paid by the actual volume; and the CC was responsible for the unit cost risk since the unit cost was almost fixed. (The unit cost was only adjusted in certain situations specified in the contract).

The supervision consultants (SC) were responsible for reviewing the actual volumes performed by the construction contractor. Then the SC provided the head of the PMT with reports of the actual volumes that were basic so that the director of the PMU paid for the CC.

There was no any cost baselines in this project, so the update of the cost was performed throughout comparing the actual volumes with the correspondent volumes in the approved detailed design to recognize the expenditure status of the project.

Both the owner and the CC had power to make the RFCs during the construction stage. Moreover, the CC may get compensation for approved changes; and the cost of these changes was estimated by the DC, and was approved by the owner. In addition, if these

changes caused the cost overrun, the owner would provide recommendations to the ultimate decision-maker (Provincial Committee) for approving the changes.

4.6.2.2 Influences of relationships between the key parties on the process of the cost control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the cost control because of several below reasons:

* The contracts clearly determined responsibilities of the relevant parties in the cost control. This was a legal obligation to assure that the relevant parties had to attend in the process of the cost control.

* Regulations about payment for the construction contractor, the adjustment of the unit cost and so on specified in the contract positively affected the process of the cost control.

Functional relationships: The functional relationships had negative influences on the process of the cost control. This is because significant conflicts happened when the relevant parties performed their tasks in this process. A main reason of having the conflicts is that they always acted to protect their own interests. For example, the CC always wanted to adjust the unit cost, but the owner did not want to do that.

Trust relationships: The trust relationships had positive impacts upon the process of the cost control. This is because the trust relationships reduced conflicts between the relevant parties in this process. The conflict reduction led most of payments for the construction contractor in U Minh bridge construction project to be conducted on time. Furthermore, the owner and the construction contractor had high trust to each other, the owner advanced money to the construction contractor to conduct his construction activities.

Personal relationships: The personal relationships had positive influences on the process of cost control since the personal relationships enhanced trust and encouraged communications between the relevant parties in this process.

4.6.3 Influences of relationships between the key parties on the process of the quality control

4.6.3.1 Process of the quality control during the construction phase

The quality control of U Minh bridge construction project during the construction stage included the director of the PMU's construction inspections, the supervision consultants' construction supervision, and the design consultants' supervision.

The supervision consultants (SC) supervised and assessed quality of deliverables submitted by the construction contractor (CC) based on the quality standards of the Vietnamese government. This was specified in the contract between the director of the PMU and the SC. When recognizing the deliverables with unsatisfied quality, the SC required the CC for correction. Furthermore, the SC examined the inputs of the CC by taking experimental prototypes on site. In this case, a specialized company hired by the CC performed acceptance tests.

The design consultants (DC) periodically visited on site during construction stage. When recognizing the errors of the CC against the specifications of the approved design, the DC asked the CC for correction. Furthermore, the DC attended in the director of the PMU's construction inspections to assess whether the CC's deliverables were accepted.

If the CC did not perform corrective actions for the deliverables with unsatisfied quality realized by the SC and the DC, the director of the PMU would determine cost for correction, and then the CC had to pay for this cost.

The head of the project management team (PMT) checked the activities of the SC and usually visited on site to examine the project quality to ensure that both the CC and the SC correctly performed the quality activities. Moreover, the director of the PMU performed period and complete inspections during the construction phase to determine whether the CC's deliverables were accepted.

4.6.3.2 Influences of relationships between the key parties on the process of the quality control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the quality control because of several below reasons:

* The contracts clearly determined responsibilities of the relevant parties in the process of the quality control. This was a legal obligation to assure that the relevant parties had to attend in this process.

* Regulations for resolving the deliverables with unsatisfied quality of the construction contractor positively affected the process of the quality control.

* The construction contractor (CC), the supervision consultants (SC), and the design consultants (DC) had adequate capacity to perform their tasks.

Functional relationships: The functional relationships had positive impacts on the process of the quality control because most of the relevant parties well performed tasks with a positive attitude. For instance, the owner and the director of the PMU had high concern in the quality control. They usually visited on site, and directed the head of the PMT to check the quality activities of the contractors. Furthermore, the SC strictly supervised the construction activities of the construction contractor in accordance to the quality standards.

By contrast, the functional relationships also had negative influences on the process of the quality control since several interest conflicts between both the owner and the SC and the CC happened. In addition, the DC infrequently visited on site to perform their tasks in this process.

Trust relationships: Trust relationships positively affected on the process of the quality control. This is because only a few significant conflicts occurred in this process, and these conflicts were quickly resolves based on trust that they had to each other.

Personal relationships: The personal relationships did not seem to have any influences on the process of the quality control because in this process, the relevant parties were very strictly required in accordance with regulations specified in the contract.

5. A NORWEGIAN CASE: “PIRBRUA IN TRONDHEIM”

5.1 An overview of the Norwegian case

Pirbrua in Trondheim is River Nid bridge construction project (Figure 14). It is a public project completed in June 2009, forming a part of the new ring road to lead traffic round Trondheim's city center. This bridge has length of 130 meters, and includes two road lanes as well as pedestrian and cycle paths.



Figure 14: River Nid Bridge

The main four goals of the project are:

- (1) Relieve the downtown and downtown residential areas through traffic, heavy traffic and traffic of dangerous of goods.
- (2) Reduce the number of dwellings in the downtown and Ila with indoor noise over 35 dBA to 75-80% and the number of accidents in the downtown and Ila by 10-20%.
- (3) Tie up and operate the port areas of Nyhavna, Brattøra, Ila pier and Høvringen.
- (4) Facilitate close to the city housing and commercial development, including the lower river port and Brattøra Iilsvika.

The owner is Norwegian Public Roads Administration (NPRA). The owner used a management contracting approach that is considered as a traditional method (Design/Bid/Build) to deliver the project. Furthermore, the owner appointed a construction manager (CM) to coordinate and supervise the construction activities of the separate package contractors. In addition, the CM was assigned to make contracts with both the design consultants (DC) and the package contractors.

5.2 Project phases of the Norwegian case

The life cycle of River Nid bridge construction project included five phases that are the pre-project phase, the preliminary design phase, the detailed design phase, the construction phase, and the operation phase (Figure 15).

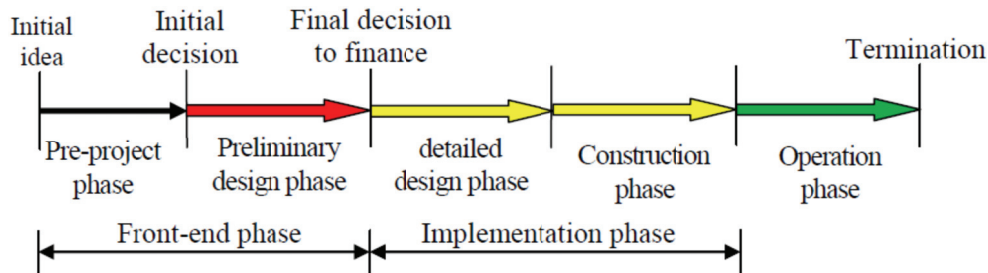


Figure 15: Phases of the River Nid bridge construction project

The pre-project phase: There were two main decisions produced at the phase. Trondheim Kommune made a political decision for approving the general scope of the project such as a number of lanes of the bridge, the location, etc. Meanwhile, Norwegian Public Roads Administration (NPRA) made a decision for approval of technical issues.

The preliminary design phase: In this phase, an open competition was conducted to choose the best preliminary design alternative for the project. There was the attendance of three consultant contractors who are:

- * Pir II (PirII/Myklebust),
- * Reinertsen (Reinertsen/Selberg), and
- * COWI (COWI/Dissing+Weitling).

Each of these contractors provided a preliminary design alternative. Furthermore, a group consisting of the project leader (PL), the construction manager (CM), and experts was responsible for the assessment of the competition for choosing the consultant contractor. Finally, COWI (COWI/Dissing+Weitling) won this competition.

The detailed design phase: After the preliminary design phase completed, the CM contracted with COWI for the detailed design of the project, and managed the work of the DC during the detailed design stage. In addition, NPRA, in this stage, was a final decision-maker for approving the detailed design before starting a competition for choosing construction contractors. Therefore, NPRA hired other consultant contractor called the review consultants (RC) to review the detailed design as the basic of decision-making.

The construction phase: The project was divided into five work packages of “piling”, “concrete”, “steel”, “machine”, and “asphalt”. Thus, five separate open competitive bids

were conducted to select construction contractors. After these competitive bids completed, the CM was responsible for making the contracts with winners.

The operation phase: This phase started when the package contractors handed over the bridge until its disposal.

To manage the project, NPRA established a hierarchical organizational structure presented in Figure 16. This organization included five key parties, i.e., (1) NPRA, (2) Statens vegvesen Region Midt, (3) the development manager (DM), (4) the project leader (PL), and (5) the construction manager (CM). Moreover, the PL and the CM were fully delegated to manage directly the detailed design and construction phases of the project.

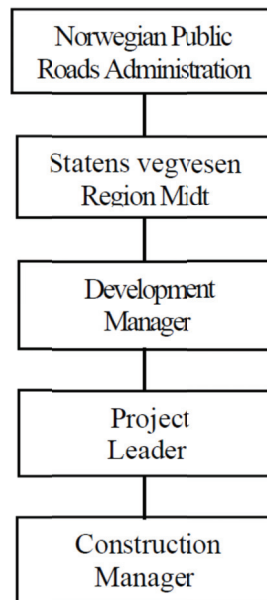


Figure 16: Hierarchical organizational structure on owner side (River Nid bridge construction project)

5.3 Relationships between key parties in the detailed design phase

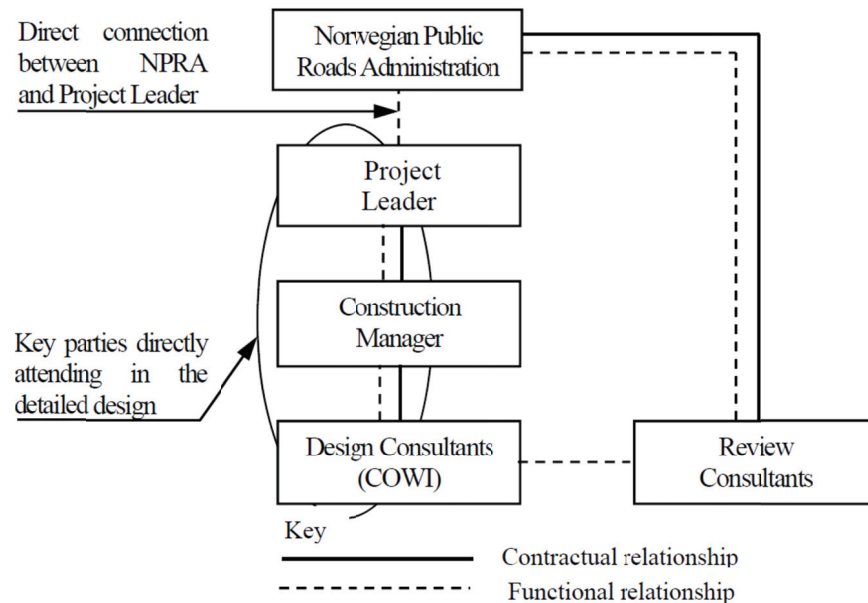


Figure 17: Contractual and functional relationships between the key parties in the detailed design phase (River Nid bridge construction project)

There are three actors directly joining in the detailed design of River Nid bridge construction project (Figure 17). They are (1) the project leader (PL), (2) the construction manager (CM), and (3) the design consultants (DC).

After the detailed design completed by the DC, the PL had direct contact with NPRA for review and approval of the detailed design. This direct connection was outside Statens vegvesen Region Midt and the development manager (DM) in the hierarchical organizational structure presented in Figure 16.

In this case, NPRA hired a consultant company called the review consultants (RC) to review the detailed design. Therefore, five actors attended in the detailed design phase are (1) NPRA, (2) the PL, (3) the CM, (4) the DC, and (5) the RC (Figure 17).

5.3.1 Formal relationships between the key parties in the detailed design phase (contractual and functional relationships)

Two formal relationships between the key parties in the detailed design phase were contractual and functional relations as follows:

* The functional relationship was a relation between NPRA and the project leader (PL). This is because there were interrelations between NPRA and the PL during the review of the detailed design. For example, the PL provided the documents of the detailed

design to NPRA, and got back a decision produced by NPRA for approval of the detailed design to conduct competitive bids for construction.

* The functional relationship was also a relation between the design consultants (DC) and the review consultants (RC) since they had contact with each other during the review of the detailed design.

* The PL and the CM had both the contractual and functional relationships to each other. This is because besides the contract, the CM had to report to the PL on progress of the detailed design, the cost, etc. In addition, the PL directed the CM to resolve issues occurring over the process of the detailed design.

* The CM and the DC, and NPRA and the RC had both the contractual and functional relationships to each other. This is because the CM hired the DC for making the detailed design, and NPRA hired the RC for reviewing the detailed design. In addition, the functional relation between the CM and the DC was presented via that the CM reviewed design documents submitted by the DC. Furthermore, NPRA and the RC had the functional relation to each other since the RC reported NPRA on the result of the review of the detailed design.

5.3.2 Informal relationships between the key parties in the detailed design phase (trust and personal relationships)

Besides formal relationships, the key parties had informal relationships to each other, including trust and personal relationships as follows:

* NPRA and the PL did not seem to have the personal relationship to each other since the connection was very formal. Furthermore, the PL and the CM had both the trust and personal relationships to each other. This is because they well knew to each other, and had many chances to get information on knowledge, experience, and ability to each other. This helped to form trust in the relation.

* The CM and the DC had both the trust and personal relationships to each other. At the beginning, there were not any trust and personal relations between the CM and the DC since they did not know to each other before. However, the trust and personal relationships were established and developed over the detailed design phase. This is because they had many opportunities to work together, so they could get information on knowledge, ability, and experience to each other. Furthermore, they had good activities to build good personal relations to each other as having dinners in the evening.

* In this case, the trust relationship was recognized to find fast out solutions to problems, and the personal relation made communication between the key parties better in the detailed design phase.

5.4 Relationships between the key parties in the construction phase

There were ten actors attending in the construction phase of River Nid bridge construction project. They are (1) the development manager (DM), (2) the project leader (PL), (3) the construction manager (CM), (4) the design consultants (DC), (5) the supervision consultants (SC), (6) the concrete contractor, (7) the asphalt contractor, (8) the piling contractor, (9) the machine contractor, and (10) the steel contractor (Figure 18). Particularly, the DM may be considered as the owner of the project in the construction phase.

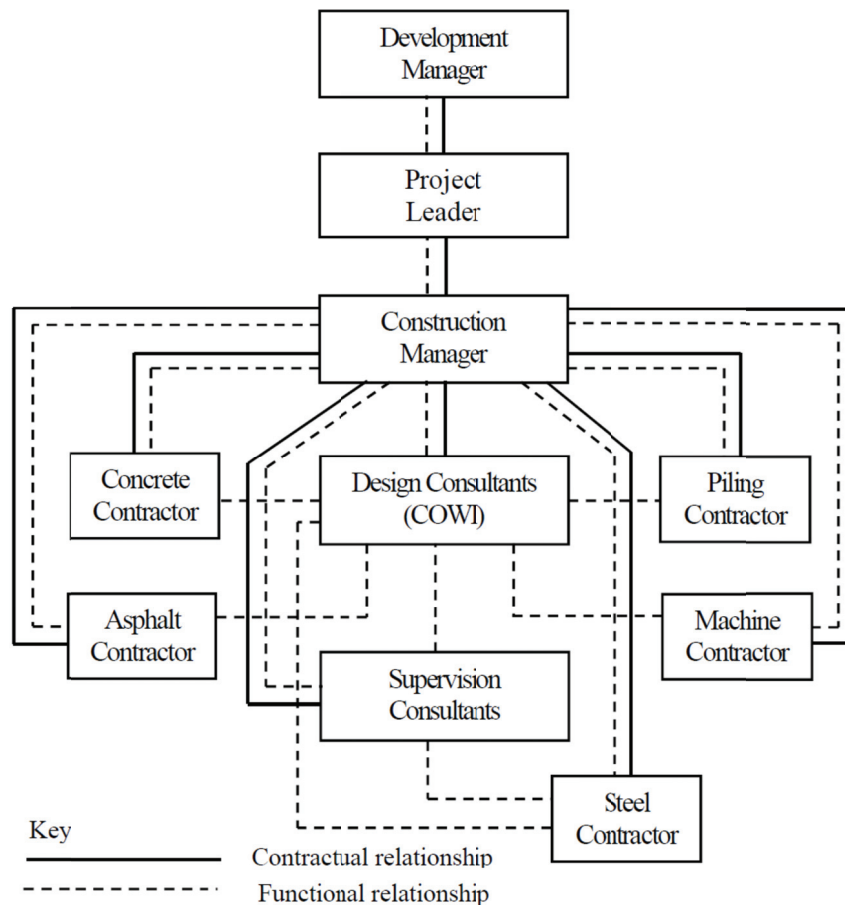


Figure 18: Contractual and functional relationships between the key parties in the construction phase (River Nid bridge construction project)

5.4.1 Formal relationships between the key parties in the construction phase (contractual and functional relationships)

Two formal relationships between the key parties in the construction phase were contractual and functional relations as follows:

* The development manager (DM) and the project leader (PL) had both the functional and contractual relationships to each other. This is because besides the contract, the PL had to report monthly the DM on project progress, project finance, security issues, etc.

* The PL and the CM also had both the functional and contractual relations to each other. This is because besides the contract, the CM performed his function in connection with the PL. For example, the CM provided the PL with recommendations to make decisions for approval of changes. In addition, sometimes the CM had several meetings with the PL to handle problems regarding the construction activities of the contractors.

* The CM and the package contractors (the concrete contractor, the asphalt contractor, the piling contractor, the machine contractor, and the steel contractor) had both the contractual and functional relations to each other. This is because besides the contracts, the CM performed his function in connection with the package contractors. The CM supervised and coordinated the construction activities of these contractors. Moreover, the packages contractors submitted their RFCs, RFIs and actual volume reports to the CM.

* The CM and both the DC and the SC had both the contractual and functional relationships to each other. The reason for this is that the CM hired the SC for supervising and controlling only the construction activities of the steel contractor. Furthermore, the functional relation between the CM and the DC was presented via that the CM contacted the DC for reviewing the RFIs and submittals of the package contractors.

* The functional relationships were relations between the design consultants (DC) and the package contractors. This is because the DC continued to provide their services as information provision in the construction phase.

* The functional relationship was also a relation between the DC and the SC, and between the SC and the steel contractor since the SC performed their function in connection with both the DC and the steel contractor. For instance, the SC controlled the activities of the steel constructor against the contract documents as well as direct information exchange between the DC and the steel contractor during the construction phase.

5.4.2 Informal relationships between the key parties in the construction phase (trust and personal relationships)

Besides formal relationships, the key parties had informal relationships to each other, including trust and personal relationships as follows:

* The DM and the PL had both the personal and trust relationships to each other, but the degree of these relations was low since the connection was very formal. Furthermore, the PL and the CM had both the trust and personal relationships to each other. This is because they well knew to each other, and had many chances to get information on knowledge, experience, and ability to each other. This helped to established trust in the relationship.

* The informal relationships between the CM and both the package contractors and the SC in the construction phase were similar to these relations between the CM and the DC in the detailed design phase. The CM and both the package contractors and the SC did not seem to have any trust and personal relations to each other before. This is because this was the first time they worked together. However, the personal and trust relations was formed and developed over the construction stage.

* The personal and trust relationships were recognized to have positive influences on the project performance during the construction phase.

5.5 Project organization, decision-making and communication processes in the construction phase

5.5.1 Project organization for construction

Project organization for construction of River Nid bridge construction project consisted of main three systems (Figure 18 & Figure 19) as follows:

(1) Owner personnel system included NPRA, the development manager (DM), the project leader (PL), and the construction manager (CM).

(2) Consultant services system contained the design consultants (DC) and the supervision consultants (SC).

(3) Construction contractor system included five package contractors, i.e., (1) the concrete contractor, (2) the asphalt contractor, (3) the piling contractor, (4) the machine contractor, and (5) the steel contractor.

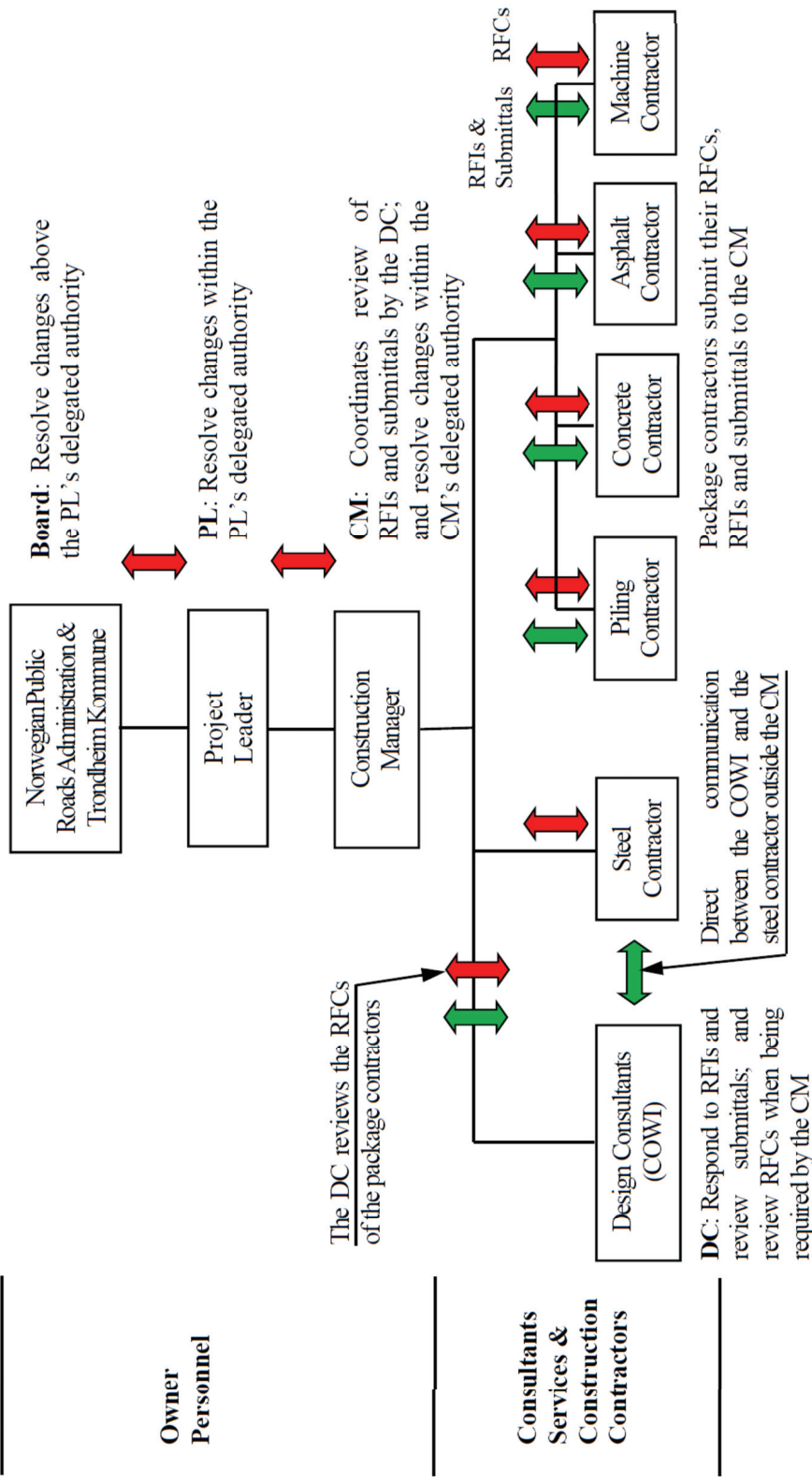


Figure 19: Project organization, assigned authority and lines of communications for construction (River Nid bridge construction project)

5.5.2 Decision-making process for resolving requests for changes (RFCs)

The “**red arrows**” present the decision-making process for resolving the requests for changes (RFCs) of the package contractors (Figure 19). This decision-making may be responsibility of NPRA, Trondheim Kommune (political decisions), the PL, and CM. This depends on big level of changes. In this case, the CM was assigned to make almost all decisions for changes of technical issues during construction. Furthermore, NPRA and/or Trondheim Kommune took responsibility of approving huge changes such as changing the project concept.

The decision-making process for resolving the RFCs included several steps as follows:

- * Firstly, the package contractors submitted their RFCs to the CM. Then the CM reviewed these RFCs, and made a decision for approval. In some cases, the CM needed to get opinions from experts as well as the DC as a basis for making a decision.

- * Secondly, if the decision-making were over the CM’s assigned authority, the CM would provide recommendations to the PL to make a decision for approval. In this case, the PL had power to make a decision for approval of changes if these changes caused cost overrun that was under 20% of the project budget.

- * Finally, NPRA and/or Trondheim Kommune would produce decisions for approval of changes when the decision-making was over the PL’s assigned authority.

5.5.3 Communication process for reviewing requests for information (RFIs) and submittals

The “**green arrows**” illustrate the lines of communications for reviewing the requests for information (RFIs) and the submittals of the package contractors (Figure 19). There were differences in communication lines between different package contractors in connection with the role of the CM.

For the RFIs and submittals of the concrete contractor, the asphalt contractor, the piling contractor, the machine contractor, the CM worked as a coordinator to link information between the DC and these contractors. This communication process included several following steps:

- * Firstly, these package contractors submitted their RFIs and submittals to the CM. The responsibility of the CM was to review these requests, and then sent them to the DC for reviewing and responding.

- * Secondly, the responsibility of the DC was to respond these requests, and sent back the CM. Finally, these package contractors received the responses of the DC via the CM.

For the RFIs and submittals of the steel contractor, there was a direct communication line between the DC and the steel contractor. This was a special connection outside the CM in this case.

5.6 Influences of relationships between the key parties on the processes of time, cost and quality control during the construction phase

5.6.1 Influences of relationships between the key parties on the process of the time control

5.6.1.1 Process of the time control during the construction phase

Time control of River Nid bridge construction project was performed based on the construction schedules provided by the package contractors, and approved by the CM.

After making the contracts, the CM would make the whole construction schedule based on the schedules submitted by package contractors. In the whole construction schedule, the CM made opening time between different contractors to aim at time compensation when any package contractors got progress problems in their own construction schedule.

Updating the construction schedule was conducted every two weeks. In addition, the package contractors took responsibility of updating their own schedule, and the CM was responsible for reviewing this update. Furthermore, the CM monthly reported the PL on project progress.

5.6.1.2 Influences of relationships between the key parties on the process of the time control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the time control. One of most important reasons is that the contracts regulated that the CM and the package contractors had to have meetings every two weeks to talk about the construction schedule, and give solutions to progress problems. These meetings were very important to complete the project on time. In addition, procedures for penalizing the package contractors when they were behind the approved schedule remarkably affected this process.

Functional relationships: The functional relationships had very positive influences on the process of the time control because in this process the relevant key parties worked as a team with good attitudes and relations. Another reason is that effective information exchange in the two-week meetings made the relevant parties understand well what happen or what should happen in the next two weeks. Therefore, they well performed their

function in this process. Particularly, the design consultants (DC) fast came up with good solutions when there were several problems regarding the drawings and specifications prepared by the DC.

Trust relationships: The trust relationships positively affected process of the time control. This is because trust in information exchange between the relevant parties made this process more convenient. In addition, the trust relationships made communication between the relevant parties easier. Furthermore, the relevant parties quickly find out good solutions to progress problems due to trust in previous experience of the key parties.

Personal relationships: The personal relationships had positive influences on the process of time control since they made communication more effective. In addition, the relevant key parties had good personal relations to each other, so there were not any problems when they worked together. Moreover, besides the two-week meetings, sometimes the CM informally contacted the leaders of the package contractors to talk about progress problems as well as solutions to these problems. This positively affected this process.

5.6.2 Influences of relationships between the key parties on the process of the cost control

5.6.2.1 Process of the cost control during the construction phase

The CM and the package contractors had unit cost contracts to each other. The CM took responsibility of the risk of the volumes because the package contractors were paid by the actual volume; and the package contractors were responsible for the unit cost risk since the unit cost was almost fixed. In this case, if the actual volume of the item increased 15% against the contract volume, the unit cost would be adjusted.

The actual volume was calculated by the package contractors, and was controlled by the CM. In addition, the CM paid for the package contractors based on the reports of the actual volume provided by the contractors.

An important technique of the cost control is cost update that was performed every month by the CM based on the cost baseline. In this case, to manage cost of changes, the CM had power to use the contingency fund of 15% of the project budget, and the PL had power to use the contingency fund of 20% of the project budget.

Both the owner and the package contractors had power to make RFCs during the construction stage. In addition, the package contractors might get compensation for approved changes. The cost of these changes was estimated by the package contractors, and was approved by the CM. Furthermore, if the contractors suggested changes bringing about cost savings, the package contractors would be shared 50% of the cost savings.

5.6.2 Influences of relationships between the key parties on the process of the cost control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the cost control because the contract terms covered this process in the construction phase. For example, the contract terms regulated procedures for payment for the contractors, how price of approved changes estimated, etc. Furthermore, a system agreed in advance by the relevant key parties for solving conflicts remarkably affected this process.

Functional relationships: The functional relationships had mostly positive impacts on the process of the cost control because the relevant parties performed their function with a good attitude. Sometimes, several conflicts with high voices occurred in the meetings, but these conflicts were quickly handled based on the contract terms, the system for solving conflicts, and understanding to each other.

Trust relationships: Trust in actual volume reports coming from the package contractors made the process of the cost control more convenient. However, the trust relationships had positive impacts upon this process when there needed to have a certain level of trust.

Personal relationships: The personal relationships positively affected the process of cost control. This is because the personal relations made convenient in communication, so cost issues were fast resolved. Moreover, the CM and the package contractors had a good personal relation to each other. Thus, they often had informal communications to each other to talk about price of changes. In addition, the contractors could show details building up the price. As a result, this helped the CM to check out the price in a timely and effective manner.

5.6.3 Influences of relationships between the key parties on the process of the quality control

5.6.3.1 Process of the quality control during the construction phase

The CM and his team were mainly responsible for the quality control of River Nid bridge construction project during the construction stage. Moreover, the SC – the third party hired by the CM controlled only the quality activities of the steel contractors. In addition, the package contractors had to conduct the basic control of their quality activities for themselves. In this case, the DC did not attend in the process of quality control during the construction stage.

After making the contracts, the package contractors were required to submit their own quality control plans that were basic so that the CM made a quality control plan for the whole project. This plan was viewed as an important system to perform construction supervision and construction inspection, and to resolve conflicts in the process of the

quality control. When recognizing the deliverables with unsatisfied quality, the CM required the package contractors for corrective actions with the same quality.

5.6.3.2 Influences of relationships between the key parties on the process of the quality control during the construction phase

Contractual relationships: The contractual relationships had positive influences on the process of the quality control. This is because the contractual terms regulated how the quality control conducted in the construction phase. This includes how inputs of the package contractors were checked out, procedures for solving deliverables with unsatisfied quality, and how the construction activities of the contractor were inspected.

Functional relationships: The functional relationships had very positive impacts on the process of the quality control because the relevant parties performed their tasks with a positive attitude. In addition, the relevant parties with good technical knowledge and practical experience were ease to understand their function in this process. Particularly, in this case, there were not any significant conflicts between the relevant parties in the process of the quality control. Furthermore, the CM found out the mistakes of the project manager of the concrete contractor, and then required to change him to assure that the quality of the project was satisfied.

Trust relationships: Trust relationships positively affected on the process of the quality control. One of important reasons is that trust in documentations coming from the package contractors made easier to check out. Moreover, there was less control of construction activities on site when the relevant parties had the trust relations to each other. Nevertheless, the formal quality control of the construction activities was always done, not depending on level of trust that was low or high.

Personal relationships: The personal relationships have positive influences on the process of the quality control since these relations seemed to make the relevant parties perform their tasks better.

6. COMPARISON and DISCUSSION

6.1 Comparison and discussion on formal relationships between key parties in a detailed design phase

6.1.1 The theoretical case and the Vietnamese case

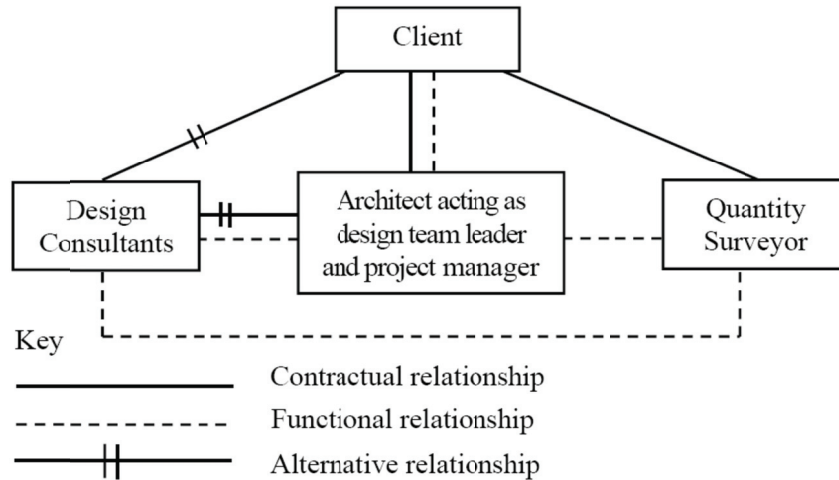


Figure 3: Functional and contractual relationships in a detailed design phase, Design/Bid/Build

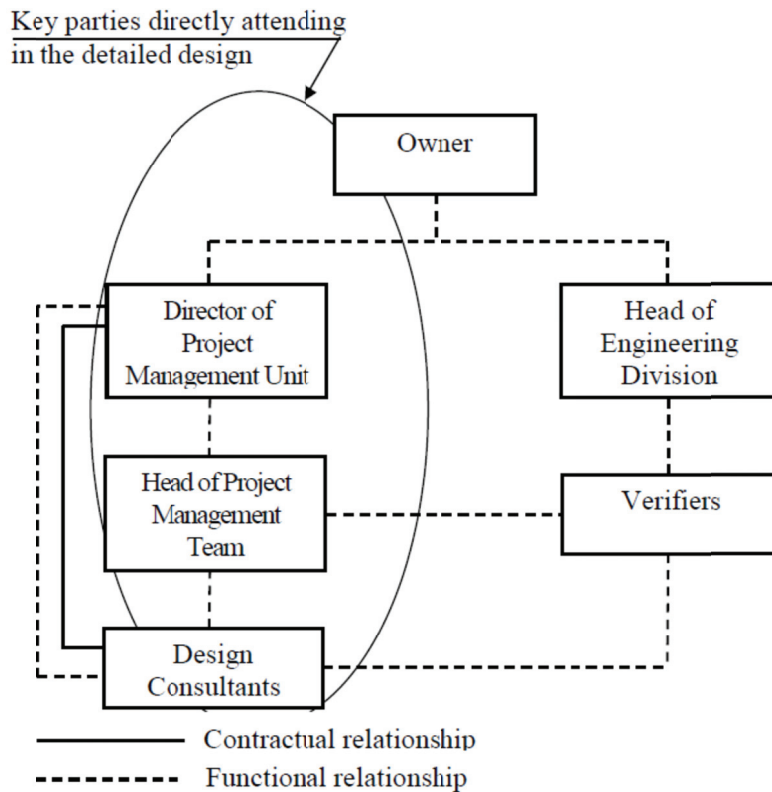


Figure 11: Contractual and functional relationships between the key parties in the detailed design phase (U Minh bridge construction project)

Two formal relationships - contractual and functional relationships between the key parties are found in both the Vietnamese (Figure 11) and theoretical cases (Figure 3). There are similarities and differences in the formal relationships between the Vietnamese and theoretical cases as follows:

* The director of the PMU in the Vietnamese case is the project manager in the theoretical case. The Vietnamese case has more actors than the theoretical case, i.e., six actors in the Vietnamese case in comparison with four actors in the theoretical case. This is because the management of the detailed design and the review of the detailed design in the Vietnamese case are conducted by two separate individuals – (1) the director of the PMU who is responsible for the management of the detailed design; and (2) the head of the ED who takes responsibility of the review of the detailed design. In the theoretical case, however, only the project manager is responsible for performing both these two roles (Masterman, 1992 & Federal Transit Administration (FTA), 2003).

To my limited knowledge, this difference may bring both advantages and disadvantage for the detailed design phase in the Vietnamese case. The first benefit is that the head of the ED is high competence in the review of the detailed design, so his review may help to achieve a more feasible detailed design. The second advantage is that there are more reviews of the detailed design, including both the director of the PMU and the head of the ED. Thus, it is potential to recognize mistakes that are made by the DC to achieve a right design. Nevertheless, one of significant drawbacks is that it takes much time.

From my observations, I realize that the detailed design phase will be completed sooner if the director of the PMU is fully responsible for reviewing the detailed design without the head of the ED's review of the detailed design, which is similar to the theoretical case. However, the quality of the detailed design might be poor. This is because the director of the PMU usually tries to complete the detailed design as planned to prepare for construction bids, which may lead to less concentration on the quality of the detailed design. Furthermore, because the director of the PMU directly manages both the detailed design and construction phases, mistakes of the detailed design can be corrected easily in the construction phase. This might cause subjectivity of reviewing the detailed design.

* The degree of the contractual relationships in the theoretical case is more complex than in the Vietnamese case. It is recognized that there is only one contractual relation in the Vietnamese case, but there are three contractual relations in the theoretical case. This difference can be explained by several reasons. Firstly, in the theoretical case, the owner contracts with two separate individuals – (1) the DC who makes the detailed design; and (2) the quantity surveyor who produces the quantity of bill. However, in the Vietnamese case, only the DC performs both these two roles. Secondly, the owner and both the director of the PMU and the head of the ED do not have the contractual relationships to each other in the Vietnamese case. This is because they are permanent governmental officials (in-house resources). In my opinion, in the Vietnamese case, the

DC conducts two roles – making (1) the detailed design and (2) quantity of bill. This may bring more benefits for the detailed design phase since it is easier to manage this stage.

* The level of the functional relationships in the theoretical case is less complex than in the Vietnamese case since the Vietnamese case has more actors than the theoretical case. This means that one actor can have more connections with other actors when he conducts his tasks in the Vietnamese case.

6.1.2 The theoretical case and the Norwegian case

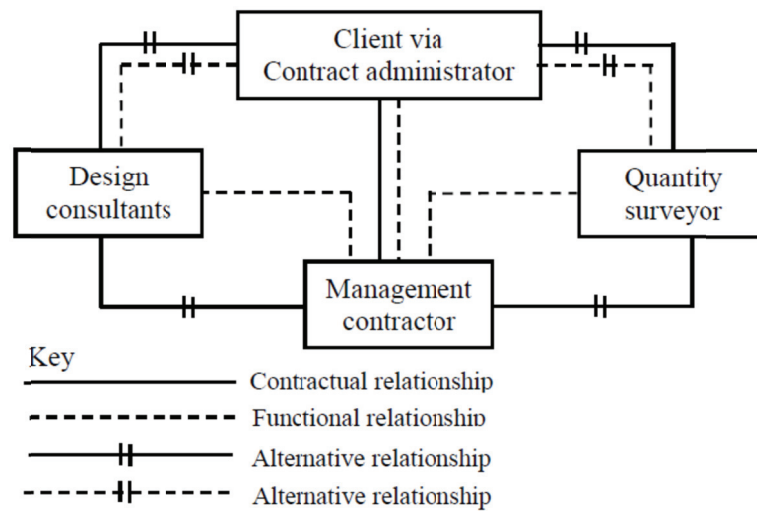


Figure 5: Functional and contractual relationships in a detailed design phase, Management contracting approach

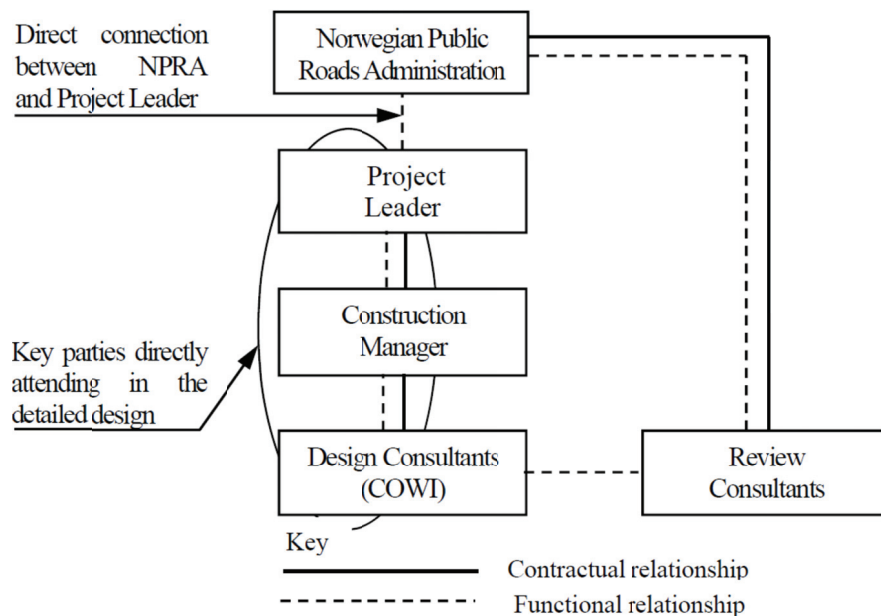


Figure 17: Contractual and functional relationships between the key parties in the detailed design phase (River Nid bridge construction project)

Two formal relationships - contractual and functional relationships between the key parties are found in both the Norwegian (Figure 17) and theoretical cases (Figure 5). There are similarities and differences in the formal relationships between the Norwegian and theoretical cases as follows:

* The CM in the Norwegian case is the management contractor in the theoretical case. The Norwegian case has more actors than the theoretical case, i.e., five actors in the Norwegian case in comparison with four actors in the theoretical case. This is because the management of the detailed design and the review of the detailed design in the Norwegian case are conducted by two separate individuals – (1) the CM who is responsible for the management of the detailed design; and (2) the RC who is hired by NPRA takes responsibility of the review of the detailed design. Nevertheless, in the theoretical case, only the management contractor is responsible for performing both these two roles.

To my mind, there are several reasons to explain why NPRA hires the RC to review the detailed design. Firstly, characteristics of the detailed design may be new and complex. Secondly, the CM is not competence in the review of this design. To make a contract with the RC for reviewing the detailed design can bring both advantages and disadvantages for the detailed design phase. One of significant benefits is that the RC is high competence in the design review, so throughout the review of the RC the detailed design is more feasible to build. This helps to limit changes that can occur in the construction phase. However, a remarkable drawback is that choosing wrongly the RC is risky. Hiring the RC with limited abilities cannot result in a feasible detailed design. Another disadvantage is that it takes much time since there are some procedures for selecting the RC.

* The level of the functional relationships in the Norwegian case is more complex than in the theoretical case since the Norwegian case has more actors than the theoretical case. Nevertheless, the degree of the contractual relationships is roughly similar in both the Norwegian and theoretical cases. This is because in the theoretical case, the owner contracts with two separate individuals – (1) the DC making the detailed design; and (2) the quantity surveyor producing the quantity of bill. Corresponding to this, in the Norwegian case there are two separate contracts – one is between the CM and the DC; and the other one is between the NPRA and the RC.

6.1.3 The Vietnamese case and the Norwegian case

There are significant similarities between the Vietnamese and Norwegian cases:

* Firstly, the DC conducts two roles – making (1) the detailed design and (2) the quantity of bill in the detailed design phase. This may bring advantages for the detailed design phase since it helps to manage this stage easier.

* Secondly, the management of the detailed design and the review of the detailed design are performed by two separate individuals. The director of the PMU and the CM are responsible for the design management in the Vietnamese and Norwegian cases respectively. In addition, the head of the ED and the RC take the responsibility of the design review in the Vietnamese and the Norwegian cases respectively. This may result in both advantages and disadvantages as analyzed above. To my limited knowledge, a way that the management of the detailed design and the review of the detailed design are conducted by two separate individuals is essential. This is because it creates potential chances to achieve a more feasible detailed design that is a very important element for getting success of project performance in the construction stage.

However, there is a difference in resources used to review the detailed design between the Vietnamese and Norwegian cases. The owner uses internal resources (the ED of the owner) in the Vietnamese case, but external resources (an external company) in the Norwegian case. This leads to a difference in the contractual relationships. From my observations, I realize that if the internal resources are at least sufficient competence in reviewing the detailed design, using the internal resources may be better for the detailed design than using the external ones. There are two main reasons for this. Firstly, using the internal resources makes the design review more convenient because of having high trust and understanding to each other. Secondly, it is a potential opportunity where the internal resources always act to protect the interests of the owner until achieving the most feasible design. This is different from the viewpoint of the external resources who always act to achieve their own interests as much as possible.

6.2 Comparison and discussion on formal relationships between key parties in a construction phase

6.2.1 The theoretical case and the Vietnamese case

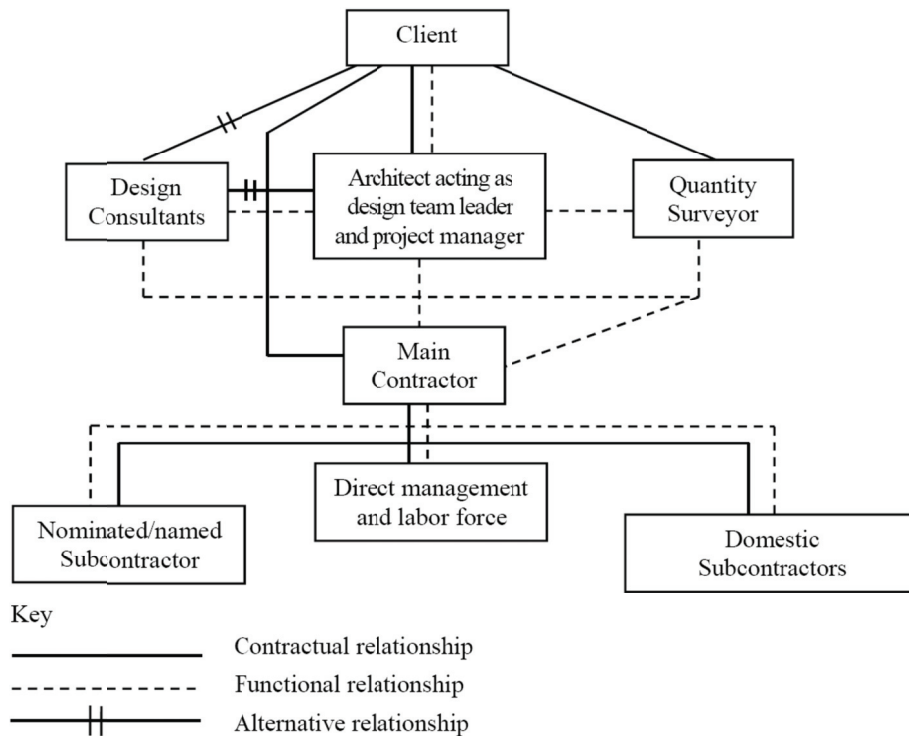


Figure 2: Functional and contractual relationships in a construction phase, Design/Bid/Build (traditional approach)

Source: Masterman (1992). An introduction to building procurement systems

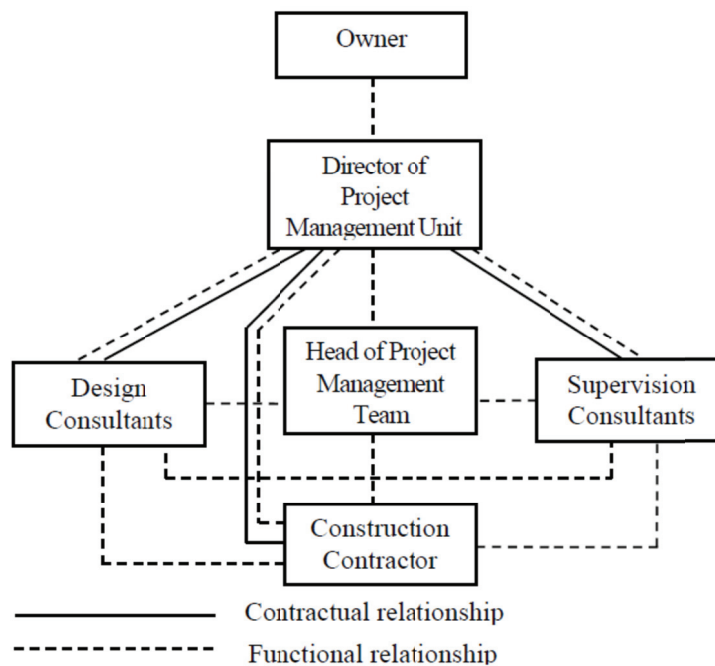


Figure 12: Contractual and functional relationships between the key parties in the construction phase (U Minh bridge construction project)

The theoretical case (Figure 2) has more actors than the Vietnamese case (Figure 12), i.e., eight actors in the theoretical case in comparison with six actors in the Vietnamese case. This is because there is only one construction contractor who takes responsibility of completing the whole project in the Vietnamese case. However, in the theoretical case, there are a main contractor and several subcontractors. The reason for this difference is that the Vietnamese project scope is small. Furthermore, the Vietnamese project work, which is undiversified, is complete concrete one. It is realized that this difference leads the degree of the contractual relationships in the theoretical case to be more complex than in the Vietnamese case. Nonetheless, the difference in the contractual relations does not lead a consequence that the project management in the theoretical case is more complex than in the Vietnamese case. This is because the main contractor is fully responsible for the construction work of the subcontractors in the theoretical case.

There are significant differences in the key parties involved in the construction phase between the Vietnamese and theoretical cases:

* In the Vietnamese case, because the DC conducts two roles – making (1) the detailed design and (2) the quantity of bill in the detailed design phase, there is not the separate appearance of the quantity surveyor in the construction phase. It is realized that this difference brings insignificant benefits for the construction phase in the Vietnamese case. This is because the roles of the quantity surveyor in the construction phase are limited, mainly making a bill for approved changes.

* In the Vietnamese case, besides the control of both the director of the PMU and the head of the PMT, there is the separate presence of the SC - an external company (the third party) hired by the director of the PMU to supervise the construction contractor's construction activities. This work, however, is performed by the project manager and his resident engineers in the theoretical case. This difference may result from the limitation of the Vietnamese project owner's available internal resources. They are not competent in overseeing these construction activities.

From my observations, I realize that hiring the SC (the third party) is necessary since it can help to enhance chances of the successful completion of the project. This is because the SC is competent to oversee and control the construction contractors' construction activities. However, the project management may become more complex because of several reasons. Firstly, there are potential problems where the SC and the construction contractors can 'shake hands' with each other to cheat construction volume to get their own benefits. This reduces quality of works. Therefore, it is essential that the project owner has much control over the activities of both the third party and the construction contractors to assure that these activities are performed right. Secondly, significant conflicts between the third party and the construction contractors can occur during the construction phase. This is because the third party very closely supervises the activities of the construction contractors. These conflicts can lead to the project delay. As a result, in this situation, (1) a suitable control system much focusing on supervision of the activities of both the third party and the

construction contractors, and (2) a system for resolving conflicts agreed in advance are essential to assure that hiring the third party for construction supervision may bring about the successful completion of the project.

The appearance of the SC (the third party) leads the level of the functional relations in the Vietnamese case to be more complex than in the theoretical case. To my limited knowledge, that the degree of the functional relationships is more complex may cause disadvantages for the project performance. The reason for this is that the degree of the functional relations is more complex, which means that one actor has more connections with other ones in the construction phase. This results in more potential to occur remarkable conflicts that negatively affects the project performance.

6.2.2 The theoretical case and the Norwegian case

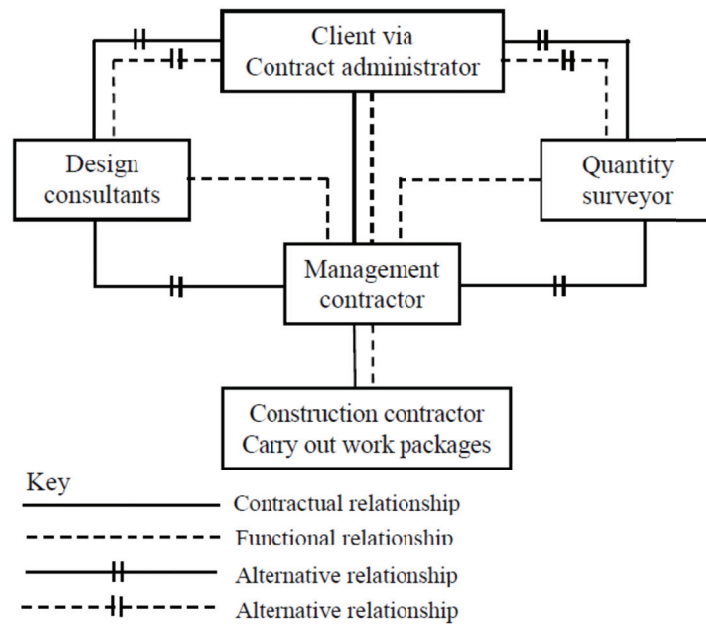


Figure 4: Functional and contractual relationships in a construction phase, Management contracting approach

Source: Masterman (1992). An introduction to building procurement systems

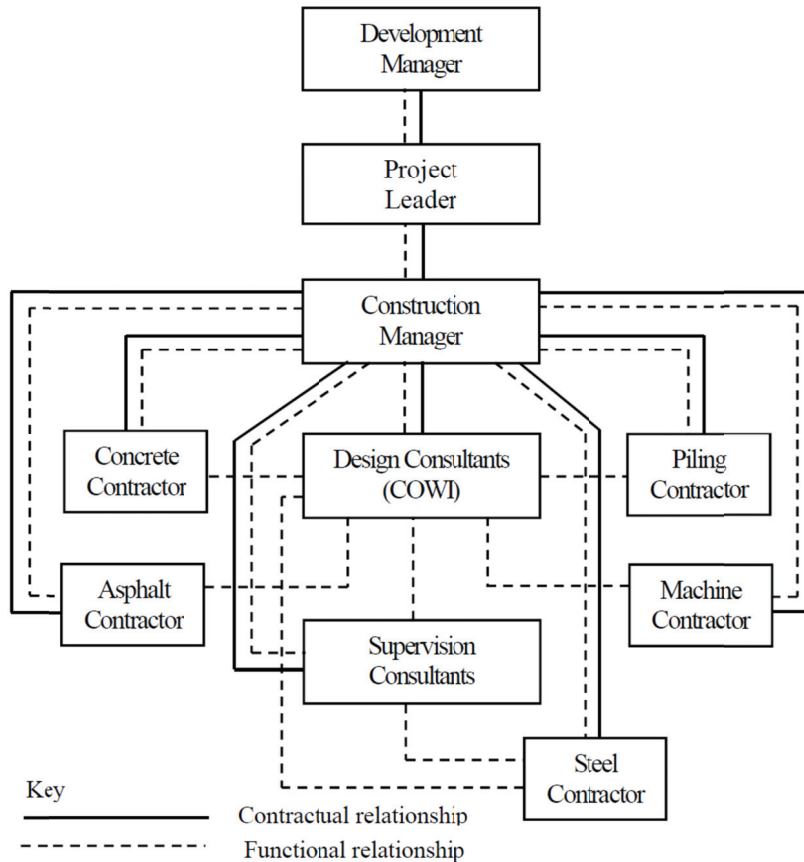


Figure 18: Contractual and functional relationships between the key parties in the construction phase (River Nid bridge construction project)

The Norwegian case (Figure 18) has more actors than the theoretical case (Figure 4), i.e., ten actors in the Norwegian case in comparison with five actors in the theoretical case. This is because a number of the package contractors in the Norwegian case are bigger than in the theoretical case. Another reason is that besides the supervision of the CM, the SC - the third party is hired by the CM to supervise the steel contractor's construction activities. However, only the management contractor (the CM in the Norwegian case) oversees all the package contractors' construction activities in the theoretical case. It is realized that these differences lead a consequence that the level of both the contractual and functional relations in the Norwegian case is more complex than in the theoretical case.

To my mind, using more different package contractors, which results in the more complex degree of the contractual relations, brings both advantages and disadvantages for project performance. One of main benefits is that the project time is shortened since different construction work packages can be performed in parallel. Another advantage is that the project owner can select the most competent contractor to conduct each construction work package to increase chances of the successful completion of the project. On the other hand, the project management becomes more complex. This is because the project owner manages not only construction activities of each package contractor but also interfaces between package contractors. Another drawback is that if a package contractor gets problems, it will affect negatively others and the whole project. For above analyses, it concludes that using many different package contractors in a construction project can enhance chances of the successful completion of the project when the project owner has enough competence in the project management. Additionally, as analyzed in 6.2.1, that the degree of the functional relationships is more complex may cause disadvantages for the project performance.

An interesting point that is found in the Norwegian case is that the owner uses both internal and external resources to oversee and control the package contractors' construction activities. Hence, the presence of the SC - the third party to supervise and control the steel contractor's construction activities is a fundamental difference between the Norwegian and theoretical cases. It is realized that the appearance of the SC – the third party is necessary, and plays an important role in the successful completion of the project in the Norwegian case. The reason for this is that the CM is less competence in the steel area. In addition, the construction activities of the steel contractor are highly complex since many technical solutions are required over the construction phase. Thus, the CM needs the third party with high competence in the steel area to control the steel contractor. From above mentions, it can be inferred that when a construction project includes many different packages, it is essential to evaluate the complexity of each package as well as the available internal resources of the project owner. This helps to determine which construction activities (packages) that should be controlled by the third party - an external company to enhance opportunities of the successful completion of the project.

6.2.3 The Vietnamese case and the Norwegian case

There are two significant similarities between the Vietnamese and Norwegian cases. Firstly, there is not the separate appearance of the quantity surveyor in the construction phase since the quantity surveyor is a part of the DC. This can bring insignificant benefits for the construction phase as analyzed in 6.2.1. Secondly, there is the presence of the SC (the third party) who is hired by the director of the PMU and the CM in the Vietnamese and Norwegian cases respectively to supervise the contractor's construction activities. This can bring both advantages and disadvantages for the project performance as analyzed in 6.2.1.

6.3 Comparison and discussion on informal relationships between key parties in both detailed design and construction phases

6.3.1 The theoretical case and the Vietnamese case

Type of trust in the Vietnamese case is competence trust that is defined by Zaghoul & Hartman (2003). The trust relations bring both advantages and disadvantages for the project performance in the Vietnamese case. Similar to Munns's opinion (1995), the trust relationships help to reduce conflicts between the key parties. This is important to enhance the project performance since construction projects delivered by the traditional method are concerned as where many significant conflicts can occur. The disadvantage of the trust relationships, however, is that the trust relations cause subjectivity of reviewing documents coming from the construction contractor. This can result in mistakes in the processes of the time, cost and quality control. Therefore, to limit this disadvantage of the trust relationships is essential to the project performance. A suggested approach is establishment of a suitable control system to assure that formal review of all documents coming from construction contractors are always conducted to prevent the subjectivity.

An interesting point that is found in the Vietnamese case is that the personal relationships seem to have only positive influences on the project performance. It means that the negative side of the personal relationships mentioned by Cheung & Rowlinson (2005) does not seem to occur in the Vietnamese case. This can be explained by several reasons. Firstly, almost all the key parties have good personal relations to each other, so they always act to strengthen and develop these relationships. Secondly, the contracts include clear and sufficient contract terms to be sure that all problems occurring in the project performance can be resolved in an effective manner based on the contract terms, not depending on the personal relationships.

6.3.2 The theoretical case and the Norwegian case

An interesting point that is found in the Norwegian case is that although the key parties do not have the trust relationships to each other before the beginning of the project, the trust relations are established and developed based on understandings each other about specialized knowledge and practical experience in both the detailed design and construction phases. This shows Kadefors's viewpoint (2004) - have potential opportunities to develop the trust relationships in traditional arrangements. Furthermore, basing on the foundation of establishing the trust relationships can confirm that type of trust in the Norwegian case is the trust competence defined by Zaghoul & Hartman (2003).

There are two important advantages of the trust relationships in the Norwegian case. One of them is that the trust relations result in effective communication that is mentioned by Zaghoul & Hartman (2003). The other benefit is that the trust relations make the key parties fast find out solutions to problems. Essentially, this benefit of the trust relations is conflict reduction mentioned by Munns (1995). This is because the solutions are only produced in a quick manner when the key parties have little conflict to each other.

6.3.3 The Vietnamese case and the Norwegian case

There is a considerable difference in the start point of the trust and personal relationships between the Vietnamese and Norwegian cases. In the Vietnamese case, the trust and personal relationships are established before the beginning of the project based on what the key parties used to work together in many successful projects in the past. Nonetheless, in the Norwegian case, the key parties do not seem to have both the trust and personal relationships to each other before the beginning of the project. This is because it is the first time they worked together, and they did not know to each other before. In my opinion, this difference brings significant benefits for the project performance in the Vietnamese case. This is because the positive influences of the trust and personal relationships are performed at the initial period of the detailed design and construction phases. Furthermore, this difference is considered as a good opportunity to achieve the higher level of the trust and personal relations that can bring more benefits for the performance of the project.

Dissimilar to the Vietnamese case, the trust relationships do not cause any disadvantages in the Norwegian case. The reason for this is that in the Norwegian case, there is a suitable control system. It assures that every formal control of the construction contractors' work is always conducted. As a result, the subjectivity that is made by the trust relations can be prevented.

Similar to the Vietnamese case, the personal relationships also seem to have only positive impacts on the project performance in the Norwegian case. Therefore, creating good chances for establishing and developing good personal relationships to each other in construction projects is necessary to enhance the performance of the project.

6.4 Comparison and discussion on project organization for construction, decision-making and communication processes in a construction phase

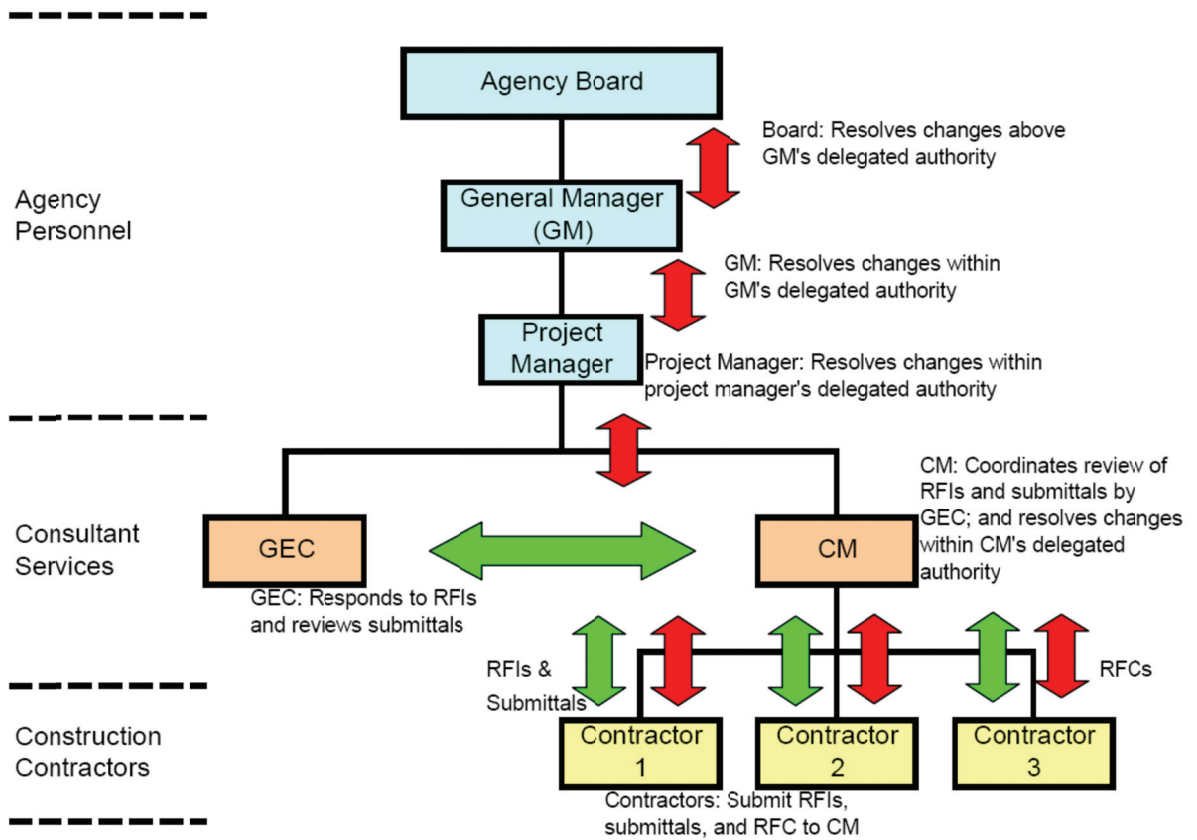


Figure 7: Project organization, assigned authorities, and lines of communications for construction
 Source: Federal Transit Administration (FTA) (2009). Construction Project Management Handbook

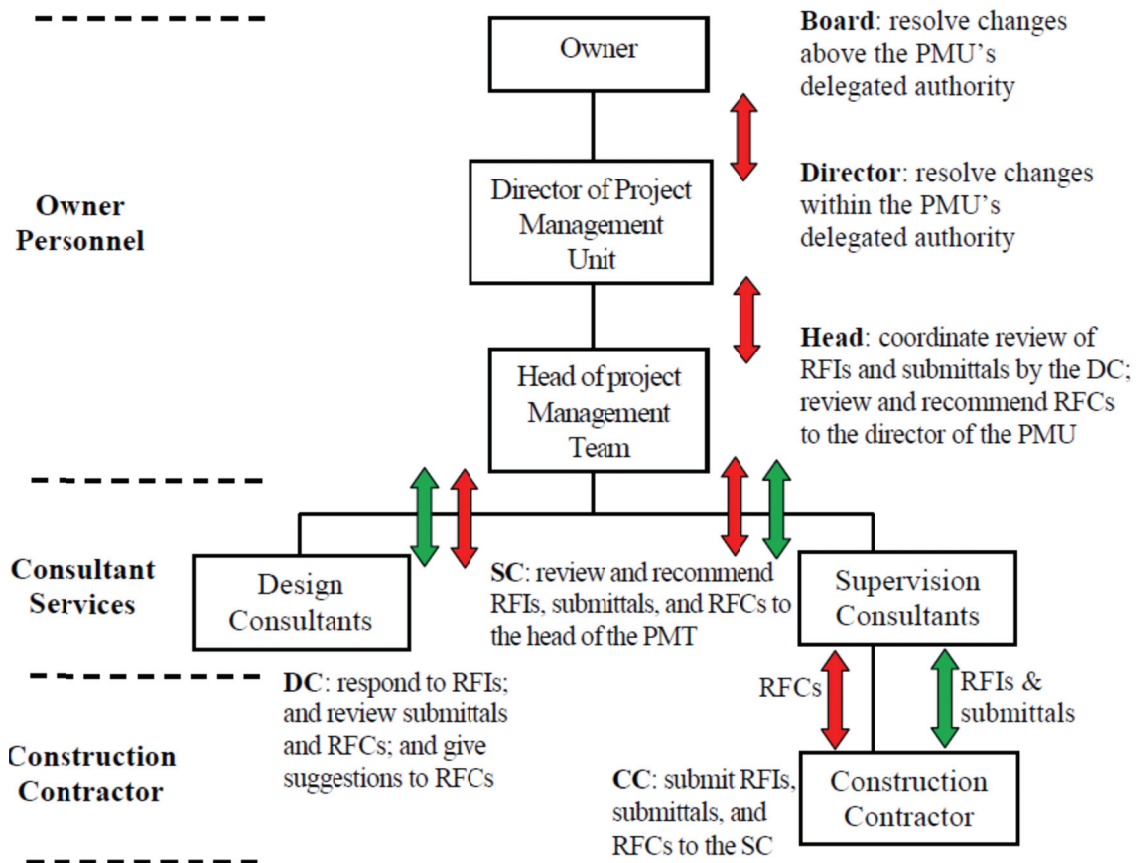


Figure 13: Project organization, assigned authority and lines of communications for construction (U Minh bridge construction project)

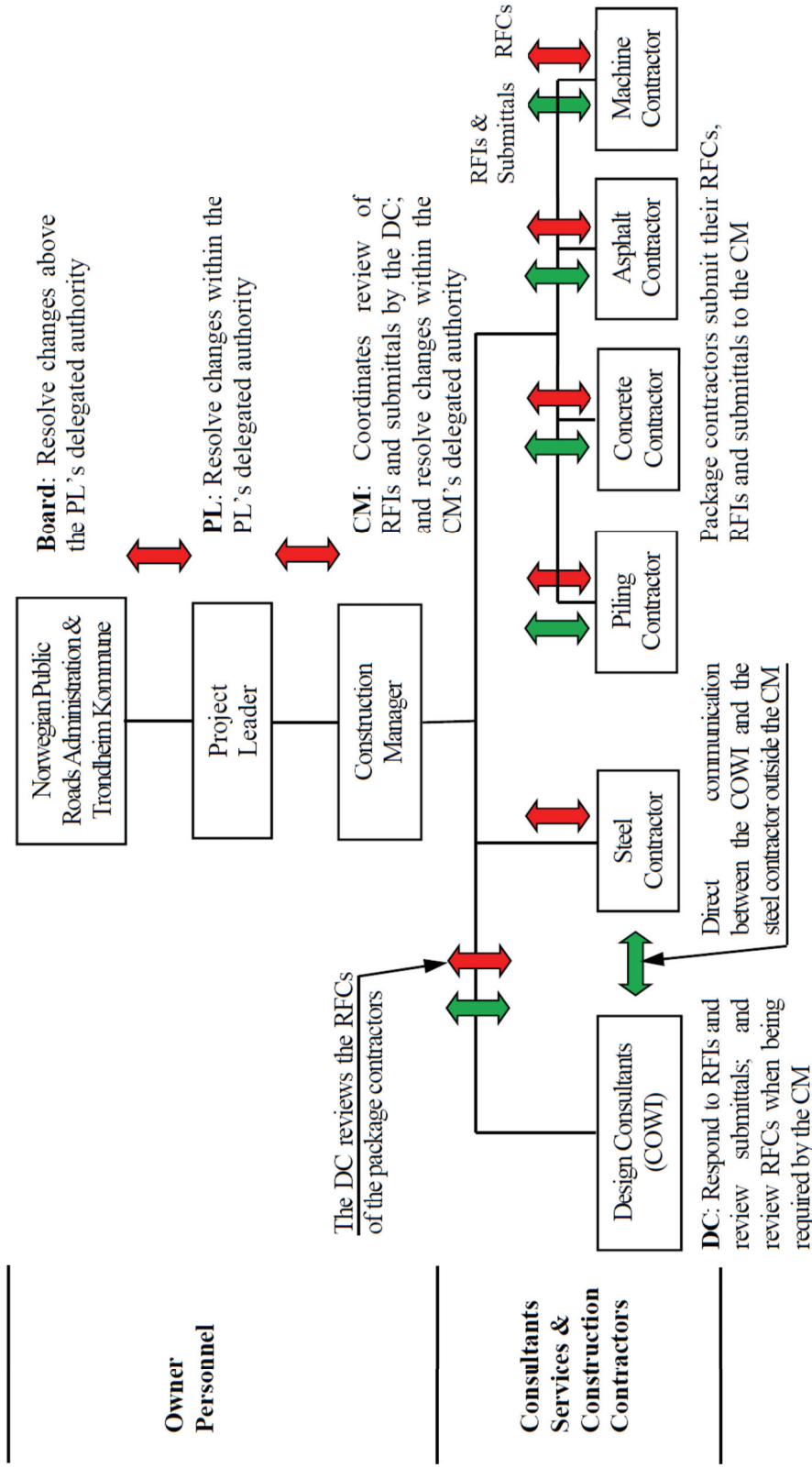


Figure 19: Project organization, assigned authority and lines of communications for construction (River Nid bridge construction project)

6.4.1 Project organization for construction

Organizational structure for construction in both the Norwegian (Figure 19) and Vietnamese cases (Figure 13) includes three systems that are the owner personnel system, the consultant service system and the construction contractor system. It is recognized that it is similar to an organizational structure introduced by Federal Transit Administration (FTA) (2009) (Figure 7).

6.4.2 Decision-making process for resolving requests for changes (RFCs)

6.4.2.1 The theoretical case and the Vietnamese case

Authority delegation for decision-making for resolving requests for changes (RFCs) of the construction contractors during the construction phase is found in both the Vietnamese (Figure 13) and theoretical cases (Figure 7). It is realized that the authority assignment for decision-making is essential since it creates good opportunities to be sure that decisions are made in a timely and decisive manner to prevent the project delay. However, a significant difficulty that the owner must face when performing the authority assignment is how the owner can control the decision-making process that is conducted by his organization's members. The purpose of this control is to assure that correct decisions are made to achieve the project goal. Thus, selecting whether the authority delegation for decision-making is conducted in the project is important since it affects the successful completion of the project. An important condition for performing the authority assignment is that the owner must have high confidence in members appointed to make decisions.

There is a remarkable difference in the level of the authority delegation for decision-making for resolving the RFCs between the Vietnamese (Figure 13) and theoretical cases (Figure 7). This difference is that in the Vietnamese case, the authority delegation is limited because only the top management level including the owner and the director of the PMU has power to make decisions for resolving the RFCs. Meanwhile, in the theoretical case, decision-making for resolving the RFCs can be conducted at the low management level in which the CM has power to produce the decisions. Therefore, decision-making for resolving the RFCs in the theoretical case is faster than in the Vietnamese case. It can be said that faster decision-making is very important since it makes work of construction contractors go ahead faster leading to the enhancement of project performance.

From my observations, I realize that there are several reasons to explain why the owner does not conduct deep authority delegation for resolving the RFCs in the Vietnamese case. The deep authority delegation means that the decision-making is conducted at the low management level. The first reason is that the owner does not want to perform the deep authority delegation since it is very difficult to control the decision-making process. Moreover, this project is a public construction one, the safety of the project performance is

considered as the first priority. Another reason is that certain reliable level that the director of the PMU and both the head of the PMT and the SC have to each other may be low. Finally, because power associates with economic benefits, so the director of the PMU wants to hold all power to get more economic benefits.

In my opinion, there is potential to perform the deep authority delegation for resolving the RFCs in the Vietnamese case to achieve more benefits for the project performance. The reason for this is that the director of the PMU and both the head of the PMT (the owner personnel) and the SC have trust to each other. Thus, the director of the PMU can assign both the head of the PMT and the SC to make decisions for resolving the RFCs. Furthermore, the head of the PMT can perform an additional role of controlling the decision-making process conducted by the SC to assure that right decisions are made. As a result, in the Vietnamese case, the decision-making process at the low management level including the head of the PMT and the SC can be performed in an effective manner. However, as analyzed above, the deep authority delegation can cause drawbacks – hard to control the decision-making process. Hence, determining properly types of changes that should be decided by the head of the PMT and the SC may be a suitable way to prevent the disadvantages of the deep authority delegation. This is because it can help to prevent the opportunistic behavior that occurs in the decision-making process conducted by head of the PMT and the SC.

6.4.2.2 The theoretical case and the Norwegian case; and the Vietnamese case and the Norwegian case

Authority delegation for decision-making for resolving requests for changes (RFCs) of the construction contractors during the construction phase is found in the Norwegian case (Figure 19), which is similar to both the theoretical (Figure 7) and Vietnamese cases (Figure 13). Furthermore, the Norwegian and theoretical cases have the equal degree of the authority delegation for resolving the RFCs in which the CM has power to make decisions for resolving the RFCs. It means that the decision-making process is conducted at the low management level in both the Norwegian and theoretical cases, which is different from the Vietnamese case. In addition, the consequence of this difference is analyzed above.

6.4.3 Communication process for reviewing requests for information (RFIs) and submittals

6.4.3.1 The theoretical case and the Vietnamese case

The head of the PMT in the Vietnamese case and the CM in the theoretical case have the same roles in the communication process for reviewing the RFIs and submittals. Their main role is to work as a coordinator to link information exchange between the DC and the

construction contractors. However, it is realized that lines of communication for reviewing requests for information (RFIs) and submittals of the construction contractors are different between the Vietnamese (Figure 13) and theoretical cases (Figure 7). This difference is that the lines of communication for reviewing the RFIs and submittals in the theoretical case are more effective than in the Vietnamese case. This is because in the theoretical case the information exchange between the DC and the construction contractors is conducted throughout only one medium - the CM, but in the Vietnamese case two media - the head of the PMT and the SC. Therefore, the time of this information exchange in the theoretical case is less than in the Vietnamese case, which is recognized as the limitation of the communication process in the Vietnamese case. Making the information exchange simpler is important since the construction projects usually include huge information exchange between the DC and the construction contractors.

To my mind, there is a suitable way to make the communication process in the Vietnamese case more effective to enhance the project performance. This way is that the SC - the third party is assigned to directly contact with the DC for reviewing the RFIs and submittals. It means that the roles of the SC in the Vietnamese case (Figure 13) are similar to those of the CM in the theoretical case (Figure 7). In addition, the head of the PMT is appointed to do an additional role of controlling direct information exchange between the SC and the DC. As a result, the information exchange between the DC and the construction contractor is performed quickly in the Vietnamese case.

6.4.3.2 The theoretical case and the Norwegian case; and the Vietnamese case and the Norwegian case

It is realized that lines of communication for reviewing requests for information (RFIs) and submittals of the construction contractors except for the steel contractor in the Norwegian case are similar between the Norwegian (Figure 19) and theoretical cases (Figure 7). The reason for this is that the CM in both the Norwegian and theoretical cases works as a coordinator to link information exchange between the DC and the construction contractors. As a result, in both the Norwegian and theoretical cases, the communication process is more effective than in the Vietnamese case as analyzed above.

An interesting point that is found in the Norwegian case is a direct line of communication between the DC and the steel contractor outside the CM in the construction phase. It is realized that a main reason for establishing this direct communication line depends on what the work of the steel contractor is highly complex, which requires huge information exchange between the DC and the steel contractor. It can be said that the direct line of communication leads a consequence that the communication process for reviewing the RFIs and submittals of the steel contractors in the Norwegian case is more effective than in the theoretical case. This is because the time of the communication process in the Norwegian case is less than in the theoretical case. As a result, the steel contractor always

gets information from the DC faster, so his construction work can go ahead faster leading to the enhancement of the project performance. Nevertheless, in this situation, a significant difficulty is how the direct communication line is controlled. The purpose of this control is to assure that right information exchange between the DC and the steel contractor is conducted. To my limited knowledge, a suggested solution to this issue is establishment of a suitable control system. This system must assure that there are at least two control faces of this direct information exchange to limit the potential mistakes of the direct information exchange.

6.5 Comparison and discussion on influences of relationships between key parties on processes of time, cost and quality control during a construction phase

6.5.1 Influences of contractual relationships between key parties on processes of time, cost and quality control

Type of contractual relationships in both the Vietnamese and Norwegian cases is a traditional arms length contract. The contractual relationships play an important role in successful performance of the processes of the time, cost and quality control during the construction phase. This is because in both the Vietnamese and Norwegian cases the contractual relationships only have positive influences on the processes of the time, cost and quality control. To achieve these positive impacts requires that the contracts must include clear and sufficient contract terms covering almost all issues of the processes of the time, cost and quality control. In other words, the contractual terms must clearly regulate roles and responsibilities of key parties involved in as well as must be foundations to resolve conflicts occurring in these three processes.

An interesting point that is found in the Norwegian case is that throughout the contract terms, a system for resolving conflicts between the key parties is established before starting the actual construction activities of the construction contractors. This is very important since it builds initial understanding between the key parties to assure that conflicts in the processes of the time, cost and quality control can be solved in a timely manner. As a result, the performance of the project is increased.

6.5.2 Influences of functional relationships between key parties on processes of time, cost and quality control

The functional relationships have positive influences on the processes of the time, cost and quality control during the construction phase in both the Vietnamese and Norwegian cases, and these positive impacts result from positive attitudes of the key parties involved in these three processes. Therefore, to make the key parties work with positive attitudes is

necessary to achieve the success of the processes of the time, cost and quality control to enhance the project performance. To my limited knowledge, there are several approaches to encourage the key parties to work with a positive attitude in the construction phase:

- * Importance of a project should be introduced so that the key parties well perceive it to increase their responsibilities when performing their tasks.

- * Project meetings should be performed in a suitable cycle to assure that the key parties well understand their tasks in time between two meetings to increase their responsibilities.

- * Good personal relationships between the key parties should be established. This is because these good relations positively affect the actions of the key parties, i.e., the key parties usually work with a positive attitude to keep their good relations.

- * Clear and sufficient contractual terms should be established so that the key parties well understand their roles and responsibilities.

There are differences in negative impacts of the functional relationships on the processes of the cost and quality control during the construction phase between the Vietnamese and Norwegian cases. It is realized that the functional relations negatively affect the processes of the cost and quality control in the Vietnamese case. This comes from significant conflicts that derive from the key parties' opportunistic behavior in traditional contractual relationships introduced by Cox & Thompson (1997) and Thomas & Thomas (2005). However, there are not any negative influences of the functional relationships on these two processes in the Norwegian case. In my opinion, this can be explained by two main reasons. Firstly, in the Norwegian case the key parties may have high level of certain trust and good personal relations to each other. Secondly, the owner has high position in the construction market, which positively affects the actions of the construction contractors. In other words, the construction contractors always act to keep good relationships with the owner since there are many high potential opportunities where they can work together in future projects.

An interesting point that is found in the Vietnamese case is that the functional relations only have negative influences on the processes of the cost and quality control, not on the process of the time control. The reason for this is that the processes of the cost and quality control include sensitive issues such as calculating actual construction volume of contractors, acceptance inspection and so on that are directly related to the economic benefits of the key parties. Thus, there is more likely to have significant conflicts that are made by the opportunistic behavior of the key parties in the processes of the cost and quality control than in the process of the time control. In other words, the negative influences of the functional relations are more likely to perform in the processes of the cost and quality control than in the process of the time control.

6.5.3 Influences of trust relationships between key parties on processes of time, cost and quality control

The trust relationships have positive influences on the process of the time control during the construction phase in both the Vietnamese and Norwegian cases, and these positive influences derive from a benefit of the trust relationships - conflict reduction between the key parties in resolving progress problems. One main reason of the conflict reduction made by the trust relations is that the key parties have a good understanding each other about specialized knowledge and practical experience. It can be said that the conflict reduction is very important for the process of the time control since it helps the key parties to find out quickly suitable solutions to progress problems to avoid the schedule delays.

However, a difference between the Vietnamese and Norwegian cases in the influences of the trust relationships on the process of the time control is that the trust relations cause subjectivity leading to the mistakes of reviewing the progress reports in the Vietnamese case. To my mind, the reason for this is that the formal review of the progress reports is not always conducted in the process of the time control, which is considered as a problem of the control system in the Vietnamese case. In addition, these mistakes are serious for the process of the time control since they result in the wrong update of the construction schedule due to wrong information. As a result, the key parties cannot recognize progress problems. Therefore, establishment of a suitable control system is essential to assure that formal review of progress reports is always conducted to prevent the subjectivity produced by the trust relations to increase the project performance.

The trust relationships also have positive influences on the processes of the cost and quality control during the construction phase in both the Vietnamese and Norwegian cases. These positive influences come from what the trust relations help to reduce conflicts in the Vietnamese case and less control of the construction contractors' work when the key parties have trust to each other in the Norwegian case. It can be said that the less control is viewed as one of main conditions of reducing conflicts between the key parties in the project performance. As mentioned above, the processes of the cost and quality control contain high potential of significant conflicts, but they do not occur in these two processes in the Norwegian case. It may prove that the trust relationships play an important role in conflict reduction. Similar to the process of the time control, the conflict reduction is essential for the processes of the cost and quality control because it helps to resolve problems in these two processes in a timely manner leading to the enhancement of the project performance.

In my opinion, the positive influences of the trust relationships on the processes of the cost and quality control in normal cases of trust may be not significant. The reason for this is that the processes of the cost and quality control are sensitive since they are directly related to economic interests, lifetime of bridges, etc. Thus, they are always conducted in a very formal manner, i.e., every control of construction contractors' activities is always conducted. This means that there will not have chances for the less control of the

construction contractors' activities that leads to conflict reduction. From above mentions, I realized that it is necessary that the key parties should build high degree of certain trust relationships to each other to create highly potential opportunities for the less control so that the positive influences of the trust relations are well performed in the processes of the cost and quality control. The high degree of certain trust relations may be formed throughout (1) the construction contractors who show high competence in their construction activities; and (2) long-term relationships where the owner and the construction contractors work together in many successful projects.

6.5.4 Influences of personal relationships between key parties on processes of time, cost and quality control

The personal relationships positively affect the processes of the time and cost control during the construction phase in both the Vietnamese and Norwegian cases. The reason for this is that the personal relations result in better communication between the key parties. It is recognized that the processes of the time and cost control contain much information exchange between the key parties, so the better communication is important. This is because it brings about better opportunities to achieve the success of this information exchange to assure that the key parties always get enough information on time. As a result, the update of the schedule and the cost as well as finding out solutions to progress and cost problems can be effectively conducted to increase the project performance.

An interesting point that is found in both the Vietnamese and Norwegian cases is a relation between the personal relationships and informal communication. It can be said that the personal relations create good chances so that the key parties informally contact with each other. This may bring advantages for not only the processes of the time and cost control but also the process of the quality control because every problem can be quickly solved.

There are considerable differences in the influences of the personal relationships between both the processes of the time and cost control and the process of the quality control in both these two cases. Dissimilar to the processes of the time and cost control, the personal relations have insignificant influences on the process of the quality control although the improved communication can bring several benefits for this process. This means that the roles of the personal relationships in the achievement of the satisfied quality of the bridges are limited. In my opinion, the reason for this is that the process of the quality control is directly related to the lifetime of the bridges that is concerned highly by the public in the public construction projects. As a result, almost all quality activities of the construction contractors are always controlled in a very strict manner, not depending on the personal relationships.

The significantly negative influences of the personal relationships are not found in both the Vietnamese and Norwegian cases. From my observations, however, I realize that in Viet

Nam, the personal relations may cause significantly negative influences on the processes of the time, cost and quality control during the construction phase in public construction projects. This is because the personal relations can negatively affect work of finding solutions to problems occurring in these three processes. When the construction contractors get problems about quality of their deliverables and so on, they usually have informal contract with the project owners based on the personal relationships to avoid a strict penalty. As a result, chosen solutions to these problems might be less suitable and not strong enough to force the construction contractors to work right. This may be viewed as the negative side of the personal relationships on these three processes. Thus, clear and sufficient contract terms are essential to limit these negative influences because every problem can be resolved based on the contract terms, not depending on the personal relationships.

7. CONCLUSION and RECOMMENDATION

Throughout comparison and analysis between both the Vietnamese and Norwegian cases and the theory, and between these two project-cases, several important conclusions are given as follows:

* In the detailed design phase, the Vietnamese and Norwegian cases have more actors than the theoretical case since the management of the detailed design and review of the detailed design are conducted by two separate individuals in both these two cases. This leads a consequence that the degree of the functional relationships in both these two cases is more complex than in the theoretical case. However, this can bring significant benefits for the project performance because there are potential chances of achieving a more feasible detailed design.

* In the construction phase, using bigger a number of the construction contractors leads the degree of the contractual relationships to be more complex. Using more different package contractors in a construction project helps to enhance chances of the successful completion of the project when the project owner has enough competence in the project management.

* In the construction phase, hiring the SC (the third party) for supervising the contractors' construction activities makes the functional relationships in both the Vietnamese and Norwegian cases more complex than in the theoretical case. This can bring both advantages and disadvantages for the project performance. There need to have (1) a suitable control system much focusing on supervising the activities of both the third party and the construction contractors, and (2) a system for resolving conflicts to limit these disadvantages to increase the project performance.

* That the DC conducts two roles – making (1) the detailed design and (2) quantity of bill creates the reduction of the contractual relationships. This brings significant advantages for the detailed design phase, but insignificant benefits for the construction phase.

* The trust and personal relationships can be established before or after the beginning of the project and bring many benefits for the project performance. However, the trust relationships can have negative influences on the project performance since they cause subjectivity. Good personal relationships, and clear and sufficient contract terms can prevent the negative influences of the personal relations on the project performance.

* Authority delegation for decision-making for resolving the RFCs of the construction contractors is found in both the Vietnamese and Norwegian cases and the theoretical case. Nonetheless, the level of the authority delegation in both the Norwegian and theoretical cases is deeper than in the Vietnamese case. This may make the project

performance in both the Norwegian and theoretical cases more effective than in the Vietnamese case.

* In both the Norwegian and theoretical cases, communication process for reviewing the RFIs and submittals of the construction contractors is more effective than in the Vietnamese case because the time of the information exchange between the DC and the construction contractors is less. This leads a consequence that the project performance in the Vietnamese case may be less effective than in both the Norwegian and theoretical cases.

* Clear and sufficient contract terms are decisive factors to achieve the positive influences of the contractual relationships on the processes of the time, cost and quality control during the construction phase to increase the project performance.

* The positive attitude of the key parties is a decisive factor to achieve the positive influences of the functional relationships on the processes of the time, cost and quality control during the construction phase. The functional relations' negative influences made by significant conflicts are more likely to perform in the processes of the cost and quality control than in the process of the time control. The high level of certain trust and good personal relationships can help to prevent the negative influences of the functional relationships.

* The trust relationships may help to increase the project performance since they result in conflict reduction between the key parties in the processes of the time, cost and quality control during the construction phase. However, there need the high degree of certain trust relationships to achieve the actual positive relations of the trust relations on the processes of the cost and quality control. This is because these two processes are sensitive, so there need the high degree of certain trust relations to create chances for the less control of the construction activities of the construction contractors.

* The personal relationships can make the increase of the project performance due to better communication. This benefit is achieved mainly throughout what the personal relationships positively affect the processes of the time and cost control during the construction phase. Meanwhile, the impacts of the personal relationships on the process of the quality control are limited.

* The personal relationships encourage informal communication between the key parties. This can bring both advantages and disadvantages for the processes of the time, cost and quality control. Clear and sufficient contract terms may help to prevent these disadvantages to increase the project performance.

Throughout these comparison and analysis, especially recognizing interesting points in both the Vietnamese and Norwegian cases, there are several recommendations suggested to increase the performance of the public construction projects that are delivered by traditional approach (Design/Bid/Build). These recommendations address project owners,

project managers and construction managers who are responsible for organizing and managing these public construction projects.

Recommendation 1: Project owners should carefully evaluate their available internal resources as well as complexity of construction activities of a construction project to determine properly which construction activities that should be controlled by the third party to enhance opportunities to successfully complete the project.

Recommendation 2: For construction projects where project owners hire supervision consultants (SC) – the third party to oversee construction activities of construction contractors, project owners should appoint the SC to make decisions for resolving the RFCs of the construction contractors to assure that the decisions can be produced in a timely manner to enhance project performance.

Recommendation 3: For construction projects where project owners hire supervise consultants (SC) – the third party to oversee construction activities of construction contractors, project owners should assign the SC to contact directly the DC to review the RFIs and submittals of the construction contractors to reduce time of a communication process to increase project performance.

Recommendation 4: When requests for information (RFIs) of construction contractors are huge, project owners should build direct communication lines between design consultants (DC) and construction contractors to shorten time of a communication process to enhance project performance. However, project owners should build a suitable control system to oversee these direct communication lines.

Recommendation 5: Before starting actual construction work, throughout contract terms project owners should establish a system for resolving conflicts in processes of time, cost and quality control during a construction phase to assure that every conflict can be solved in a timely and effective manner to increase project performance.

Recommendation 6: Although key parties involved in construction projects do not have trust and personal relationships to each other before, project owners should create good chances to form and develop these relationships to bring many benefits for project performance.

Recommendation 7: Project owners should concern ways to encourage key parties to work with positive attitudes to achieve positive influences of functional relationships on processes of time, cost and quality control during a construction phase to increase project performance.

Recommendation 8: Project owners and construction contractors should build the high degree of certain trust relationships with each other to make opportunities for less control and to achieve the actual positive influences of the trust relations on the processes of the cost and quality control during a construction phase.

Recommendation 9: Project owners should make clear and sufficient contract terms to assure that all problems can be effectively resolved based on these contract terms to limit the negative influences of the personal relationships on the processes of the time, cost and quality control.

In conclusion, this study brings significant benefits for me. This is because the study creates good chances for organizing and managing detailed design and construction phases more effectively to increase performance of public construction projects delivered by traditional method (Design/Bid/Build) in several following aspects.

1. Recognizing a good way that makes potential opportunities of achieving a more feasible detailed design is important. The reason for this is that the feasible detailed design is one of the most important factors for successful completion of construction projects. Achieving a more feasible detailed design helps to increase project performance since fewer changes occur in the construction phase. In addition, it is more possible that construction contractors perform their construction activities on site.
2. This study results in a chance to use supervision consultants (SC) for overseeing construction activities of construction contractors more effectively. This is because hiring the SC brings both advantages and disadvantages for project performance. Therefore, realizing suitable methods to limit these drawbacks is important to enhance project performance. Particularly, this study creates a useful way, i.e., evaluating carefully available internal resources to determine properly which construction activities of a construction project that should be controlled by the SC. This is essential to increase project performance.
3. This study also creates a chance to organize a decision-making process for resolving RFCs as well as a communication process for reviewing RFIs and submittals of construction contractors more effectively to increase project performance. This derives from realizing the limitations of these two processes in the Vietnamese case. Particularly, this study results in a useful way, i.e., direct lines of communication between design consultants (DC) and construction contractors can be formed to shorten time of information exchange.
4. Throughout realizing positive and negative influences of relationships between key parties on processes of time, cost and quality control during a construction phase, I can organize and manage these three processes more effectively to enhance project performance. One of useful ways is to encourage elements bringing about the positive influences. Another way is that there are more control on the processes of the cost and quality control in which the negative influences of the relationships have more likely to perform. Finally, establishing a suitable control system and a system for resolving conflicts makes potential chances of limiting the negative influences.

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APPENDIXES

Appendix 1: Questionnaire for the Norwegian case

QUESTIONNAIRE

A. Introduction

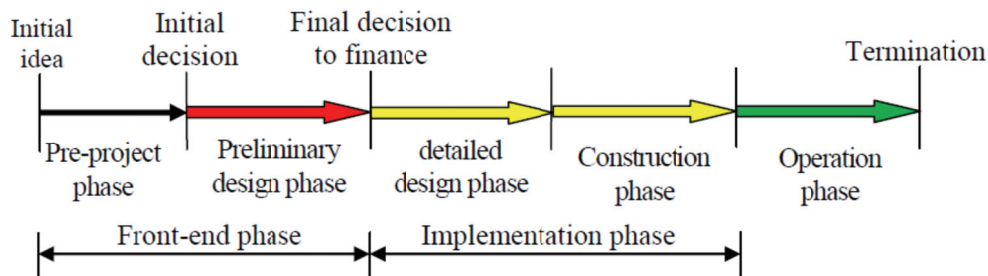


Figure: Phases of the River Nid bridge construction project

The life cycle of the River Nid bridge construction project may include five phases as the above figure.

The pre-project phase: This phase started when having needs for investing the bridge until a decision for approval was made by the decision-maker.

The preliminary design phase: An open competition was performed to choose the best design alternative. Three contractors attending in the competition were:

- * Pir II (PirII/Myklebust),

- * Reinertsen (Reinertsen/Selberg), and

- * COWI (COWI/Dissing+Weitling). Finally, COWI (COWI/Dissing+Weitling) won the competition for the preliminary design.

The detailed design phase: Statens vegvesen Region Midt contracted with COWI for the detailed design of the project.

The construction phase: The construction of the project included five packages of “piling”, “concrete”, “steel”, “machine”, and “asphalt”. Therefore, five separate open competitive bids were conducted to select construction contractors. Statens vegvesen Region Midt contracted with these package contractors.

The operation phase: This phase started when the construction stage completed fully until the bridge disposal.

My questionnaire includes questions focusing all phases of the project.

B. Pre-project phase

1. Who was the ultimate decision-maker at the pre-project phase?
2. Who did provide recommendations to the ultimate decision-maker to make a decision for approval?
3. Was there attendance of design consultants at the pre-project phase?

C. Preliminary design phase

4. Who was the ultimate decision-maker for approval of the design at the preliminary design phase?
5. Who did provide recommendations to the ultimate decision-maker to make a decision for approval?
6. What were the main contents of the preliminary design?

D. Detailed design phase

In the detailed design phase, my thesis focuses a decision-making process in which the decision-maker makes a decision for approval of the detailed design submitted by the design consultants.

7. How was the decision-making process performed at the detailed design phase?
(The aim is to present a step by step of the decision-making process at the detailed design phase).
- 7.1 Who was an ultimate decision-maker for approval of the detailed design submitted by the design consultants?
- 7.2 Who did provide recommendations to the ultimate decision-maker to make a decision for approval of the detailed design?
8. Who were the key parties joining this decision-making process at the detailed design phase? What are their roles?
9. What formal and informal relationship did these parties have each other?
(The aim is to establish a relationship model and/or an organizational model of the decision-making process at the detailed design phase. Please explain why the parties have informal relationships each other).
10. Questions for investigating the influences of relationships between parties involved in the detailed design phase on the decision-making process.

10.1 How and what did contractual relationships between the parties affect the decision-making process at the detailed design phase?

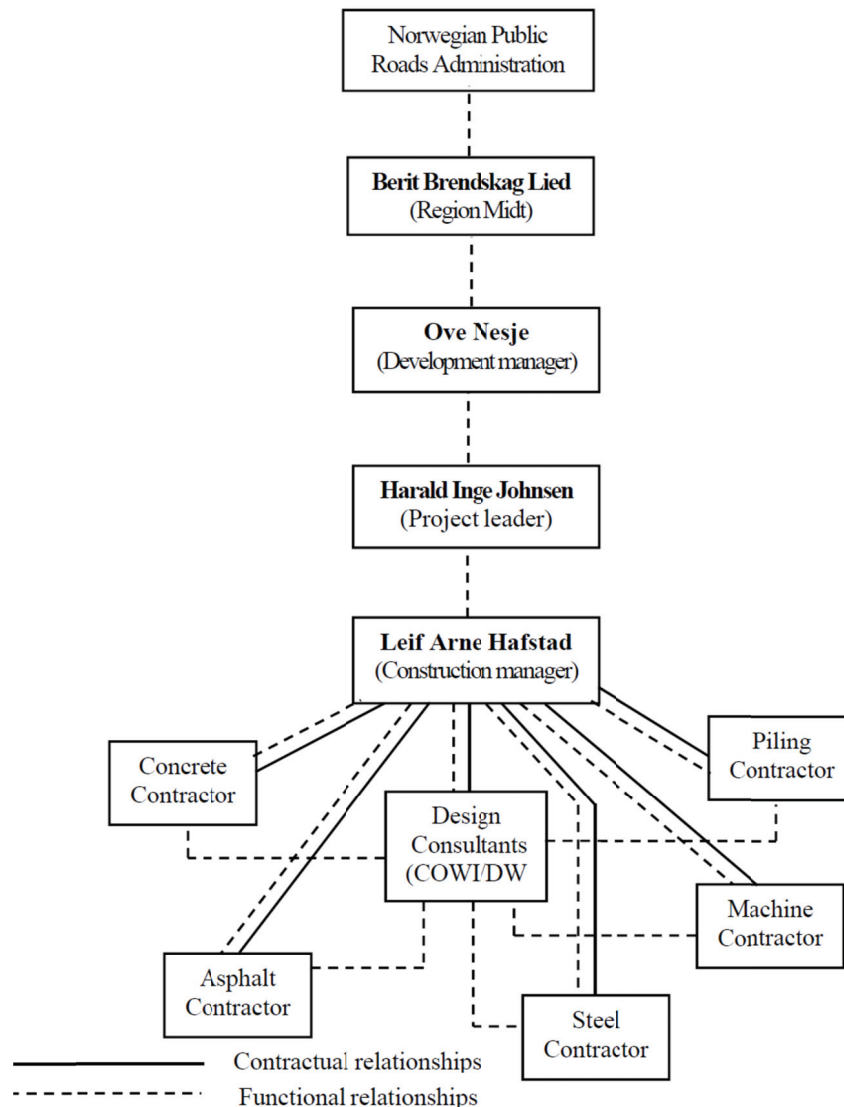
10.2 How and what did functional relationships between the parties affect the decision-making process at the detailed design phase?

10.3 How and what did trust relationships between the parties affect the decision-making process at the detailed design phase?

10.4 How and what did personal relationships between the parties affect the decision-making process at the detailed design phase?

10.5 Which types of relationships most influenced the decision-making process, and please explain why?

E. Construction phase



Base on the project materials, I have presented formal relationships (contractual and functional relationships) between the parties involved in the construction phase as follows:

* The owner personnel have the functional relationships to each other. This is presented throughout performing the functions of the owner personnel during construction. For instance, the construction manager provides the project leader with recommendations, which is basic so that the project leader makes decisions, etc.

* The functional relationships are also relations between the design consultants and the package contractors. This is because the design consultants continue to provide their services like construction supervision and inspection during construction.

* Between the construction manager and the package contractors have both the contractual and functional relationships to each other. This is because besides the contract, the construction manager has to perform his functions such as supervising and coordinating the construction activities of the package contractors, etc.

* Between the design consultants and the construction manager also have both the contractual and functional relationships to each other.

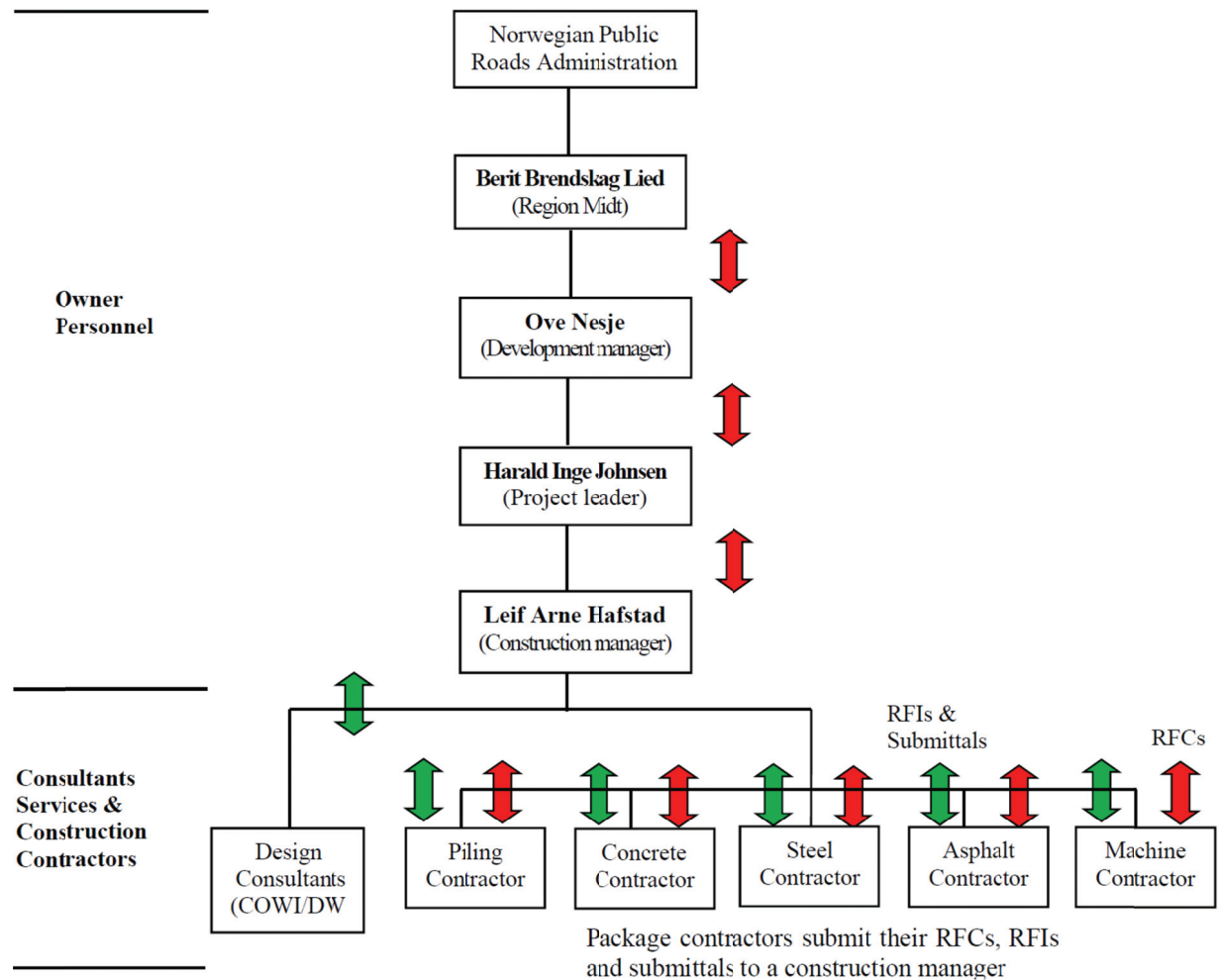
E.1 Relationships between parties involved in the construction phase

11. What informal relationships (trust and personal relationships) did the parties have each other at the construction phase? What are the parties' roles?

(The aim is to establish a relationship model and/or a project organization model for construction at the construction phase. Please explain why the parties have informal relationships each other).

12. Did Norwegian Public Roads Administration directly attend in the construction phase?

E.2 Decision-making process and communication process



The “**red arrows**” show assigned authorities between the parties involved the construction phase for resolving the requests for changes (RFCs) of the package contractors. In addition, the lines of communications for reviewing the requests for information (RFIs) and submittals of the package contractors are illustrated in the “**green arrows**”.

The “**red arrows**” and the “**green arrows**” show two main processes of the construction phase, which are decision-making and communication processes respectively

(I present these two processes in advance since this makes the interview easier and efficient, and below questions clearer. I need to interview you to get right information.

The decision-making process: The owner personnel are assigned to make decisions for resolving the RFCs of the package contractors. In fact, the package contractors will submit their RFCs to the construction manager. Then the construction manager makes a decision for resolving the RFCs within his assigned authority. If this decision-making is over the construction manager’s assigned authority, he will provide the project leader with

recommendations so that the project leader makes a decision for the RFCs. This process is repeated until a final decision for the resolving RFCs made by the ultimate decision-maker.

In addition, the design consultants perform the review of the RFCs during construction, which is basic so that the owner personnel produce decisions for the RFCs.

The communication process: *Exchanging information between the package contractors and the design consultants is performed throughout the construction manager who works as a coordinator for reviewing RFIs and submittals. In fact, the package contractors will submit their RFIs and submittals to the construction manager. Then these requests are sent to the design consultants for responding and reviewing. Finally, the package contractors will receive information provided by the design consultants via the construction manager.)*

*** Decision-making process for resolving the requests for changes (RFCs) of the package contractors**

13. Who were assigned to resolve the requests for changes (RFCs) of the package contractors? What big decisions can they make?

14. Who was an ultimate decision-maker for the requests for changes (RFCs) of the package contractors?

15. Questions for investigating the influences of relationships between parties involved in the construction phase on the decision-making process.

15.1 How and what did contractual relationships between the parties influence the decision-making process for resolving the requests for changes (RFCs)?

15.2 How and what did functional relationships between the parties influence the decision-making process for resolving the requests for changes (RFCs)?

15.3 How and what did trust relationships between the parties influence the decision-making process for resolving the requests for changes (RFCs)?

15.4 How and what did personal relationships between the parties influence the decision-making process for resolving the requests for changes (RFCs)?

15.5 Which types of relationships most influenced the decision-making process for resolving the requests for changes (RFCs), and please explain why?

*** Communication process for reviewing the requests for information (RFIs) and submittals of the package contractors**

16. Who were responsible for reviewing the requests for information (RFIs) and submittals of the package contractors?

17. Did the construction manager have the assigned authority to review all the requests for information (RFIs) and submittals of the package contractors?

18. What were official communications between the parties? Were all official communications in writing? Could you generally evaluate importance of trust and personal relationships over the communication process so that the project's work goes ahead fast?

19. Questions for investigating the influences of relationships between parties involved in the construction phase on the communication process.

19.1 How and what did contractual relationships between the parties influence the communication process for reviewing requests for information (RFIs) and submittals of the package contractors?

19.2 How and what did functional relationships between the parties influence the communication process for reviewing requests for information (RFIs) and submittals of the package contractors?

19.3 How and what did trust relationships between the parties influence the communication process for reviewing requests for information (RFIs) and submittals of the package contractors?

19.4 How and what did personal relationships between the parties influence the communication process for reviewing requests for information (RFIs) and submittals of the package contractors?

19.5 Which types of relationships most influenced the communication process for reviewing requests for information (RFIs) and submittals of the package contractors, and please explain why?

E.3 Time control process during the construction phase

20. Could you generally evaluate the project success in time, cost and quality (tactical performance)?

21. Were there any problems in the processes of time, cost and quality control during the construction phase? If happen or not happen, what were causes and solutions of that?

22. How was the process of the time control performed at the construction phase?

22.1 Who were parties directly involved the time control during construction? What are their roles?

22.2 What were inputs and tools of the time control during construction?

22.3 How often did the package contractors update the project schedules?

22.4 There were five separate package contractors, how to integrate the schedule of each into the whole project schedule?

23. Questions for investigating the influences of relationships between parties involved the construction phase on the process of time control.

23.1 How and what did contractual relationships between the parties influence the process of the time control during construction?

23.2 How and what did functional relationships between the parties influence the process of the time control during construction?

23.3 How and what did trust relationships between the parties influence the process of the time control during construction?

23.4 How and what did personal relationships between the parties influence the process of the time control during construction?

23.5 Which types of relationships most influenced the process of the time control, and please explain why?

E.4 Cost control process during the construction phase

24. How was the process of the cost control performed at the construction phase?

24.1 Which types of contracts did the owner sign with the package contractors? How was the cost risk shared between the owner and the package contractors?

24.2 Who was a decision-maker for approval when the project expenditures exceed the approved project budget?

24.3 What were inputs and tools of the cost control during construction?

24.4 There are usually many types of changes occurred during construction. Which types of changes did the package contractors get compensation for changes? Which types of changes did not the package contractors get compensation for changes?

24.5 How was the price of approved changes determined when change orders issued by the package contractors, and when change orders issued by the owner?

25. Questions for investigating the influences of relationships between parties involved the construction phase on the process of cost control.

25.1 How and what did contractual relationships between the parties influence the process of the cost control during construction?

25.2 How and what did functional relationships between the parties influence the process of the cost control during construction?

25.3 How and what did trust relationships between the parties influence the process of the cost control during construction?

25.4 How and what did personal relationships between the parties influence the process of the cost control during construction?

25.5 Which types of relationships most influenced the process of the cost control, and please explain why?

E.5 Quality control process during the construction phase

26. How was the process of the quality control performed at the construction phase?

26.1 Who were parties directly involved the quality control during construction? What were their roles?

26.2 Which work did the process of quality control during construction contain? (Inspections of construction supervision, design consultants, etc)

26.3 What were inputs and tools of the quality control during construction?

26.4 What were procedures for corrective actions when quality acceptance criteria are not met?

27. Questions for investigating the influences of relationships between parties involved the construction phase on the process of quality control.

27.1 How and what did contractual relationships between the parties influence the process of the quality control during construction?

27.2 How and what did functional relationships between the parties influence the process of the quality control during construction?

27.3 How and what did trust relationships between the parties influence the process of the quality control during construction?

27.4 How and what did personal relationships between the parties influence the process of the quality control during construction?

27.5 Which types of relationships most influenced the process of the quality control, and please explain why?

F. Operation phase

28. Which organization was assigned to manage the operation phase of the project?

29. What relationships do the owner and this organization have each other?

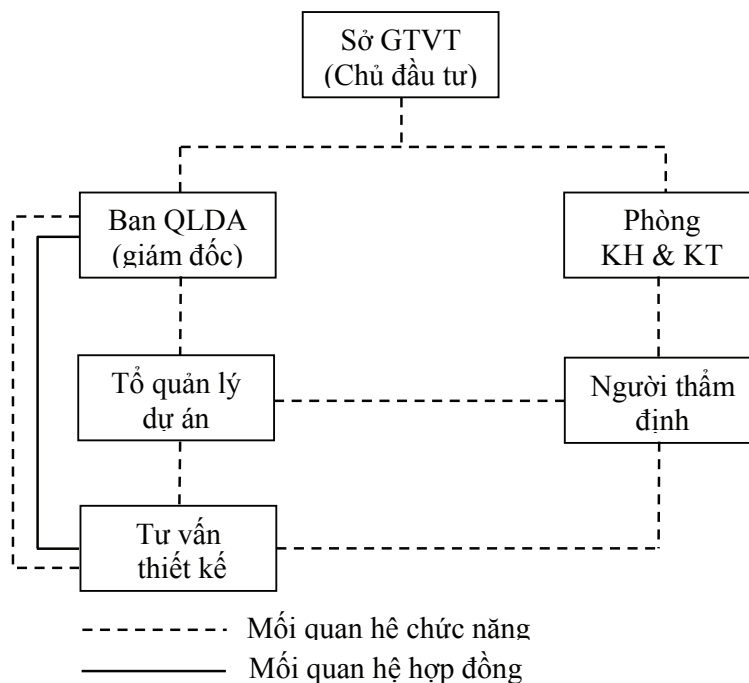
G. Questions regard the project documents

30. Could you provide me with documents for mains plans for the project? (This will help me understand and present the process of the project time, cost and quality control during construction phase).

31. Could you provide me with documents for role definitions of the parties involved in the project?

Appendix 2: Questionnaire for the Vietnamese case (in Vietnamese language)

A. Giai đoạn thiết kế



1. Tôi đã trình bày ai là thành phần tham gia vào quá trình phê duyệt thiết kế của chủ đầu tư và mối quan hệ chính thức giữa họ (mối quan hệ hợp đồng và mối quan hệ chức năng).

Mối quan hệ chính thức (mối quan hệ hợp đồng và chức năng)

* Giám đốc Ban QLDA và TVTK có cả mối quan hệ hợp đồng và mối quan hệ chức năng với nhau bởi vì Giám đốc Ban ký hợp đồng với TVTK để thực hiện thiết kế công trình (mối quan hệ hợp đồng). Mối quan hệ chức năng giữa họ được thể hiện thông qua Giám đốc Ban QLDA nghiệm thu hồ sơ thiết kế của TVTK trước khi trình Sở phê duyệt.

* Mối quan hệ chức năng là mối quan hệ giữa GD Sở GTVT và GD Ban QLDA vì GD Ban là cấp dưới thực hiện nhiệm vụ do GD Sở phân công, có trách nhiệm thuê TVTK hoàn thành hồ sơ thiết kế, sau đó đệ trình hồ sơ này lên GD Sở để phê duyệt.

* Giữa GD Sở GTVT và Trưởng Phòng KHKT cũng có mối quan hệ chức năng vì Trưởng Phòng KHKT tham mưu cho GD Sở ra quyết định phê duyệt thiết kế. Giám đốc Sở phân công Trưởng Phòng KHKT thẩm định hồ sơ thiết kế.

* Giữa Trưởng Phòng KHKT và Người thẩm định cũng có mối quan hệ chức năng bởi vì Trưởng Phòng KHKT phân công công việc cho người thẩm định. Người thẩm định có trách nhiệm báo cáo kết quả thẩm định hồ sơ thiết kế đến Trưởng Phòng KHKT.

* Giữa Tổ QLDA, TVTK và Người thẩm định có mối quan hệ chức năng với nhau bởi vì trong quá trình thẩm định hồ sơ nếu có bất kỳ thắc mắc gì thì Người thẩm định yêu cầu TVTK và Tổ QLDA qua giải thích làm rõ và chỉnh sửa những sai sót.

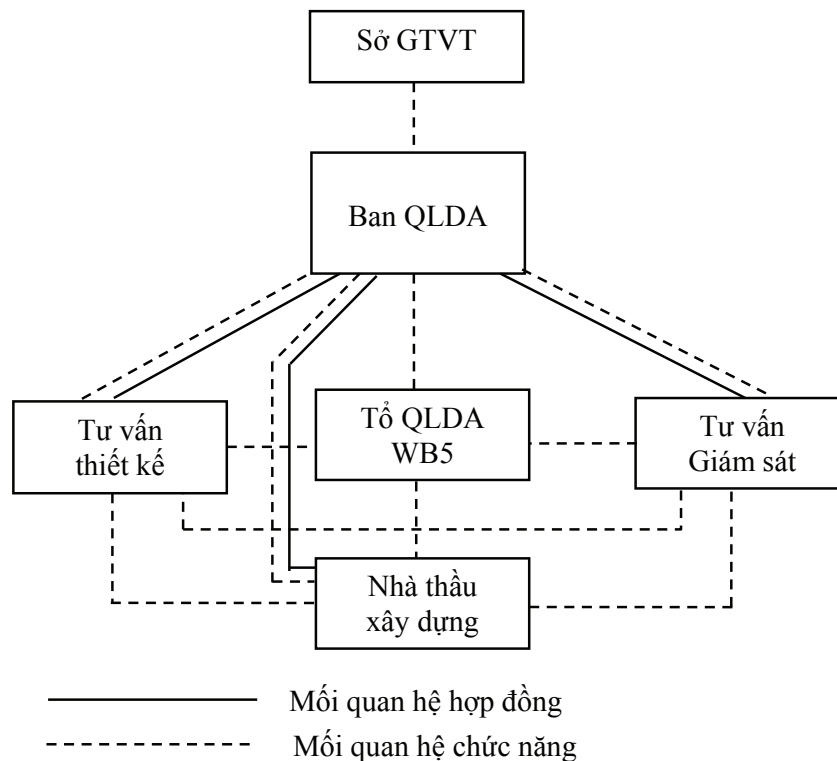
2. Vai trò của những thành phần này là gì?
3. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình phê duyệt thiết kế của chủ đầu tư như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình phê duyệt thiết kế của chủ đầu tư? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)
4. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình phê duyệt thiết kế của chủ đầu tư như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình phê duyệt thiết kế của chủ đầu tư? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)
5. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình phê duyệt thiết kế của chủ đầu tư như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình phê duyệt thiết kế của chủ đầu tư? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)
6. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình phê duyệt thiết kế của chủ đầu tư như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình phê duyệt thiết kế của chủ đầu tư? (vui lòng cho biết là mối quan hệ cá nhân giữa ai với ai)
7. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình phê duyệt thiết kế của chủ đầu tư? Vui lòng giải thích tại sao?

B. Giai đoạn thi công

B.1 Mối quan hệ giữa các bên tham gia vào quá trình thi công

8. Tôi đã trình bày các mối quan hệ chính thức (mối quan hệ chức năng và mối quan hệ hợp đồng) giữa các bên.

Giữa các bên tham gia vào giai đoạn xây dựng có các mối quan hệ không chính thức (mối quan hệ tin tưởng và mối quan hệ cá nhân) gì? Vui lòng giải thích tại sao giữa họ có mối quan hệ không chính thức này? (vui lòng cho biết là mối quan hệ gì giữa ai với ai)



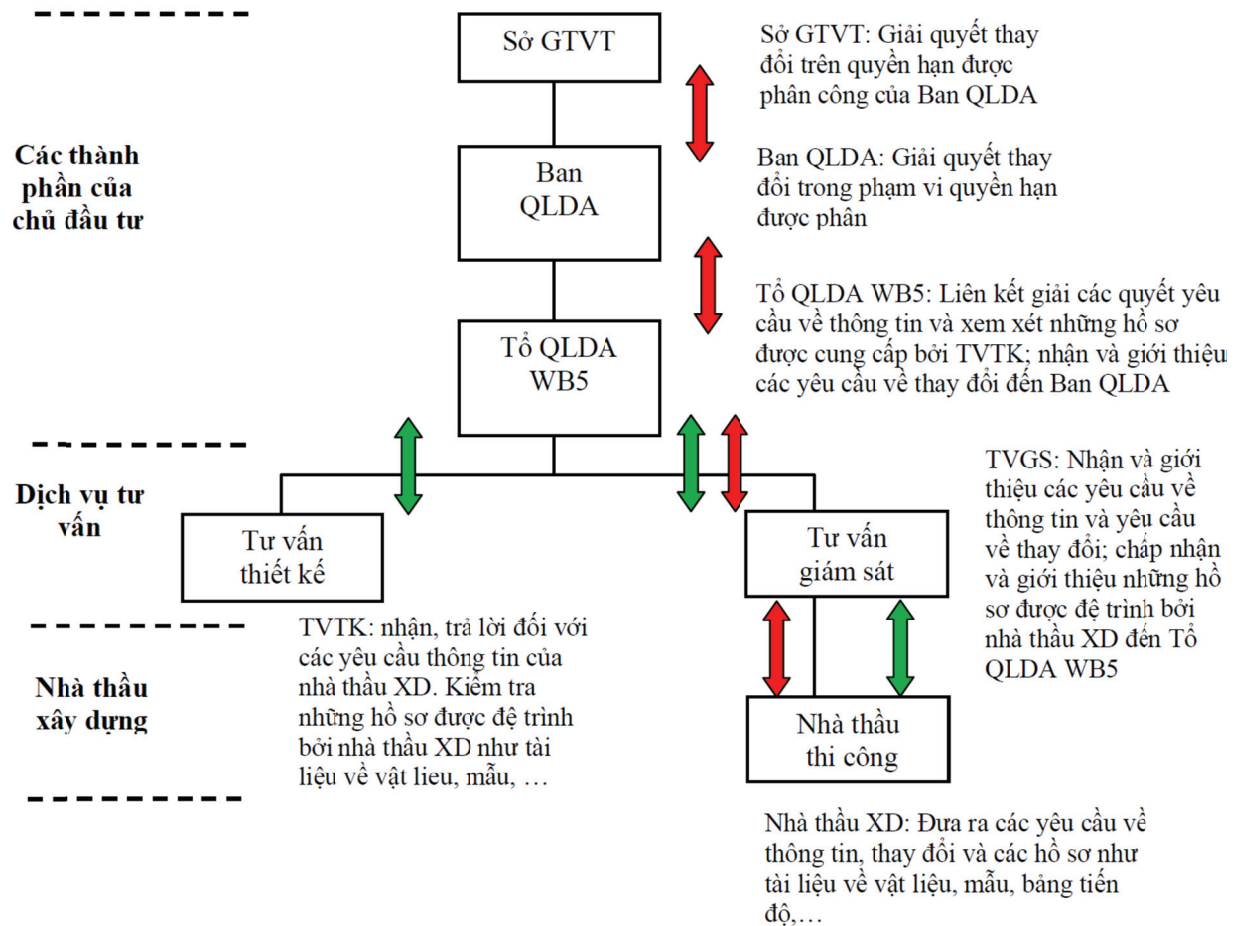
- Mối quan hệ chính thức:

+ Mối quan hệ chức năng là mối quan hệ giữa các cá nhân của chủ đầu tư như GD Sở GTVT, GD Ban QLDA, Tổ QLDA WB5 với nhau.

+ Mối quan hệ chức năng cũng là mối quan hệ giữa Tổ QLDA WB5, TVTK, TVGS và nhà thầu xây dựng với nhau.

+ Giữa GD Ban QLDA và TVTK; giữa GD Ban QLDA và nhà thầu xây dựng; và giữa GD Ban QLDA và TVGS có cả mối quan hệ hợp đồng và mối quan hệ chức năng bởi vì GD Ban ký hợp đồng với các nhà thầu này (mối quan hệ hợp đồng) và GD Ban là người trực tiếp thực hiện công tác nghiệm thu xây dựng để quyết định sản phẩm của nhà thầu xây

dụng có đạt chất lượng hay không, quá trình này có sự tham gia của tất cả các nhà thầu (mỗi quan hệ chức năng).



(Mũi tên màu đỏ chỉ quá trình ra quyết định để giải quyết các yêu cầu về thay đổi của nhà thầu xây dựng. Cụ thể:

Chỉ có GD Sở GTVT và GD Ban QLDA mới có thẩm quyền để giải quyết các yêu cầu về thay đổi của nhà thầu xây dựng. Trong quá trình ra quyết định này, TVTK và TVGS thực hiện việc xem xét và đánh giá các yêu cầu về thay đổi của nhà thầu xây dựng, làm căn cứ cho GD Sở và GD Ban ra quyết định.

Nhà thầu xây dựng đệ trình các yêu cầu về thay đổi đến TVGS. TVGS đồng ý và giới thiệu những yêu cầu này đến Tổ QLDA WB5. Sau đó Tổ QLDA WB5 xem xét và giới thiệu chúng đến TVTK để xem xét và đánh giá. Sau khi nhận được những đề xuất từ TVTK, Tổ QLDA WB5 sẽ giới thiệu các đề nghị này đến GD Ban để ra quyết định cho thay đổi. Nếu vượt quá thẩm quyền của GD Ban sẽ đề nghị lên GD Sở ra quyết định.)

(Mũi tên màu xanh chỉ quá trình giao tiếp để xem xét và trả lời cho các yêu cầu về thông tin và các hồ sơ (tài liệu về vật liệu, mẫu, bảng tiến độ,...) của nhà thầu xây dựng. Cụ thể:

Quá trình giao tiếp này được thực hiện thông qua bốn thành phần, đó là nhà thầu xây dựng, TVGS, Tổ QLDA WB5 và TVTK. Nhà thầu xây dựng đề trình các yêu cầu về thông tin đến TVGS. Sau đó TVGS sẽ xem xét và giới thiệu những yêu cầu này đến Tổ QLDA WB5 và Tổ QLDA WB5 sẽ liên hệ với TVTK để cung cấp thông tin để trả lời cho các yêu cầu thông tin của nhà thầu.)

B.2 Quá trình ra quyết định để giải quyết các yêu cầu về thay đổi của nhà thầu xây dựng (mũi tên màu đỏ)

9. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình ra quyết định như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình ra quyết định? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)

10. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình ra quyết định như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình ra quyết định? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)

11. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình ra quyết định như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình ra quyết định? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)

12. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình ra quyết định như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình ra quyết định? (vui lòng cho biết là mối quan hệ cá nhân giữa ai với ai)

13. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình ra quyết định? Vui lòng giải thích tại sao?

B.3 Quá trình giao tiếp để giải quyết các yêu cầu về thông tin của nhà thầu xây dựng (mũi tên màu xanh)

14. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình giao tiếp như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình giao tiếp? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)

15. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình giao tiếp như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình giao tiếp? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)

16. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình giao tiếp như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình giao tiếp? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)

17. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình giao tiếp như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình giao tiếp? (vui lòng cho biết là mối quan hệ cá nhân giữa ai với ai)
18. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình giao tiếp? Vui lòng giải thích tại sao?

B.4 Quá trình quản lý chất lượng suốt quá trình thi công

19. Quá trình quản lý chất lượng được thực hiện như thế nào suốt quá trình thi công?
20. Có bất kỳ vấn đề gì xảy ra đối với quá trình quản lý chất lượng suốt quá trình thi công không? Nếu có hoặc không, vui lòng cho biết đâu là nguyên nhân và giải pháp xử lý?
21. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình quản lý chất lượng suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình quản lý chất lượng suốt quá trình thi công? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)
22. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình quản lý chất lượng suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình quản lý chất lượng suốt quá trình thi công? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)
23. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình quản lý chất lượng suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình quản lý chất lượng suốt quá trình thi công? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)
24. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình quản lý chất lượng suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình quản lý chất lượng suốt quá trình thi công? (vui lòng cho biết là mối quan hệ cá nhân giữa ai với ai)
25. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình quản lý chất lượng suốt quá trình thi công? Vui lòng giải thích tại sao?

B.5 Quá trình quản lý tiến độ suốt quá trình thi công

26. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình quản lý tiến độ suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình quản lý tiến độ suốt quá trình thi công? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)

27. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình quản lý tiến độ suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình quản lý tiến độ suốt quá trình thi công? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)

28. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình quản lý tiến độ suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình quản lý tiến độ suốt quá trình thi công? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)

29. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình quản lý tiến độ suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình quản lý tiến độ suốt quá trình thi công? (vui lòng cho biết là mối quan hệ cá nhân giữa ai với ai)

30. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình quản lý tiến độ suốt quá trình thi công? Vui lòng giải thích tại sao?

B.6 Quá trình quản lý chi phí suốt quá trình thi công

31. Các mối quan hệ hợp đồng giữa các bên ảnh hưởng đến quá trình quản lý chi phí suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ hợp đồng lên quá trình quản lý chi phí suốt quá trình thi công? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)

32. Các mối quan hệ chức năng giữa các bên ảnh hưởng đến quá trình quản lý chi phí suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ chức năng lên quá trình quản lý chi phí suốt quá trình thi công? (vui lòng cho biết là mối quan hệ chức năng giữa ai với ai)

33. Các mối quan hệ tin tưởng giữa các bên ảnh hưởng đến quá trình quản lý chi phí suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ tin tưởng lên quá trình quản lý chi phí suốt quá trình thi công? (vui lòng cho biết là mối quan hệ tin tưởng giữa ai với ai)

34. Các mối quan hệ cá nhân giữa các bên ảnh hưởng đến quá trình quản lý chi phí suốt quá trình thi công như thế nào? Cái gì là ảnh hưởng của các mối quan hệ cá nhân lên quá trình quản lý chi phí suốt quá trình thi công? (vui lòng cho biết là mối quan hệ hợp đồng giữa ai với ai)

35. Loại mối quan hệ nào có ảnh hưởng nhất lên quá trình quản lý chi phí suốt quá trình thi công? Vui lòng giải thích tại sao?