Engineering, Procurement and Construction Management (EPCM) Services by a Consultant in Industrial Projects

An exploratory study into client expectations, and limitations of construction management

Delft University of Technology

MSc thesis by Arjan Oosterhof

Engineering, Procurement and Construction Management (EPCM) Services by a Consultant in Industrial Projects:

An exploratory study into client expectations, and limitations of construction management

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PREFACE

The master thesis report you are about to read is my final step at Delft University of Technology. In order to graduate from Construction Management & Engineering I studied expectations and limitations of EPCM projects at Royal HaskoningDHV.

I would like to thank my graduation commission for assisting me throughout this process. Due to Hans and Jeroen their commitment and understanding I was able to continue and keep trying. I want to thank Wijnand for his critical questions and side notes, safeguarding the scientific aspect of my story. Marian, despite joining the project in a later phase, your input became indispensable. You helped structure my thoughts and brought back confidence and fun in the process!

On a more personal note I would like to thank my girlfriend Simcha, who motivated me to reboot my graduation process. Besides her mental support, things got more practical in the final phase. After my laptop crashed (the cup of tea a couple of days before might have something to do with it) she lent me hers for two months in order for me to finish writing my thesis. Unknowing what the future might bring I am going to miss our morning train rides together, bringing her to The Hague and me to Delft. But who knows; maybe my future job will put us in the same train again!

I hope you enjoy reading.

Arjan Oosterhof

Rotterdam, October 2018

EXECUTIVE SUMMARY

Background

Clients in industrial projects in general use one of-two contract forms: Engineering, Procurement and Construction (EPC) or Engineering, Procurement and Construction Management (EPCM). In EPC a large contractor designs and constructs the project, while in EPCM a consultant designs the project but does not construct it himself. Instead the consultant acts on behalf of the client by managing the contractor(s). EPCM is a system that originated from the heavy industry sector such as mining, but is now more common in other sectors such as light industries. EPCM can be favourable since large EPC contractors are not widely available in non-Western markets, it can effectively lower project costs compared to EPC, and clients can be flexible during design and construction.

There are signs that clients' expectations of the EPCM services during the construction phase are not aligned with the consultant's provided service. It seems clients expect to bear less risk during construction than the actual risk distribution of current industrial EPCM practices. This results in client dissatisfaction and therefore putting stress on the client-consultant relationship. The research question is:

> ***How can client dissatisfaction with the construction management service in industrial EPCM projects be reduced?***

Method of data gathering and analysis

First literature is studied on the topics: client satisfaction as a project success criterion, client satisfaction as a consequence of service quality, and EPCM projects. Client satisfaction is one of 6 project success criteria in the context of industrial projects. Secondly client satisfaction is the natural consequence of service quality, in this context the construction management service provided by the consultant. The Servqual model's concept of how expectations and perceptions are formed is used to analyze causes of misalignment. Known disadvantages of EPCM projects are; no single point of responsibility, requirement for the client to control construction by installing a relatively large site team, uncertainty on budget and planning, no inherent incentives for the consultant and contradicting interests for the consultant.

In order to map the misalignment of client and consultant a structured interview was send out to 5 clients and 5 consultants. The structured interview contained Solwert (SOLL) and Istwert (IST) statements on 9 aspects (A to I), meaning participants were asked how it should (SOLL) have been and how it was perceived (IST). The 9 aspects included role, responsibility, accountability and 6 project success criteria. To map the misalignment of expectations the SOLL data is compared, IST data is used as input for the case studies. In order to find causes for the misalignment of expectations and to find limitations of EPCM project in practice 5 in-depth case studies were set up. The 5 clients and consultants who participated in the structured interviews performed 5 projects together. Those 5 light industry EPCM projects were selected as subject of the case studies. Both client and consultant were interviewed on the 3 following topics: 1) expectations, offer and perception of the CM service, 2) causes for the misalignment of expectations with Servqual as an under layer, 3) limitations of EPCM in practice. For each case the misalignments and their causes are assessed, and limitations in practice are gathered. Answers on the three topics are compared to each other in a cross-case table in order to find patterns.

Main findings

The outcome of the structured interviews show that clients have higher expectations on all 9 aspects, meaning clients expect a result obligation of the consultant. However contractually a 'best effort' obligation is offered. Main contributors to the misalignment are aspects: B) responsibility for the contractor's performance, C) accountability for project overruns, E) obligation to deliver the project in time, and H) obligation to deliver the project with the desired start-up production.

Main causes for misalignment of expectations can be found at the client, consultant, and at interaction between them. Clients' expectations are mostly formed by past experiences. Successful projects motivate client and consultant to organize new projects in an identical way, which might be unjustified. A wrong mentality of expecting to 'lie back' during construction does not meet the requirements of an EPCM project, since the client is supposed to actively control design and construction by installing a relatively large site team. The consultant causes misalignment of expectations by inconsistency of terminology and incompleteness of documents amongst and throughout projects. Client and consultants do not discuss the terms and details of the division of roles, responsibilities and accountability prior to the project, but end up discussing these aspects after project completion.

Main limitations in current EPCM practices are low control on the contractor, reactive construction management, and how accountability is handled. 1) Low control on the contractor by the consultant is perceived due to the lack of teamwork between client and consultant and due to the client's prohibition to award penalties. 2) The consultant does not meet the CM service as expected by the client or as described in theory. Despite their ambitions the consultant in general 'monitors and reports' instead of pro-actively manages and co-ordinates contractors. Missing the 'right person on the job' plays a big role. 3) In current practice the consultant is responsible without any accountability, what causes a feeling of unfairness for the client. This leads to settlements on the consultants' fee after project completion, even in cases when the project is considered to be successful. The absence of agreements on responsibility and accountability prior to the project leads to discussion after the project in case of any form of overrun, even if this overrun is considered to be acceptable.

In order to prevent client dissatisfaction with the construction management service in industrial EPCM projects the misalignment of expectations should be bridged and certain limitations of EPCM should be overcome. Therefore in aspects B, C, E, and H, the main aspects found in the structured interviews, the following improvements need to be made. In order to improve on responsibility (B) and accountability (C) the consultant should be incentivized by a certain level of accountability fitting its responsibility. Having more control over the contractor is required, what can be achieved by client and consultant performing as one team with good teamwork. Installing the right person on the job is a condition for good construction management. In order to improve the consultant's obligation to deliver the project (E) in time client and consultant should agree prior to the project how planning overruns are handled contractually. Improving the obligation to deliver with the desired start-up production (H) means the scope of the consultant should be expanded.

Recommendations

In order to bridge the misalignment, client and consultant are recommended to improve communications prior to the project and improve performance during the project. In order to align, client and consultant should assess whether EPCM is the right choice of contract by discussing; 1) the willingness of the client to bear risk, 2) the willingness of the client to control design and construction by installing a relatively large team, 3) the role, responsibility and accountability of the consultant. Secondly the consultant should avoid misaligned expectations by incorporating a company policy on the definition of its construction management service, what should be used consistently throughout and amongst projects. Based on that, project managers of the consultant should be aligned amongst themselves regarding the contents of the services they provide.

In case EPCM is the desired project delivery system, client and consultant should discuss in order to align expectations and project strategy; 1) Roles: focus on definition of what the team is and roles are/ establishing good teamwork between client and consultant and functioning as one team, 2) Responsibility: establish a pro-active management style/ agree on policy on contractor penalties, 3) Accountability: incentives for the consultant and level of involvement in contractor selection process, 4) Planning: remuneration based on milestones, 5) Start-up production: in- or excluding commissioning and start-up in the consultant's scope.

Recommendations for further research are 1) sending out the structured interviews as an EPCM sector-wide survey; 2) quantitative studies on misalignment causes and EPCM limitations; and 3) inclusion of the contractor's point of view in order to triangulate and complete client and consultant's expectation and perception.

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Abbreviations

CM	Construction Management
EPC	Engineering Procurement Construction
EPCM	Engineering Procurement Construction Management
FEED	Front-End Engineering and Design
PDS	Project Delivery System
PM	Project Manager
RHDHV	Royal HaskoningDHV

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1. INTRODUCTION

1.1 Introduction

At the Light Industries business unit of Royal HaskoningDHV (RHDHV) projects are executed within the field of consumer's goods. The design, engineering and managing services vary from warehouses to harbours, and production lines to breweries. Therefore mechanical engineering covers a big part of the scope in both types of project. Clients in this industry in general organize their projects in two ways: Engineering, Procurement and Construction (EPC) or Engineering, Procurement and Construction Management (EPCM) contracts. Even though they are one letter apart, the differences are considerable. In EPC projects a large contractor designs and constructs the project often for a lump sum amount, while in EPCM projects a consultant designs the project but does not construct it. The consultant acts on behalf of the client by managing the contractor(s). EPCM is a system that originates from the heavy industry sector such as mining, but is now more common in other sectors. The meaning of EPCM is relatively unknown in these other sectors (Loots & Henchie, 2007). Causes are 1) its upcoming popularity, 2) the confusion between the "C" in EPC and "CM" in EPCM, 3) no standard form of contract (Loots & Henchie, 2007).

For the clients of the Light Industries business unit of RHDHV EPCM is the preferred system in recent years. This method is considered to be favoured since; 1) large EPC contractors are not widely available in non-Western markets, 2) EPCM can effectively lower costs compared to EPC, 3) Clients can be flexible during design and construction.

In practice clients seem less satisfied with the Construction Management service compared to the Engineering and Procurement services. There are signs that clients' expectations of the EPCM services during the construction phase are not aligned with the consultant's provided service. It seems clients expect to bear less risk during construction than the actual risk distribution in Industrial EPCM projects at RHDHV. This results in client dissatisfaction and therefore putting stress on the client-consultant relationship. Therefore clients and consultants are looking into new ways of collaboration and contracting, even though it is not clear whether the current EPCM method is to blame. Since this is not clear insights are demanded in 1) client's expectations of EPCM and 2) limitations of current EPCM practices.

1.2 Problem definition

The identified problem is twofold. In practice clients are not always satisfied with the consultant's services during the execution phase of EPCM projects. It seems clients' expectations of construction management are not aligned with the service offered by the consultant. Secondly it is not clear whether client complaints on the construction management service are caused by a lack of performance by the consultant or by limitations ingrained in the current EPCM set up.

1.3 Objectives and scope

The goal of this thesis is to find ways to improve client satisfaction of projects executed under an EPCM contract. Therefore the following research objectives are defined.

- Explore the definition of EPCM by describing the roles and responsibilities, risk allocation, collaboration form, pro's and con's etc.
- Map client and consultant's expectations of the EPCM services.
- Find causes for a potential misalignment of these expectations.
- Find limitations of EPCM projects in practice
- Formulate recommendations on improving current EPCM practices.

1.4 Research questions

RQ: How can client dissatisfaction with the construction management service in industrial EPCM projects be reduced?

1: On what aspects are the client's expectations misaligned with the construction management service the consultant offers?

2: What causes the misalignment of client and consultants' expectations?

3: What limitations of the construction management service are found in EPCM projects in practice?

4: What needs to improve in order to align client and consultant in EPCM projects?

1.5 Research Approach

Figure 1 provides an overview of all steps of the research approach and their matching chapters. Orientation in literature and practice shows there are varying conceptions of the definition of EPCM. Therefore the theoretical background chapter will provide an exploration of the definition of EPCM. Since client expectation and satisfaction is the starting point of the problem definition we want to find out what is known about expectations and satisfaction in the context of consultant's services. The theoretical background's conclusions will serve as the starting point of the empirical work, as explained in the methodology chapter. Chapter 4 and 5 explain how data in the structured interviews and case studies are gathered and analysed. Chapter 6 cross case analyses the findings and links it to the outcome of the structured interviews by showing its implications for practice. In Chapter 7 all research questions are answered and translated into recommendations. Finally Chapter 8 gives a personal reflection on the product and process of this thesis.

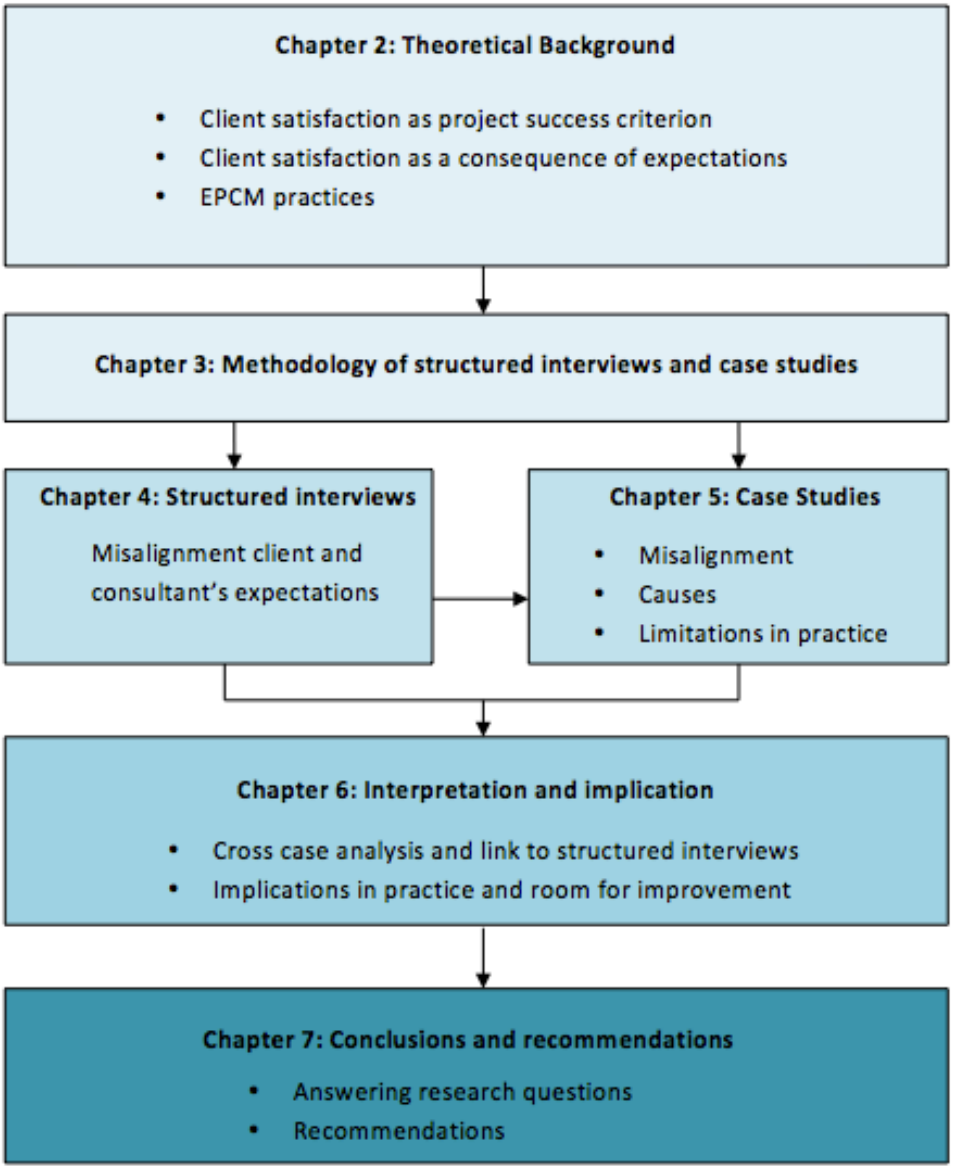

Figure 1: Flowchart research approach

2. THEORETICAL BACKGROUND

In order to define the theoretical background the following topics were studied: client satisfaction as a project success criterion, client satisfaction as a result of aligned expectations, and EPCM projects.

2.1 Client Satisfaction

Client Satisfaction as a criterion of Project Success

Project success can be explained by success criteria and success factors. Criteria are the set of principles or standards by which success can be judged, whilst factors contribute to the project outcomes (Lim & Mohamed, 1999). Project success factors facilitate project success, measured by project success criteria.

Literature describes project success in various ways. In one of its simplest terms a project is successful when it comes in on-schedule, on-budget, achieves basically all goals and is accepted and used by the Client (Pinto & Slevin, 1997, p. 169). The 'iron triangle' (figure 2) represents the three success criteria cost, time, and quality, which is similar to Pinto and Slevin's (1997) on-schedule, on-budget, and achieving goals.

Figure 3 defines project success from the project's as well as the client's point of view. From the project's point of view performance, cost, and time are indicators of project success; the iron triangle. According to Chan and Chan (2004) the project point of view can be completed with the criteria 'business case', Health Safety and Environment (HSE), scientific and technical aspects. From the client's point of view criteria are use, satisfaction, and effectiveness. This could be completed by adding Health, Safety and Environment (HSE), commercial value, and user expectation/satisfaction as criteria for measuring project success (Chan & Chan, 2004).

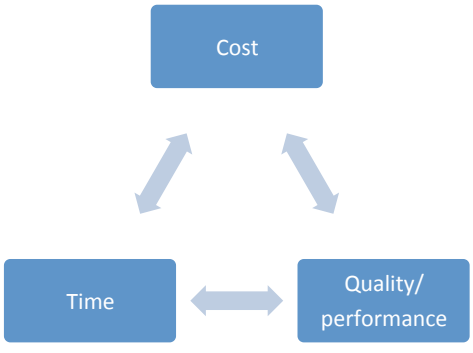

Figure 2: Iron triangle (Project Management Institute, 2004)

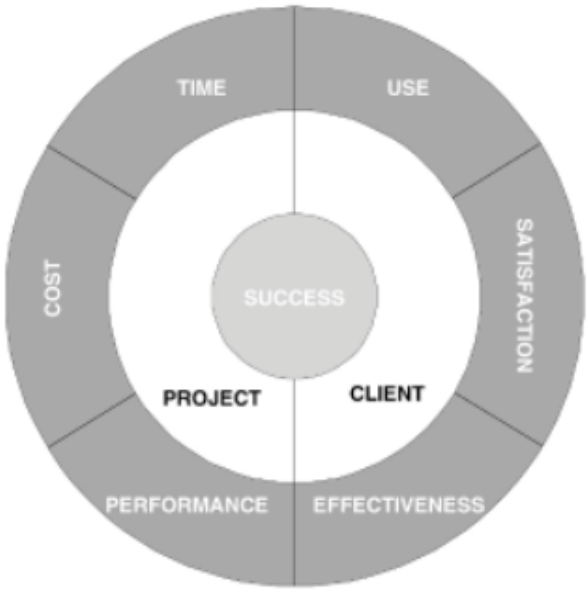

Figure 3: Model of project success criteria (Pinto, 1988)

Kerzner (Morris & Pinto, 2007) makes a distinction between successful projects and successfully managed projects. Project management success comprises technical performance specifications and satisfaction of key people on the project team. Project success means accomplishing the mission to

be performed with satisfaction in parent and client organisation (Morris & Pinto, 2007, p. 227). This is supported by Bjeirmi and Munns (1996, p. 82) who identify the difference between project management success and project success. Both have a different scope and can perform independent of each other, however are interrelated, as can be seen in figure 4. Project success comprises in general return on investment, profitability, competition and marketability, whilst project management success comprises completion to budget, satisfying schedule, meeting quality standards and project goal (Munns & Bjeirmi, 1996, p. 82).

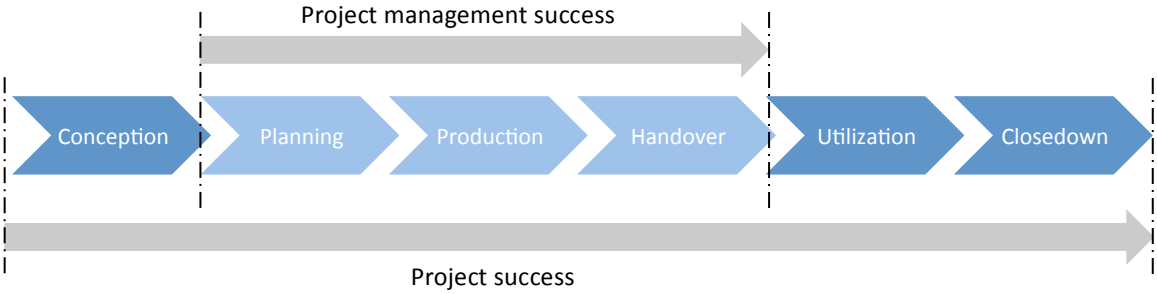

Figure 4: Scope of success within the project life cycle (Munns & Bjeirmi, 1996, p. 85)

Arkesteijn et al. (2009) developed a project success measurement model with 6 criteria which is derived from a Q-sort study performed with practitioners in the process industry. According to this study the following criteria define project success: safety, client satisfaction, budget, quality, schedule, start-up production. With results pointing out the budget criterion has the most influence on Client Satisfaction. The study is concluded with a model to measure project success of industrial projects. For each project success criterion a score can be awarded of 1, a 1/2 or 0 points. A project scoring above 4,5 is considered to be successful, equal or below 4,5 means the project was unsuccessful. The scoring table can be found in chapter 3.2, where it is explained in the case study methodology.

Even though client satisfaction is seen as one of the project success criteria it is highly correlated with the other project success criteria. Budget, schedule, quality, safety, and the start-up production are big contributors to client satisfaction.

According to Oliver (1997) there are three variants of satisfaction; 1) satisfaction with individual elements of product and service delivery, 2) final outcome satisfaction, and 3) satisfaction with satisfaction. Fuller and Matzler (2007) proposed their version of 'The Kano model' of Customer Satisfaction, which classifies 3 types of factors affecting Client Satisfaction;

1. Basic factors; minimum requirements, absence leads to dissatisfaction, presence not to satisfaction
2. Performance factors; absence leads to dissatisfaction, presence to satisfaction. Examples are reliability and friendliness
3. Excitement factors; factors that increase clients' satisfaction, absence does not lead to dissatisfaction.

Besides other project success criteria affecting client satisfaction also 'softer' aspects play a role. Multiple studies show that relationship quality between client and contractor positively affects client

satisfaction (Williams, Ashill, Naumann, & Jackons, 2015). Relational contracting, as called by Suprapto (2016), enhances project success including client satisfaction. Main mediator of relational contracting is teamworking quality. Chapter 2.3 elaborates why contracting is not a 'game changer'.

Client satisfaction as an indicator of Service Quality

Measuring client satisfaction has several benefits for an organisation; improvement of communication between parties and reaching mutual agreement, recognition of demand of improvement, better understanding of problems, evaluation of progress, monitoring and reporting results and changes (Rahman & Alzubi, 2015). Satisfaction can be seen as the comparison between one's perception of an outcome and its expectation for that outcome (Locke & Latham, 1990), in this case the outcome of the construction management service. If the outcome of the service meets or exceeds the client's expectations, satisfaction is achieved or even exceeded (Cheng, Proverbs, & Oduoza, 2006). The level of satisfaction is therefore dependent on one's perceptive and 'expectational' thinking (Cheng, Proverbs, Oduoza, & Fleming, 2005). Identifying and sequentially satisfying the needs of clients is a critical aspect for the existence and competitiveness of the construction industry (Cheng et al., 2005).

There are several tools to measure the quality of a service. One established tool to do so is SERVQUAL, developed for the retail industry by Parasuraman, Zeithaml and Berry (1988). In this model client satisfaction is a natural effect of service quality. The model explains by its '5 gaps' how a potential misalignment between the expected service and the perceived service could arise. The actual alignment of expectation and perception of the service is made measurable with the so called 'RATER' criteria: Reliability, Assurance, Tangibles, Empathy, and Responsiveness. The authors state that the criteria are universally applicable in other service industries, however they might need to be adjusted to its context (Parasuraman et al., 1988, p. 28). This is backed up by (Hoxley, 2000) who mentions it is suitable for the construction sector after some adjustments of the criteria.

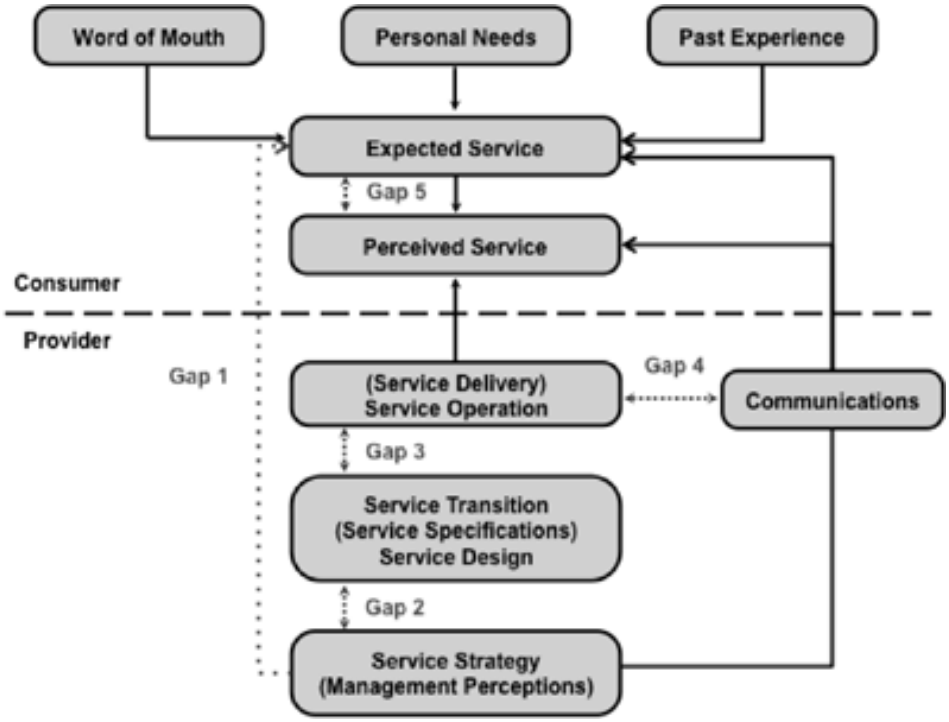

Figure 5: Servqual model (Parasuraman et al., 1988; Hoxley, 2000.)

Figure 5 above gives an overview of the process of service quality (Parasuraman et al., 1988). The model shows certain expectations of the service are caused by the external factors 'Word of mouth', personal needs, past projects, and external communications. The perceived service comes to exist by the interpretation of the service provider translated to a service strategy, translated to the service specifications, and finally translated to the actual practices of the services. Between all these steps, with their matching products and activities, certain gaps arise which all can contribute to the eventual misalignment of expectation and perception (gap 5). The dashed line between 'Consumer' and 'Provider' separates both worlds and is connected by communication.

2.2 Engineering Procurement and Construction Management

Project Delivery System

Literature has many different conceptions on the phasing of the project life cycle. PRINCE2 (2002) describes it as the sequence of phases through which a project must pass. In general different terminology reflect the industry in which the projects are executed (Prabhakar, 2008). Kerzner (2009, p. 68) for instance developed the following project phasing: 1) Conceptual, 2) Planning, 3) Testing, 4) Implementation or Execution, 5) Closure. Authors use various terms for similar phases, therefore Archibald & Voropaev (2003) identified four broad phases with common alternative terms: 1) Concept (initiation, identification, selection), 2) Definition (feasibility, development, demonstration, design prototype, quantification), 3) Execution (implementation, realization, production and deployment, design/ construct/ commission, installation and test), 4) Closeout (termination, including post-completion evaluation).

In projects working relationships between three main parties are expected: Client, Engineering Consultant and the Contractor(s). A so-called Project Delivery System (PDS) determines how these relations are organised. The activities of owners, design professionals, and constructors making decisions, providing services, and performing work to deliver constructed projects are known as 'project delivery' (ASCE, 2012, p. 15). A PDS describes how participants are organized to interact, transforming the owner's goals and objectives into a finished facility (ASCE, 2012, p. 15). A PDS is a contractual structure including a compensation arrangement used to acquire a facility that meets the needs of the owners (Mafakheri, Dai, Slezak, & Nasiri, 2007, p. 200). Clients select a PDS to define the roles of participants, share authority and responsibility, allocate profit and risk, and organize and incentivize participants to fulfil objectives (Qiang, Wen, Jiang, & Yuan, 2015, p. 1780). The Cambridge dictionary (2018) defines role, responsibility and accountability as follows. Role: "the position or purpose that someone or something has in a situation, organization, society, or relationship." Responsibility: "something that it is your job or duty to deal with / blame for something that has happened." Accountability: "a situation in which someone is responsible for things that happen and can give a satisfactory reason for them."

Before commencing a project certain ex-ante factors determine the project definition. As mentioned by the IPA (Bakker, 2014, p. 19) the 'wrong contracting strategy' is a reason for project failure. This is backed up by Chan, Yung, Lam, Tam, and Cheung (2001) claiming selecting the appropriate Project Delivery System (PDS) is one of the most important success factors.

For the choice of contracting strategy circumstances such as product and/or process uncertainty, desired allocation of risk, owner in-house capability, and market conditions should be taken into account. The contract type choice depends on factors like: initial trust and commitment emerged from prior relationships, perceived risk and uncertainty as a function of scope definition, external factors such as regulatory challenges, market volatility, and difficulties due to location (Suprapto, Bakker, Mooi, & Hertogh, 2015). Merrow (2011, p. 264) bases his contracting strategy selection decision making model on three aspects to consider: the capabilities of the sponsors (clients), the nature of the project, and the state of the EPC services market. According to Peeters and In 't Veld (1989, p. 27) contract decision criteria are: cost uncertainty, technical uncertainty, available extra resources, schedule criticality, performance criticality, and long-term motives. Aspects that should be taken into consideration when choosing the payment type are (Carmichael, 2000); budget considerations, cost uncertainty, type of work/services, environment, technical uncertainty,

availability of resources, project duration, schedule importance, performance importance, contractor motives, past performance and reputation of contractors, delivery method. However in practice the contract decision might be quite subjective based on past successes for instance (Carmichael, 2000, p. 62). Different phases of the project could be divided over different contracts, which have influence on the project and risk distribution. Contractual governance emphasizes the use of a formalized, legally-binding agreement to specialize the inter-Organisation trading partnership (Ping, Shuping, Lamei, Ping, & Xiaoyan, 2015, p. 214). The choice of Project Delivery System (PDS) and contract determine the working relations from the contracting point of view, soft skills which are incorporated in the level of collaboration determine the working relations as well. The PDS is a contractual structure that includes a compensation arrangement. This compensation arrangement (remuneration) could be explained as the 'choice of contract', which lies between the spectrum of the two extremes Lump Sum and Reimbursable. Remuneration is connected to risk, since remuneration is just the price attached to the allocation of risk. Figure 6 shows the contracting spectrum with 'fixed price' where risk is allocated at the contractor/consultant, and 'cost plus' on the other end where risk is allocated at the Client.

Figure 6: Remuneration versus risk (Berends, 2014; Kerzner, 2009)

In general contracts comprise the following documents (Morris & Pinto, 2004, p. 680); 1) the contract agreement, 2) general specification and scope of work, 3) general conditions of contract, 4) special conditions of contract, and 5) administrative and coordination procedures. Berends (2014) describes a contract to be the product of three interrelated elements: scope of work, price and payment provisions, and terms and conditions.

More variations of Lump Sum and Reimbursable contracts exist, the most commonly used forms of remuneration for FED, EPC and EPCM are Fixed Price, Cost Plus Fixed Fee, Cost Plus Percentage Fee, Cost Plus Incentive Fee, and Unit Rate (or bill of quantities) (Berends, 2014). For the Construction Management service it is common to use reimbursable contracts.

According to the risk allocation versus remuneration model the use of contractual incentives should cause a more balanced risk distribution. However studies show there is no direct relationship between contract types and project performance (Suprapto et al., 2015). Contracting is a second order concern (IPA, 2010); project outcome is linked to the combination of contractual as well as relational aspects. However Chan et al. (2001) claim the correct choice of the project delivery method to be one of the factors leading to Project Success. Contract types and contractual incentives are not 'game changers', more important are parties' attitudes towards a collaborative relationship and how this works out into actual teamworking behaviour (Suprapto et al., 2015, p. 13). Project cost

performance for instance is associated with the alignment between owner and contractor and their agreement in allocating and managing risk, regardless of the contract type (CII, 1986). However there is a growing interest in the implementation of contractual incentives to efficiently balance risk between Client and Contractor (Kwawu & Laryea, 2013, p. 729).

A good Front-End Definition should contain clear operationalized project goals, clarity of scope definition, quality of basic design, and quality of project execution plan. The maturity of Front-end definition results from Front-end Development (FED). The goal of FED is to prepare future project phases and to provide the Client with sufficient project information to decide on the continuation of the project (Bosch-Rekveldt, 2014, p. 119). That decision is called the Final Investment Decision (FID). Figure 7 shows how value is created and the influence it has on project performance.

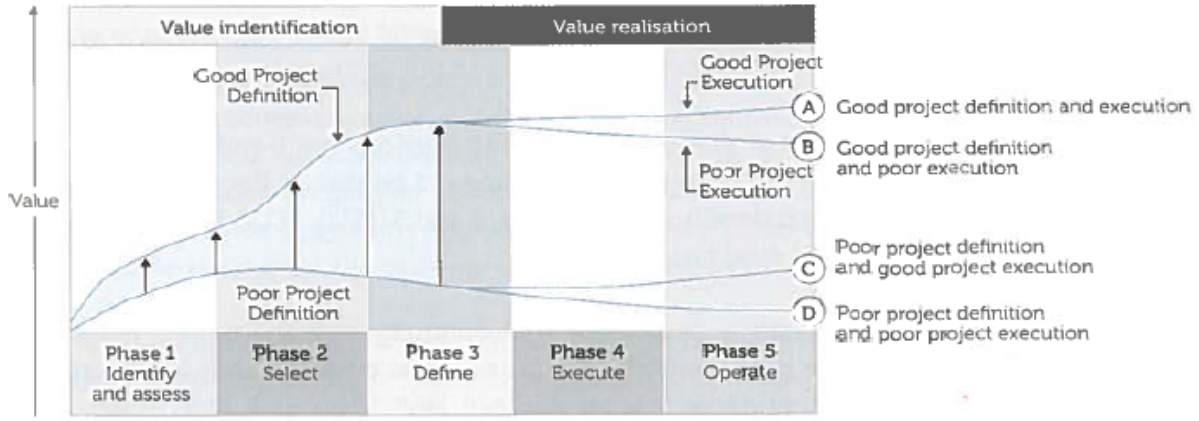

Figure 7: Effect of Front-end Definition on value (Bosch-Rekveldt, 2014, p. 119)

Aspects that are included in FED are objectives, the scope, design basis, project planning, required resources, and involved risk (Bosch-Rekveldt, 2014, p. 119). FED is divided into 3 phases before going into execution and operation, which are 'Identify and assess', Select, and Define (figure 7). This is similar to 3 successive phases: Concept (FED1), Feasibility (FED2), and Design (FED3) (Turner, 2008).

EPCM practices

A commonly seen Project Delivery System for industrial projects within the context of this thesis is EPCM, in which the client employs an engineering consultant. In EPCM contracts the consultant is not performing the actual construction; this is done by contractors. When the execution phase of the project commences the consultant's focus shifts from designing and engineering towards construction management. The main difference with EPC, as can be seen in figure 8, is the client holding contracts with all parties involved, compared to EPC where the entire project is outsourced to one large contractor.

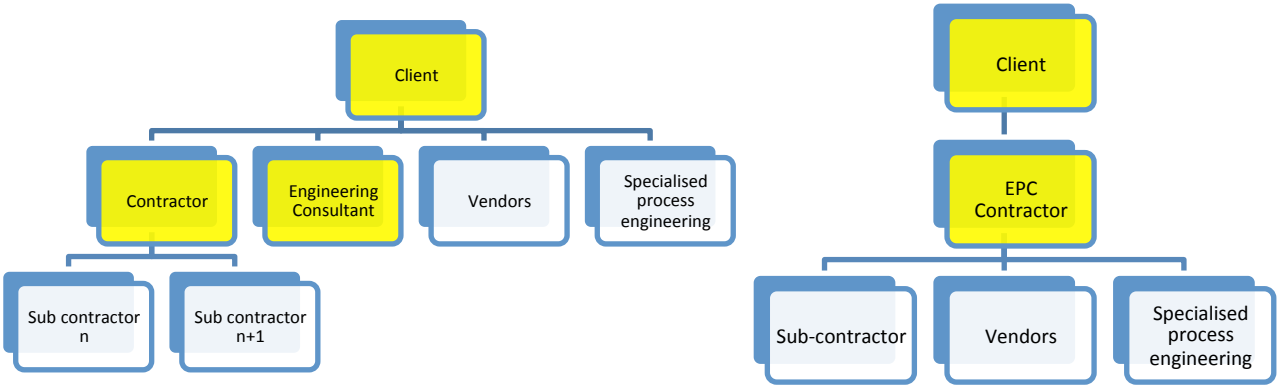

Figure 8: EPCM contract (left) versus EPC (right)

In EPCM the risk is in general at the client, since the client holds the contracts with the contractors. The consultant provides a construction management service during execution and acts on behalf of the client. In general the consultant is paid lump sum to do the Front-End Development (FED), detailed design and procurement. During execution his role changes; the consultant is often paid reimbursable for construction management services. There is a shift in the role of the consultant as soon as construction starts, which is also noticeable in the contract where the risk moves from the consultant to the client. Since the EPCM route splits responsibility for engineering and construction, the client ought to be far more pro-active in its management of the project (Loots & Henchie, 2007). Which is confirmed by Berends (2014) who mentions EPCM requires large and competent client's team and involvement, also controlling the consultant.

Recently there has been a significant increase in the EPCM contract procurement route for international infrastructure and major construction works, particularly in projects in the petrochemical, mining, power and desalination sectors. The shifting away from lump sum EPC reflects the bargaining position of many EPC contractors and to some extent the increasing size and complexity of international projects. In the petrochemical sector for example this position of EPC contactors originates since few EPC contractors are available with the know-how and experience, resulting in rising EPC prices (Loots & Henchie, 2007, pp. 1-2). Just as any Project Delivery System EPC and EPCM have advantages and disadvantages. Both systems are suitable for different types of projects; therefore one is no better than the other by definition.

Loots and Henchie (2007) describe the process of an EPCM project by splitting it into two phases; 1) Front-End Engineering and Design (FEED), also known as FED, and 2) Engineering, Procurement, and Construction Management (EPCM).

The FED phase defines the work scope and breaks it down into work packages in order to make estimates on budget and schedule. It usually includes basic engineering and design, project schedule, cost estimates, and sometimes procurement of long-lead items. After the FED phase, moving towards the Engineering, Procurement and Construction Management, the Client has in general 3 options (Loots & Henchie, 2007):

1. Appoint the engineering consultant to assist the client to manage and procure an EPC contractor to develop the detailed design and build the project.
2. Appoint the engineering consultant (or another consultant) to develop the FED into detailed design and manage the procurement and construction on behalf of the Client; the so-called EPCM model.
3. The client decides not to proceed with the project.

In case the second option is selected the EPCM project continues as a 'professional service contract'. Usually the consultant is responsible for 1) design, 2) procurement of materials and equipment, and 3) management and administration of construction contracts.

According to Loots and Henchie (2007) for the engineering and designing activities the consultant is in general responsible for preparation of FED and the detailed design, which needs to be in accordance with normal industry and good engineering practices. The consultant is responsible for the complete plant design. Since industrial projects often incorporate a patented process and/or specific process design the client often owns this in-house knowledge or uses a specialist supplier to get access to this for the design and implementation of the specific process installations. In the context of industrial projects this would mean there is a civil and a utilities design, obviously as integrated as possible. This could mean work is split between consultant and supplier and/or client regarding civil works and utilities. The consultant however remains responsible for managing design and execution.

The procurement activities mean the consultant will advise the client on the strategy for the contracting and procurement of equipment and materials, including assistance in implementing that strategy (Loots & Henchie, 2007). It depends to what level this advice and assistance is desired since clients often already have an idea. The consultant will assist in making the work packages, arranging invitations to tender, advice on suitable contractors, and putting the contracts in place. The contracts with the contractors (and suppliers) that are put into place are direct agreements between client and contractor.

Construction is a series of actions undertaken to produce or alter buildings and infrastructure. Radosavljevic and Bennett (2012, p. 10) describe construction and construction management as the activity of ensuring these actions are undertaken effectively, efficiently, and on time. Doing so requires coordination of complex interplay of people, materials, components, tools, equipment and machines, all subject to environmental variables interfering with progress. Therefore Construction Management requires effective communication and efficient systems. According to Merrow (2011, p. 297) excellent construction management may be the difference between success and failure. In the

EPCM model project management is in conjunction with construction management (Carmichael, 2000, p. 141). Besides that the characteristics of a project manager are very much the same as for the construction manager (Berendsen, 2014, p. 238). Construction Management can be seen as Project Management activities during the execution phase.

According to Loots and Henchie (2007) Construction Management in the context of EPCM means the consultant is responsible for the overall management, supervision and co-ordination of all construction activities and construction contractors. The goal is to ensure the work is performed safely and in compliance with schedule and quality requirements. Going more into detail this would mean organising and supervising safety management by being present on the construction site, securing evidence of defects and its consequences and keeping a complete documentation of these facts. This is important to protect the client against claims from contractors. Loots and Henchie (2007) give additional importance to cost control, schedule control, and dispute resolution.

The following tables 1-4 summarize advantages and disadvantages of EPCM and EPC, formulated by varying sources. EPCM is compared to EPC in order to get a better understanding of this Project Delivery System. The main advantages of EPCM mentioned in literature are the flexible nature of the project and its budget and planning benefits. The project has more flexibility since design and construction can progress in parallel. Since the consultant makes the design, parts of construction can be put out for tendering, leaving more room for design changes.

Table 1: Advantages of EPCM

Advantages
Significant continuity and schedule benefits (FEED rolling into detailed design) (Berends, 2014).
Limited commercial exposure (Berends, 2014). Capital estimates can be significant lower with EPCM compared to EPC (FPTK), since EPC contractors include contingent pricing to manage the additional risk (Norton Rose Fulbright, p. 6).
Design and construction can progress more quickly and in parallel, since the client can instruct the trade contractors when required. The trade contractors are less likely to get away with minimum performances (as described by standards) since the EPCM contractor is controlling the process and ensure good quality (Smith, 2012, p. 1).
More flexibility, minimizing the need for variations and time/cost consequences (Smith, 2012, p. 1).
The client remains in control of the design development and construction (Norton Rose Fulbright, p. 6).
Flexibility in the procurement process (Norton Rose Fulbright, p. 3).

The traditional EPCM model gives little performance and efficiency incentive for the consultant. The client must drive the project and install a relatively large team, especially in planning, budget and contract management. The client bears all risk and has no single point of responsibility. Disputes between client and contractors hardly end up accountable to the consultant. The consultant has contradictory interests where he assesses claims from the contractor that could be caused by the consultant himself.

Table 2: Disadvantages of EPCM

Disadvantages
Requires relatively large and competent Client's team, especially in progress/cost control and contract management. Requires extensive control by owner. (Berends, 2014)
The Client has to select the EPCM contractor (the engineering consultant) very early in the project lifecycle (Berends, 2014).
Role of the EPCM contractor and the contract forms cause contradictory interests; assessing claims by the trade contractor which could be caused by the EPCM contractor (Loots & Henchie, 2007, p. 12).
No single point of responsibility, disadvantageous for the Client (Smith, 2012, p. 2). Subcontractors' risks are covered in separate contracts with the Client and not covered in the 'EPCM umbrella' (von Branconi & Loch, 2004).
Potentially uncertainty on construction period and price (Smith, 2012, p. 2). No fixed contract sum at the investment decision (Berends, 2014, p. 169).
No inherent performance incentive for the consultant (Berends, 2014, p. 169).
No incentive for the consultant to be efficient (von Branconi & Loch, 2004)

The more traditional EPC project requires less client involvement. Since the contractor takes responsibility on the budget, planning and quality of the design and construction there is one single point of responsibility. This also provides more cost certainty.

Table 3: Advantages of EPC

Advantages
Responsibility on single point basis (Berends, 2014, p. 168; Stephenson, p. 14).
From the owner's point of view the contractor takes responsibility on cost of completion, time for completion, quality of design and work (Loots & Henchie, 2007, p. 15), therefore there is a performance incentive and little Client involvement is required (Berends, 2014, p. 168).
Relative cost certainty (Berends, 2014, p. 168) which makes it preferred for project financing (Berends, 2014, p. 168)

EPC projects are in general less flexible since the detailed design is the contractor's prerogative. The client provides a preliminary design, the EPC contractor after obtaining the project provides the detailed design. After signing the contract design or order changes are obviously very costly, therefore it is important to define the scope as complete and accurate possible early in the project.

Table 4: Disadvantages of EPC

Disadvantages
Detailed design is the contractor's prerogative (Loots & Henchie, 2007, p. 15; Stephenson, p. 14).
'Hidden information problem': Split in FEED and EPC (Berends, 2014, p. 165)
Good scope definition is required, with limited 'rely-upon' items (Berends, 2014, p. 168). Also in the start of the contract all requirements need to be agreed on (Berends, 2014, p. 168).
EPC is only effective when sufficient credible tenders are obtained (Berends, 2014, p. 168). Besides that tendering period is significant to enable risk pricing and FEED verification (Berends, 2014, p. 168).
The Contractor is not well placed to bear the consequences of cost escalation (Berends, 2014, p. 168).

2.3 Conclusion

Client satisfaction is one of the project success criteria of EPCM projects. In the context of industrial projects the other five criteria are budget, planning, quality, safety and start-up production. A distinction can be made between project success and project management success, the first being mainly a result of the delivered structure, the second being mainly a result of completion in time, budget and quality. This thesis scopes down on client satisfaction derived from project management success, since the focus is on construction management services.

In general satisfaction is a result of the comparison between one's expectation and perception of a certain outcome. In this context satisfaction is the result of client's perception of the construction management services compared to his expectations. Servqual is a widely acknowledged model that explains how expectations and perception of a service are formed. It provides a standard checklist of aspects in order to measure the gap between expectation and perception, known as service quality. Since we are not interested in measuring the service quality of the construction management services this checklist as a whole is not applicable for this thesis, nor shall be adapted. However the concept of how expectations and perception are formed due to factors and gaps is universal and applicable in the context of this research. The factors explain the steps between service strategy and operation, how the client personally is influenced, and communications between client and consultant. In that process gaps can arise on 5 places, all adding to the misalignment of expectation and perception.

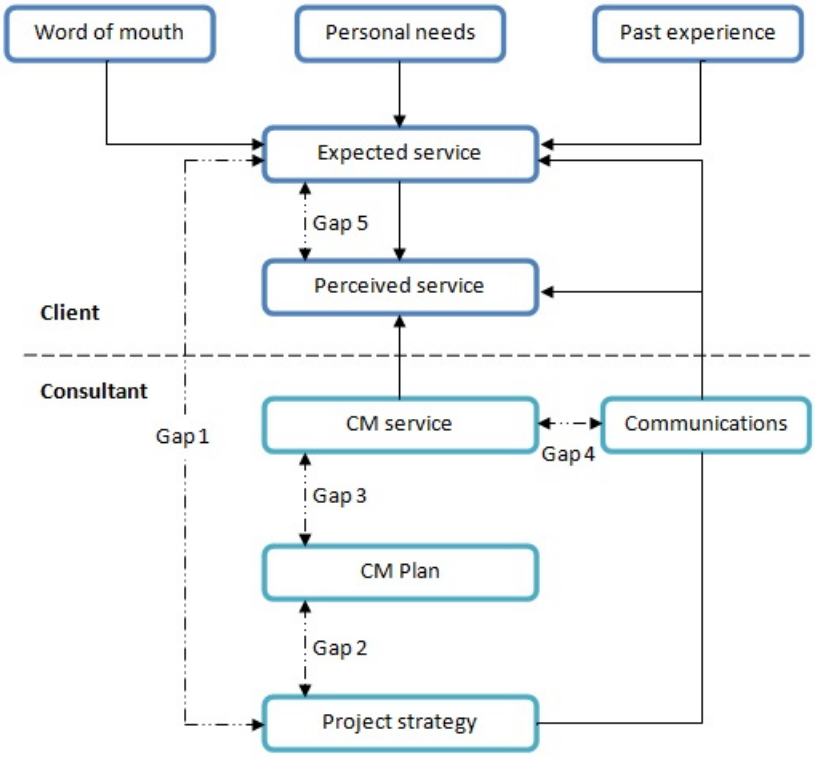

Figure 9: Adapted Servqual model with its factors and gaps

Since we want to find out why client and consultant are misaligned the model in figure 9 is an interpretation from the original model (figure 5), in the context of EPCM projects. The following small adaptions to the factors are made. 'Personal needs' could be interpreted as the ex-ante factors which should be formulated during FEED. These ex-ante factors describe the specific needs the client has prior to the project. 'Past experience' is relevant since employees of both client and consultant in

general have experience with previous projects. ‘Service strategy’ is translated to ‘Project strategy’, since the CM service is part of the entire EPCM project. ‘Service design’ is translated to ‘Construction Management Plan’, which is the actual document of how the construction management service will be executed. ‘Service operation’ is translated to ‘CM service’, the execution of the service itself. ‘Communication’ influences the aspects and causes gaps in the model. Communication is encountered numerous times in literature as a project success factor (Pinto & Slevin, 1997) as well in studies on relational contracting (Suprapto, 2016).

Clients select a project delivery system to define the roles of participants, share authority and responsibility, allocate profit and risk, and organize and incentivize participants to fulfil objectives (Qiang et al., 2015, p. 1780). A remuneration scheme is part of the project delivery system, since it puts a price on the allocation of risk. Multiple studies show contracting is no game changer, but a second hand concern. Project success can be achieved with different contracts; the choice of contract and relational contracting are of importance too.

EPCM offers significant planning and budget benefits, limited commercial exposure, more flexibility in changes, and client control in design and construction. Disadvantages are the missing single point of responsibility, uncertainty in planning and budget, lack of performance incentive, and the requirement for the client to install a relatively large site team.

Contractually the client is owner of the contract with the consultant and with the contractor(s). However the consultant is responsible for the overall management, supervision and co-ordination of all construction activities and contractors. This could lead to a ‘double role’ in which he acts on behalf of the Client in case of a dispute, which however might be caused by the consultant himself (Loots & Henchie, 2007). Secondly the consultant is expected to act on behalf of the client despite the actual contractual link with the contractors is missing, therefore we expect a difference between the contractual and organisational role of the consultant.

After comparing the advantages and disadvantages of EPC and EPCM, client’s motives for selecting EPCM are reducing costs and maintaining control and flexibility during design and construction. Client’s motives for not selecting EPCM are the incompetence of controlling the project and installing a relatively large team, bearing all risk and the lack of one point of responsibility.

The general idea in practice is clients expect to bear less risk than the actual risk distribution, since in current practices all risk is at the client’s. Issues clients have with current practices seem to revolve around roles, responsibility and accountability. The project participants’ roles, responsibilities and accountability are incorporated within the selection of the project delivery system. Therefore empirical data will be gathered on the misalignment of client and consultant regarding roles, responsibility, accountability and the obligation to deliver the project successfully in terms of the 6 project success criteria.

3. RESEARCH METHODOLOGY

The goals of the empirical study are to determine 1) the misalignment of client's expectation of the consultant's role, responsibilities and accountability, 2) causes of this misalignment, 3) encountered limitations due to the current project set up of EPCM projects. In order to reach those goals structured interviews are followed by 5 in-depth case studies. Due to this layered set up of the case study the quantitative structured interviews can conclude on the misalignment of the client and consultant's group, whilst the qualitative in-depth case studies investigate causes and EPCM limitations. Figure 10 illustrates the layered set up of the empirical work, where the case study participants are grouped for quantitative study before going into-depth in the five case studies.

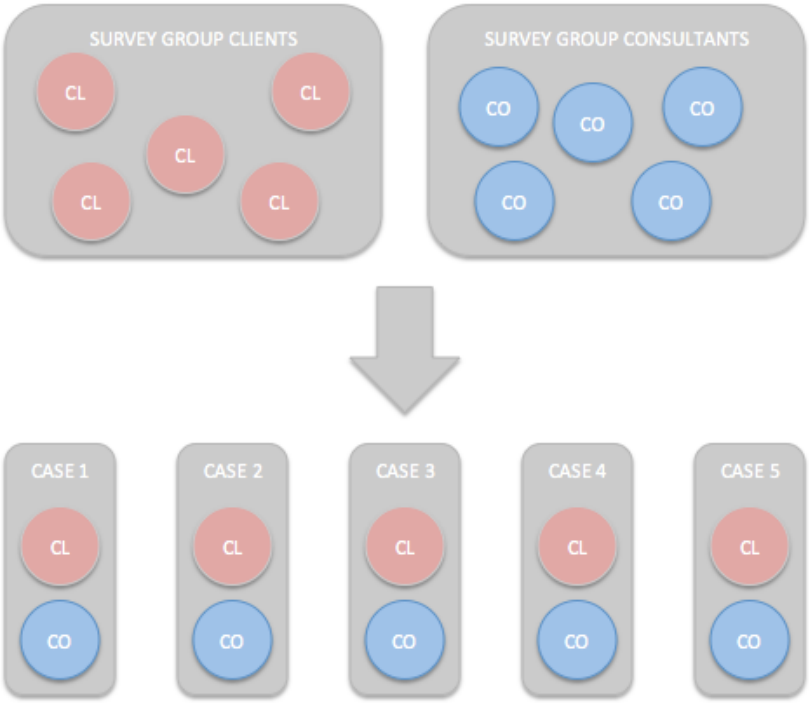

Figure 10: Structured interviews into case studies

3.1 Structured interviews

A cross-sectional survey gathers material at a certain moment in time for one and the same group (Verschuren & Doorewaard, 2010). Seven characteristics for surveys are 1) a substantial domain, 2) extensive data generation, 3) more breadth than depth, 4) random sample rather than strategically sample, 5) an assertion consisting of variables and the relationship between them, 6) remote, closed data generation, 7) quantitative data and analysis. For this study it is decided to investigate a group of 10 units, the same 10 participants of the 5 case studies. With a strategic sample and a small domain a survey is not applicable in this situation. The structured interviews as part of the case studies are however sent out in a survey-like manner. The structured interviews can quantitatively visualize the misalignment of client and consultant. By answering the same set of statements the position of clients and consultants can be measured.

The goal of the structured interviews is to gain the overall picture as a starting point for the case studies. The group of units therefore is not large sized and slightly strategic sampled. The Sollwert – Istwert method measures target and actual values, which will be used to map the expectations (SOLL) and perception (IST) (Samal & Becker, 2004).

The theoretical background concluded a Project Delivery System organises how roles, responsibilities and accountability are distributed. Therefore the statements cover where risk should be, who is responsible for the contractor and what the consultant's obligations are in regard of the project success criteria.

Participants

For the structured interviews 10 project managers were invited; 5 consultants and 5 on the client's side. The project managers on clients' and consultants' side are selected on project base, each 'couple' of client and consultant worked together on an EPCM project. By selecting these project managers, the interviews of the case study can go into depth based on their answers in the structured interviews. The selection process of the cases can be found in Chapter 3.2. All projects were constructed in a development country, however engineered in The Netherlands.

Data gathering

The first set of 9 statements, listed in table 5, cover the expectations (SOLL) regarding roles, responsibility and risk. Statement A describes the role as determined by Loots and Henchie (2007). Statement B and C capture the current discussions on responsibility and accountability. Statement D till I split accountability in the six project success criteria by Arkesteijn: budget, planning, quality, safety, start-up production, and overall satisfaction. The Sollwert-Istwert method measures target value (SOLL) and the actual value (IST). Therefore measuring SOLL gives us the expectation. To make the values measurable we can let the participants comment on statements by using the Likert Scale (Vagias, 2006). A widely accepted scaling set is; (1 = Absolutely disagree, 2 = Strongly disagree, 3 = Disagree, 4 = Neutral, 5 = Agree, 6 = Strongly agree, 7 = Absolutely agree).

Table 5: Statements A-1 (SOLL)

#	Statements expectation (SOLL)
A	The Consultant is responsible for overall management, supervision, and co-ordination of all construction activities and Contractors.
B	The Consultant is responsible for the Contractor's actions and performances.
C	Risk of project exceedance (cost, time, quality) should be at the consultant's.
D	The Consultant is obligated to deliver the project within budget.
E	The Consultant is obligated to deliver the project within time.
F	The Consultant is obligated to deliver the project within the desired quality.
G	The Consultant is obligated to deliver the project without any Lost Time Incidents.
H	The Consultant is obligated to deliver the project with a start-up production as expected.
I	The Consultant is obligated to deliver the project with a high overall satisfaction of the Client.

Table 6 shows the same 9 aspects formulated for the IST-data. Client and consultant fill in their level of agreement on the statements regarding role (A), responsibility (B), and accountability (C), and how successful the project was (D-I).

Table 6: Statemens A-1 (IST)

#	Statements Perception (IST)
A	The Consultant is responsible for overall management, supervision, and co-ordination of all construction activities and Contractors.
B	The Consultant is responsible for the Contractor's actions and performances.
C	Risk of project exceedance (cost, time, quality) should be at the consultant's.
D	Project success criterion: Budget
E	Project success criterion: Planning
F	Project success criterion: Quality
G	Project success criterion: Safety
H	Project success criterion: Start-up production
I	Project success criterion: Satisfaction

In Chapter 2.3 of the theoretical background the following additional aspects are included: Clarity of roles and responsibilities, understanding specific needs of the client, pro-active management, and teamwork. Also for these aspects the Sollwert – Istwert method is used (table 7 & 8). This additional data will be used during the case studies.

Table 7: Statements 1-5 (SOLL)

#	Statements additional data (SOLL)
1	Roles and responsibilities should be clear prior to the project
2	Employees of the consultant should understand the specific needs of the client
3	The consultant should perform Construction Management pro-actively, and not only when problems occur
4	The level of teamwork quality between the consultant and client should be high
5	The level of teamwork quality between the consultant and contractor should be high

Table 8: Statements 1-5 (IST)

#	Statements additional data (IST)
1	Roles and responsibilities were clear prior to the project
2	Employees of the consultant understood the specific needs of the client
3	The consultant performed CM activities pro-actively, and not only when problems occured
4	The level of teamwork quality between the consultant and client was high
5	The level of teamwork quality between the consultant and contractor was high

Finally participants are also asked how they perceived the performance of the CM service in terms of budget, planning, quality and safety (table 9).

Table 9: Statements 6-10 (IST)

#	Statements CM performance (IST)
6	The consultant had adequate means to control the costs of the project
7	The consultant had adequate means to control the progress of the contractor
8	The consultant had adequate means to control the quality of work
9	The consultant had adequate means to supervise the safety on site
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs

Data analysis

Expectations of the EPCM service will be analysed by;

- Comparing the average clients' and consultants' answer on statements A - I (SOLL) regarding expectations in one spider graph. The measurable unit will be the expectations of clients minus the expectation of consultants. ($SOLL^{client} - SOLL^{consultant}$ = misalignment)
- Comparing clients' and consultants' answers on statement A - I in bar graphs. The spider graph only provides data of the average answers of the client and consultant groups. The bar graph on each statement can give inside of how aligned that answer is. The distance between answers within the client and the consultant group tells something about the misalignment amongst clients and consultants.
- Statements 1 to 5 (SOLL) and statements 1 tot 10 (IST) are used for input of the interviews in the case studies. Data is also analysed for case studies and cross case analysis. (Table 7, 8 & 9)

Based on the clients' and consultants' plot we can conclude whether they are misaligned and analyse which aspects contribute the most.

3.2 In-depth Case studies

Case study type

The goal of the case study is to: 1) Formulate for each case the misalignment of client and consultant. 2) Determine causes of the misalignment. 3) Observe how the CM service was experienced and what limitations were encountered.

The three conditions for research method selection are the type of research question, the control the investigator has over the studied events, and the focus on contemporary or historical events (Yin, 2009). The case study was chosen as the preferred research method since we want to answer the 'why' and 'how' questions. Secondly no control over behavioural events is required and we are focussing on contemporary events. We want to know why client and consultant are misaligned and why consultants cannot perform as clients expect. For the five case studies semi structured interviews were held with both clients' and consultants' project managers. Data of the structured interviews will be used as input for the in-depth interviews of the case studies. Interesting or unexpected answers, outliers or comments of structured interviews can be reasons for additional questioning. The interview format can be found in the appendix, the transcripts are compiled in a separate document.

Case selection

For the case selection the following criteria were taken into account:

- The project is finished within the past +/- 10 years
- Engineering, Procurement and Construction Management as part of the consultants' scope
- Within the field of light industry
- Both successful and unsuccessful projects

During the selection process a short list of ten projects was set up, all complying with above criteria. In order to have variety amongst clients three cases were excluded. Out of the seven remaining cases five were selected (table 10), due to commitment of both consultants and clients to participate in both the structured interviews and the consecutive in-depth interviews.

Table 10: Overview of cases

#	Location	Client	Project
1	Nigeria	Brewing company	Brewery
2	Nigeria	Consumer goods corporation	Distribution Centre
3	Myanmar	Brewing company	Brewery
4	Vietnam	Shipbuilding and engineering	Shipyard
5	Vietnam	Food and drink company	Production Plant

The selected projects are a specific set of EPCM projects. The consultants performing the EPCM services were all Royal HaskoningDHV employees. Furthermore they are light process industrial projects in the field of consumer's goods. All clients are Western, while all projects are constructed in developing countries in Africa and Asia. These projects cause the case studies to say something about this specific set of projects and not about all EPCM projects in general.

In order to make a distinction between successful and unsuccessful projects a model by Arkesteijn (2009) was used, as described in Chapter 2.1. The user of this model awards points to six criteria (budget, planning, quality, safety, start-up production, client satisfaction) in order to measure project success. Table 11 gives an overview of the measurement tool of Project Success criteria. A score above 4,5 is considered as project success, scores equal to or lower than 4,5 are considered as project failure. Despite the model being binary, it erases the discussion on project success. It is used as a starting point in the case studies and gives a better understanding of the concerning project.

Table 11: Project performance tool (Arkesteijn et al., 2009)

Criterion	Answer range	Value
Lost time incident (LTI)	0 LTI's	1
	1 LTI	0
	2 LTI's	0
	3 LTI's	0
Client Satisfaction	Very satisfied	1
	Satisfied	1
	Not completely satisfied	0,5
	Absolutely not satisfied	0
Budget	Estimate exceeded with more than 20%	0
	Estimate exceeded with 11-20%	0,5
	Estimate exceeded with 1-10%	1
	Similar to estimate	1
	Cost were 1-10% less than estimated	1
	Cost were -11-20% less than estimated	0,5
	Cost were more than 20% less than estimated	0
Quality	All quality requirements were met	1
	Most of all requirements were met	1
	Half of the requirements were met	0,5
	Failed most of all requirements	0
	Failed all requirements	0
Schedule	>20%	0
	>11-20%	0,5
	>1-10%	1
	Similar to estimate	1
	<-1-10%	1
	<-11-20%	0,5
	<20%	0
Start-up production	> 80% of the planned production	1
	50 – 80% of the planned production	0,5
	< 50% of the planned production	0

Data gathering & analysis

As explained in Chapter 2.3 the concept of the Servqual model serves as an 'underlayer' for the causes of misalignment. In order to reach goal 1 of the empirical study (misalignment) in each case the interviewees were asked what they expected (client), what they offered (consultant), and how the CM service is perceived. To find causes for the misalignment (goal 2) the client was asked what his expectations were based on (top part of the model). The consultant is asked about his strategy leading to the actual services (bottom part of the model). In order to analyse the data derived from the interviews the gaps and factors on client's side (upper part of the model), on consultant's side (lower side), and the overlapping gap 1 and factor E are cluster as shown in table 12.

Table 12: Adapted Servqual model including clustering for interviews

Factor/gap	Cluster
Expected service	Client
Word of mouth	
Personal needs	
Past experiences	
Perceived service	
Project strategy	Consultant
Gap 2	
CM Plan	
Gap 3	
CM service	
Gap 4	
Gap 1	Client – consultant interaction
Communications	

Client and consultant are asked how the project performed and how situations were handled regarding roles, responsibilities and accountability. The consultant is asked what limitations prevent him from performing as the client aspects. Table 13 summarizes the three goals as described above; 1) the misalignment, 2) causes for misalignment, and 3) perception and limitations of the CM service. The cross case table in appendix E compares the tables of all five cases.

Table 13: Interview analysis table

Misalignment	
Aspect	**Summary**
Expectation client	
Offered by consultant	
Perception Client	
Causes for misalignment	
Aspect	**Summary**
Client	
Consultant	
Client – Consultant interaction	
Case observations	
Aspect	**Summary**
Case observations	

4. STRUCTURED INTERVIEWS

This chapter shows the results of the structured interviews, the analysis of the data and finally the conclusions. Five project managers of the consultant and five project managers of different clients participated. The statements are answered with a Likert scale ranging from 1 (absolutely disagree) to 7 (absolutely agree) and 4 as neutral. The average values on all aspects of both the client and consultant group are compared to each other by plotting a spider diagram. All aspects are handled individually by plotting a bar diagram showing the number of answers given by clients as well as consultants.

4.1 Results

The 9 studied aspects are the role (A), responsibility (B) and accountability (C) of the consultant and the obligation to deliver the project successfully according to Arkesteijn's project success criteria (D to I). The spider plot in figure 11 illustrates the misalignment between client and consultant. The clients' expectation is plotted outside the consultants' answers on all statements, meaning the client has higher expectations. Whilst the clients agree on all statements, the consultants disagree on 3.

For both the spider plot and bar graphs the answers of the consultant of case 2 were excluded. The consultant's project manager fully agreed (score of 7) on all aspects, what he explained in the consecutive interview as his view of what the service should be instead of what he believes he offers to the client.

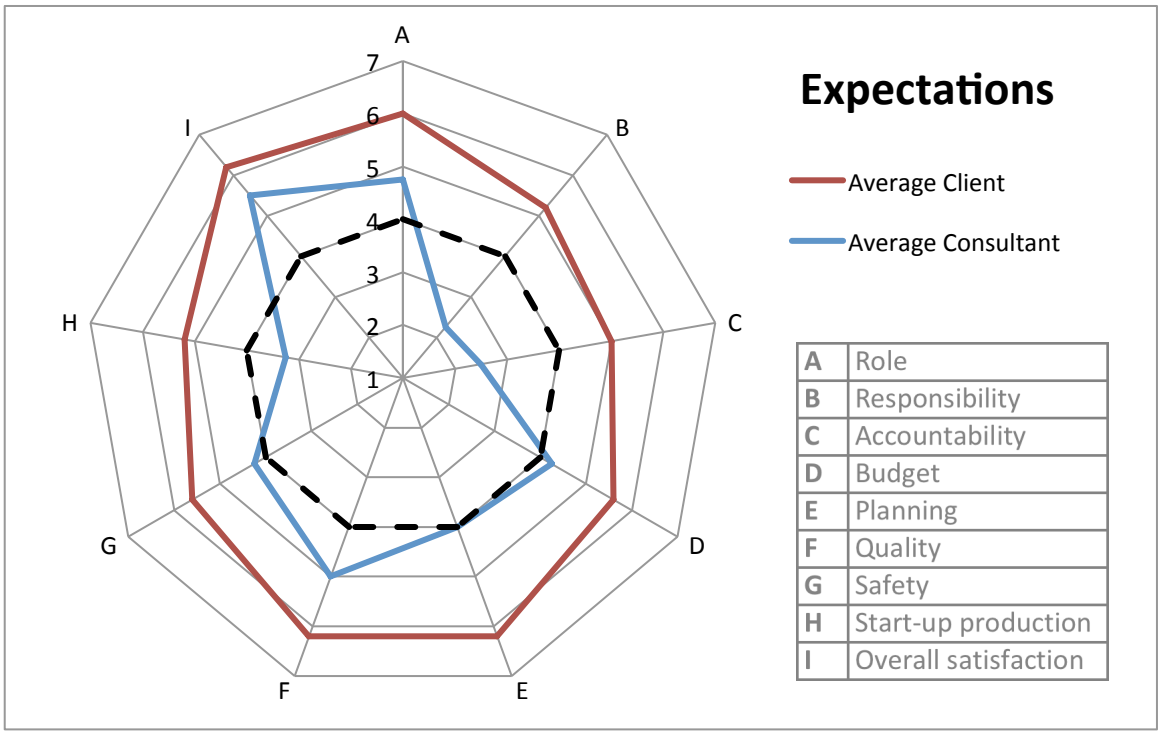

Figure 11: Average expectations client and consultant

4.2 Analysis

Despite feeling responsible for managing the contractor (aspect A), the consultant does not feel responsible for the contractor's performances on site (B). The consultant feels obligated to deliver the project with the desired quality (F) and with overall client satisfaction (I). He slightly feels obligated to deliver in budget (D) and safely (G), however feels neutral on planning (E) and disagrees

on start-up production (H). The client believes the consultant should be obligated to deliver the project on all terms, especially in time (E), with the desired quality (F) and to his satisfaction (I). The consultant believes he should not bear the risk of exceedance (C) of any of these project success criteria, whilst the client expects he does.

Roles, responsibility and accountability

Both client and consultant believe the role of the consultant is to manage and supervise the contractor (A), even though the client agrees more (figure 12). The only disagreeing consultant explained in the consecutive interview he slightly disagrees (score of 3) since he believes the consultant supervises and not manages. In general it seems client and consultant agree on the role of the consultant.

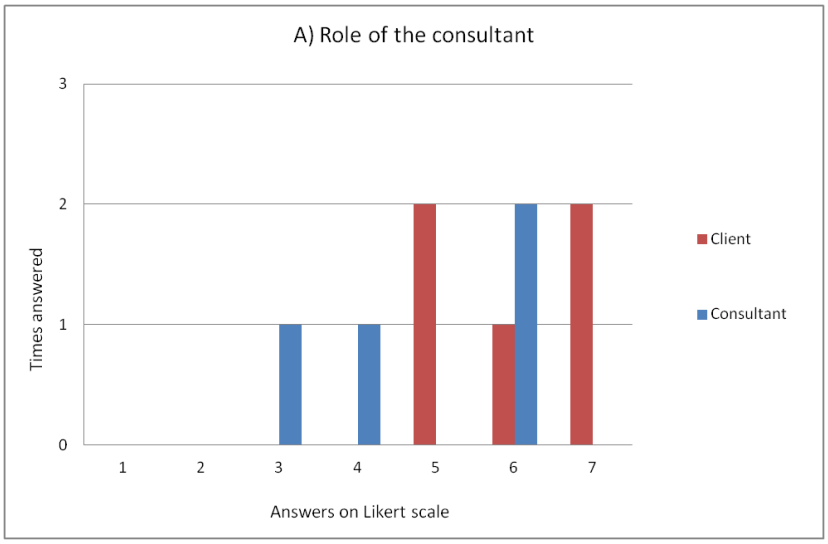

Figure 12: Outcome statement A

For aspect B and C the consultants' answers show great variation and contradiction within the consultancy firm. While 3 project managers feel no responsibility for the contractors' actions, one project manager does slightly, a comparable pattern can be seen in the answers of aspect C. The clients' answers of aspect C are more clustered and show alignment amongst each other.

On average consultants disagree (2,3 out of 7) with the responsibility for the contractor's actions (figure 13), while the clients slightly agree (5,2 out of 7). The delta of +- 3 points shows a significant misalignment. This is comparable to aspect C (figure 14) in which client and consultant are 2,5 apart with respectively scores of 2,5 and 5.

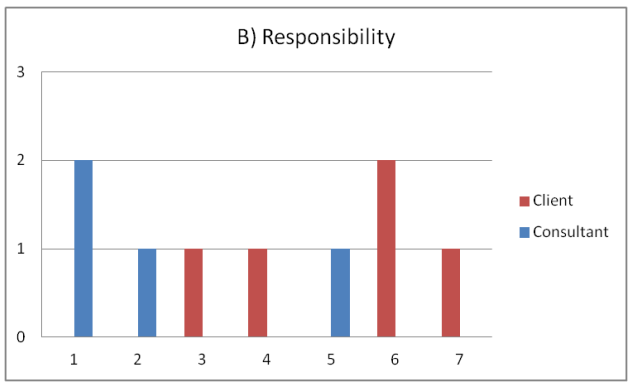

Figure 13: Outcome statement B

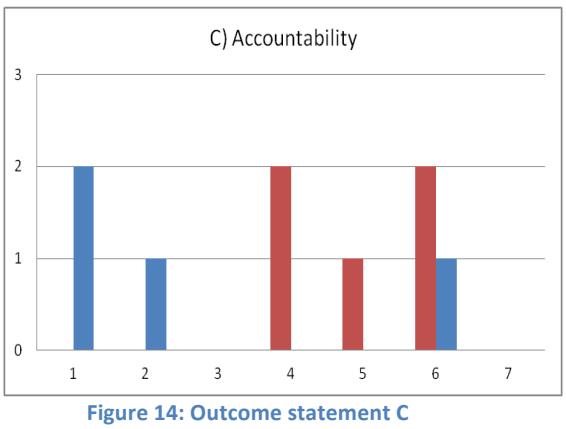

Figure 14: Outcome statement C

Result obligation

Out of the 6 Project Success criteria budget (D), quality (F), safety (G) and overall satisfaction (I) show a small delta ranging from 0,7 to 1,3. On average the consultant answered neutral (4,3 out of 7) on the budget criterion (figure 15), the client agrees on the statement (5,6 out of 7). The consultant does not agree he is obligated to deliver the project within budget, while the client expects he is. Regarding quality (figure 16) the consultant slightly agrees on the obligation with a score of 5, the client agrees (6,2).

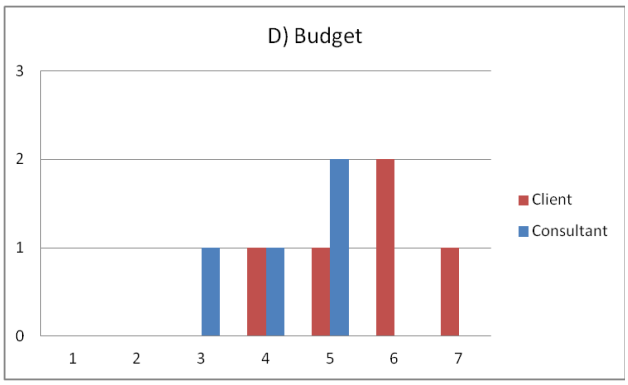

Figure 15: Outcome statement D

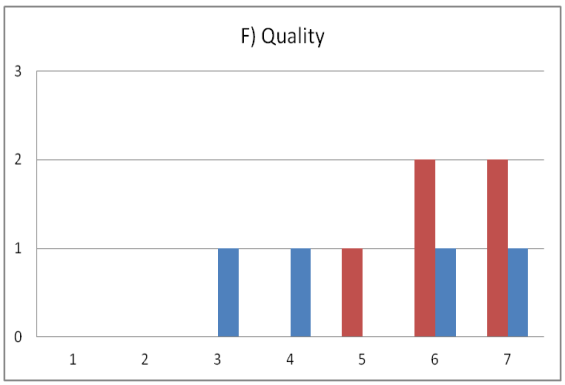

Figure 16: Outcome statement F

The data on the safety aspect (figure 17) matches with aspect D, showing a delta of 1,3 due to the consultant´s neutral answer (4,3) and the client agreeing (5,6). Overall client satisfaction is the project success criteria showing the most alignment. All project managers, except one consultant, believe the consultant is obligated to deliver the project with high client satisfaction (figure 18). Both consultants and clients agree with the statement with scores of respectively 5,5 and 6,2.

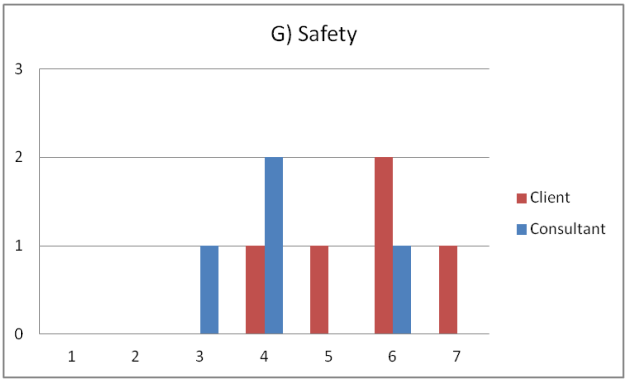

Figure 17: Outcome statement G

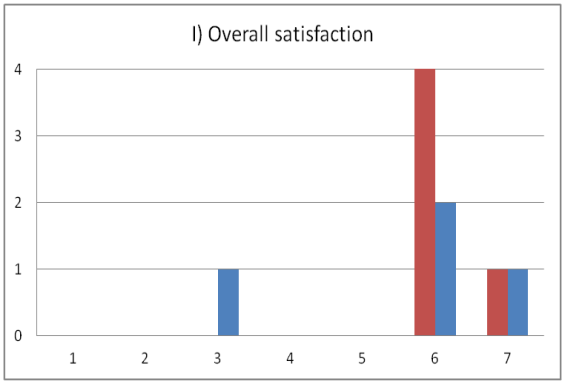

Figure 18: Outcome statement I

Of all Project Success criteria Planning (E) and Start-up production (H) show a significant delta. All clients expect the consultant to deliver the project on time, whilst three consultants either disagree or answered neutral (figure 19). With an average score of 4 the consultant does not agree nor disagree with the obligation to deliver the project in time. The client agrees with the statement (score of 6,2), resulting in a significant delta of 2,2 points.

Start-up production (figure 20) is contractually excluded from the consultant's scope, however clients expect the consultant to deliver the project with the desired production (score of 5,2). The consultant disagrees slightly with an average score of 3,3 out of 7.

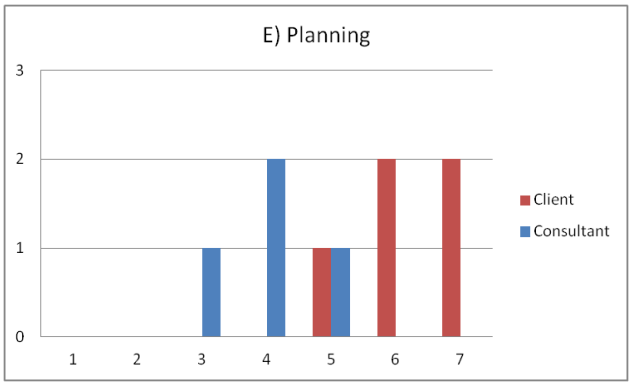

Figure 19: Outcome statement E

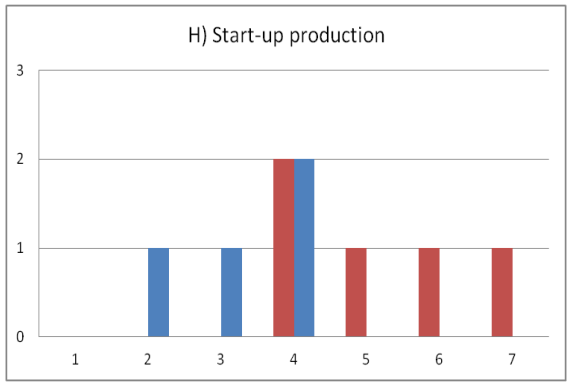

Figure 20: Outcome statement H

4.3 Conclusions

The distribution of the consultants' answers (blue) is more scattered than the client's on 4 out of 9 aspects. These aspects are B (responsibility), C (accountability), F (quality) and I (overall satisfaction). Meaning the consultant's group is less aligned amongst themselves on the aspects than the clients are. In the consultant's group there are scores above and below 4 on each statement, meaning there are contradicting answers on each statement, whilst the projects they are working on are similar. The client's answers are more clustered and consenting, meaning their view is more unanimously.

On all 6 Project Success criteria the client expects a greater obligation than the consultant offers. Contractually the consultant has a 'best effort' obligation, however the client expects a result obligation. Regarding quality and overall satisfaction both consultants and clients agree with the statement, showing a small delta. The delta's on budget and safety are small, however the consultant does not agree with the statement. Planning and start-up show significant deltas with the consultant disagreeing and the client agreeing with the statement.

Client and consultant more or less agree on the consultant's role of being responsible for managing all construction site activities. However there is a big gap in the aspects responsibility and accountability. Clients expect the consultant to be responsible and accountable for the contractor's performances, the consultant however feels he should not be.

Therefore we can conclude clients expect a result obligation and the consultant offers a 'best effort' obligation. The four biggest contributors in the misalignment of client and consultant are the missing obligation to deliver the project in time (aspect E) and with the desired start-up production (H) and the lack of consultant's responsibility (B) and accountability for the contractor's actions (C).

The structured interviews show clients have higher expectations regarding responsibility and accountability than the consultant offers. The in-depth interviews with all participants, as part of the case studies, give opportunity to elaborate on their perspectives.

5. IN-DEPTH CASE STUDIES

This chapter shows how the 5 case studies are performed. Each case is introduced by a short description and the measurement of project success. Secondly results of the interviews are summarized and divided into the client's expectation, the consultant's offer, and the project events. Finally a short analysis and table summarizes each case.

5.1 Case 1

In order to realize an extension of a brewery in Lagos, Nigeria (2008-2009), the client hired the engineering consultant for his EPCM services. Early in the project the decision was made to outsource the entire design and supervision to the consultant. On site the construction management team worked together with a client representative and an installations manager, being in charge of brewing installations. Both client and consultant had project managers working in The Netherlands assigned to the project.

Table 14: Project success case 1

Project Success Criteria	Performance	Score
Budget	Similar to estimate	1
Planning	1-10% more	1
Quality	All requirements met	1
Safety	0 LTI	1
Start-up Production	>80%	1
Client Satisfaction	Very satisfied	1
Total		6

Even though the planning exceeded by 1 to 10% it can be seen as a successful project (table 14), with the highest possible score of six. For this case the client's project manager and the consultant's construction manager were interviewed. The client's project manager has past experiences with RHDHV. Also was he, as a representative of the client, experienced in construction projects as well in The Netherlands as abroad. The consultant's construction manager had some experiences in the field with CM activities.

Client: What was expected?

The client was not afraid of poor CM performances prior to the project, due to positive earlier experiences. Prior to this project the client's project manager had worked with RHDHV in The Netherlands, Vietnam and Russia. Due to these experiences the client entered negotiations openly, and the CM service was not formulated concretely. Client and consultant just started on the project, since the impression was created that the CM phase is free of risk.

The client has trouble finding civil personnel for site management in countries in Africa, Asia and South America. They try to employ people for site management in case when there is no consultant contracted or when there is agreed to set up a combined site team.

Consultant: What was offered?

The consultant agrees on the open nature of CM's definition and contents. In the past even the design phase used to be open. "Design a brewery for us, that's it." Regarding CM, there is not always an opportunity created for the client to indicate what they think is important. Leaving it completely blank would lead to misaligned expectations and no focus on what the client thinks is important during CM.

According to the consultant the client's strategy was to select an average contractor to reduce costs and add a managerial layer in order to upgrade the contractor's '4 or 5' performance to a '6 or 7'. An average contractor without supervision would lead to poor quality; a well-organized contractor in Nigeria would be expected to deliver good quality. The difference in costs is that big, the client decided to hire a consultant to supervise the 'average contractor.'

Project: What happened?

The client was surprised to learn that in some projects the consultant has the same amount of trouble in finding the right person for the job, leading to hiring someone from an external source. The client expects to hire someone with the consultant's 'DNA and skills', however this cannot be guaranteed. This seems unfair to the client, since the consultant uses the same sources to find site personnel as the client does, however asks a premium. In case something in execution goes wrong and the settlement is not pleasing the client, the fact that the consultant's personnel is external becomes an issue. According to the client this is not the case when the project is all going according plan.

The client feels the consultant needs to 'start over' every single project; lessons learned do not seem to be logged and implemented. That implies to managerial work, but also actual know how such as brewery standards that are applicable to all brewery projects.

The consultant's CM was not involved in early phases of the project. The level of involvement and commitment by the consultants on site was positively perceived by the client and contributed to his satisfaction of the CM service.

The consultant experienced to a certain degree low control on progress, costs, quality and safety. Construction management feels more like monitoring, since there are not many means of control. The CM can threaten with claims, but not add construction workers to the site working force for instance. He also cannot change the contractor for another in case he is not performing, this should be done via the client. In the end the client decides on changes. The consultant thinks you need to cooperate really closely with the client in order to function as one team. In case of good teamwork client and consultant can make use of each other's responsibilities and competences. In this case teamwork between consultant and client was high according to both parties. The consultant believes this was one of the reasons for project success. The division of client's and consultant's personnel was not visible; they performed as one team. However in case the contractor needed to be forced, mitigations went via the client, since they are the contract holder. Frequent open communication regarding events on site with the client is important in the eyes of the consultant. The information should not surprise the client but rather warn or inform him. The consultant should immediately offer possible solutions so the client can play a role in mitigations. According to the consultant teamwork was high since client and consultant knew each other from past projects. Also the consultant focussed on the soft side rather than the formal engineering aspect of CM. The contractor

should be given no room to avoid dealing with the consultant. Being a team with the client is also important to establish credibility of the consultant. If the client overrules agreements between contractor and consultant, apparently you cannot make trustworthy agreements with the consultant. In the case of Lagos the consultant felt 'backed' by the client.

It can be hard to imply western standards in developing countries, something the client realized according to the consultant. It can be quite a shock for a local contractor to work for a Western client. Quality issues arrised, however the client realized it is sheer impossible to achieve the same standards as in The Netherlands. The consultant was responsible for at least achieving the minimal quality. The consultant has experience in past projects with clients who were disappointed with quality, unaware of the quality gap in developing countries. The consultant believes you can achieve good enough quality with proper construction management. During the project a time delay occurred, this was however mitigated by already starting with installation equipment without completing the brew house's roof.

Analysis

The project was successful and also the construction management service is perceived as such. Due to past experience the client was not fully aware of the risks during the CM phase of the project. Also in his eyes the consultant created the impression construction management is free of risk. The fact that the construction management activities were not formulated concretely contributed to this expectation. Teamwork between client and consultant is by both parties seen as the biggest contributor to project success. The consultant explains performing as one team gives greater control over the contractor since the client's competences can be used.

Table 15: Analysis case 1

Misalignment	
Aspect	**Summary**
Expectation client	The consultant employs their own trained personnel, instead of hired external personnel the client can have access to as well. The client was under the impression CM was free of risk.
Offered by consultant	Supervision of a local contractor in order to 'upgrade' his performances.
CM perceived by Client as	The client believes the site team was highly involved and committed. The consultant felt 'backed' by the client, making full use of each other's competences.
Causes for misalignment	
Aspect	**Summary**
Client	Client not aware of risks due to past experience; successful projects
Consultant	- CM not formulated concretely - CM not involved in early phases.
Client – Consultant interaction	- Information should be frequently and open, without surprising the client.
Case observations	
Aspect	**Summary**
Case observations	- Difficulty in finding the right person on the job therefore hiring external employees. - Small clients site team: a representative and installations manager - Right person on the job. - Low level of control on progress, costs, quality, safety. CM feels like monitoring. - Teamwork with the client leads to higher control on the contractor. - Client thinks lessons learned by consultant are not implemented.

5.2 Case 2

The client is expanding its activities in Nigeria and planning to build a new distribution centre in Lagos with a size of approximately 20,000 sq. meter (2013-2015). A second consultant developed a preliminary design. The client requested the consultant to make a proposal for the review, procurement and construction management. This resulted in the consultant reviewing the design first before accepting to procure and manage the project in order to secure itself from liabilities of the second consultant.

Table 16: Project success case 2

Project Success Criteria	Performance	Score
Budget	1-10% more	1
Planning	11-20% more	0,5
Quality	Most are met	1
Safety	0 LTI	1
Start-up Production	>80% achieved	1
Client Satisfaction	Satisfied	1
Total		5,5

Even though the project was delivered with a small budget overrun and an 11 to 20% time delay the project can be seen as successful (table 16). The consultant's project manager was located in The Netherlands and at the time had 8 to 9 year experience in comparable projects. The client installed a project manager, construction manager, project engineer and technical engineer on site. The team of the consultant consisted of a construction manager, document controller, two M&E supervisors, safety supervisor and a quantity surveyor. According to the consultant the size of the client's on-site team was large, probably due to the fact they were inexperienced with EPCM and wanted a certain level of control. Compared to the other cases the client of case 2 indeed installed a relatively large site team.

Client: What was expected?

For the client the choice for EPCM was based on the motivation to reduce costs. Since they wanted to make a low investment in Nigeria they decided to let a Western consultant manage a local contractor. The savings between a large European EPC contractor and a local Nigerian contractor were 20 million US dollar, nearly half the budget.

The client expected the consultant to provide a team who would work directly with the contractor. He expects the team to properly manage the project so it is done on time, in budget and safely. Meaning the consultant should check off all contractor's works, pro-active schedule planning, and justification and possible reduction of extra works. All of this should be reported to the client, with as little surprise as possible, rather avoiding crisis than handling it. The client should be able to lay back on parts of the scope that are outsourced to the consultant.

Since the client had a large on-site team they were able to observe both consultant and contractor. They expected the consultant to work with the contractor as one team, being able to look at the consultant instead of the contractor when something goes wrong.

According to the client it was clear what the role and responsibility of the consultant's team would be, since an 'organisation chart' was used. However the client gave clarity of roles, responsibility and accountability a low score in the structured interview since he feels the consultant did not understand what the client expected from him.

Consultant: What was offered?

The consultant offers a leading role; 'a pro-active role in which they take ownership'. The roles that were agreed on are the consultant monitoring the contractor, and the client monitoring the consultant. In order to do so the client installed a relatively large site team.

According to the consultant roles and responsibilities were clearly discussed in the proposal phase. The project manager made a responsibility matrix (RACI) as part of the CM manual, which is also shared with the client. The matrix however was intended mostly for the consultant's CM, and not discussed with the client.

Project: What happened?

The client was impressed by the consultant's systems to manage the budget; every claim was handled properly. However in managing quality and planning the client observed a blaming culture. In one case of a quality issue both contractor and consultant pointed at each other surprising the consultant who expected the contractor and consultant to function as one team. The client expected the consultant's site team to be on site to guide the contractor in his works, instead of performing inspection afterwards and writing reports. When an important construction milestone seemed to be overdue the consultant ordered the contractor to come up with a new plan, since 'the client is not happy'. This again was surprising for the client who expected the consultant to come up with a plan together with the contractor. In the eyes of the client the consultant's idea was 'just to report as soon something goes wrong'.

The difference between a local contractor and an European contractor is the level of organisation and quality. In order to control the contractor the consultant needs certain tools, such as milestones and penalties. In this case the client did not allow the consultant to use penalties. The client defends this as the use of penalties not matching their preferred policy. They want the contractor to make a profit too, even in case the project goes sour. The client also fears knock-on delays by awarding penalties.

According to the consultant the contractor is fully responsible for the quality of work. Two supervisors on site are authorized to reject work when it is not meeting the described quality. However it is also the site supervisor’s responsibility to go through the plans with the contractor prior to the work in order to help him prevent making mistakes. When the site team gives priority to other tasks corrections of construction work keep occurring instead of preventing them. For the consultant's project manager the construction management team on site is 90% of his tools to steer the contractor. Therefore the team needs to be capable, and have good instructions, supervision and training.

After the client expressed his dissatisfaction with the consultant's construction manager a more pro-active manager who fitted the client’s preferred profile replaced him. The contractor also indicated cooperation was better with a manager helping with performing the construction work, rather than

performing inspections afterwards. The consultant backs this up; he believes the CM was not fully fit to educate the contractor in certain tasks.

The consultant was remunerated based on an initial mile stone planning. After a planning overrun asking for renewal led to dissatisfaction of the client since they considered the consultant to be part of the delay's cause. Since the client felt the delay could have been prevented if the consultant would have managed properly, they agreed on a settlement with a lower fee. The consultant does not feel fully incentivized to add own manpower in case the contractor is more 'in need'. This was not stipulated in the contract, besides it does not hurt the consultant financially when the project is overdue. The consultant's PM believes incentives for the consultant and the contractor would be beneficial for project planning. During negotiations of this project the use of incentives were discussed, however decided on not to implement them. The reason according to the consultant is the client did not agree on an incentive system that incorporated not only penalties but also bonuses. In the contract of the contractor penalties were however included. As mentioned earlier the client did not allow the consultant to award penalties.

The contractor is responsible for the construction work he executes, even in case the consultant neglects to help him prevent making mistakes. As long as the drawings and descriptions are good, deviations of the plan are his responsibility. The client is in his right to point out more could have been done to prevent the overrun. The consultant did take accountability by changing the construction manager and by agreeing on a settlement regarding the continuation of the fee.

In general consultant and client discuss on the allocation of risk and the settlement of accountability. In comparable projects the consultant proposed a fee-less first month of delay, but in case time is won there will be no cutting of the fee. However in case there is no common ground with the client for such agreements you have the risk of not being awarded the project. So according to the consultant there is a dilemma how much you agree on prior to the project and how much you leave open. In the consultant's experience clients in general are proponents of penalties, but not of bonuses. The client tries to allocate as much risk possible at the consultant for a fee as low possible. The consultant's consideration is to agree enough to be awarded with the project, without losing the margins and their freedom.

The consultant thinks current EPCM practices are reasonably effective. He wonders whether these accountability issues should really all be incorporated in contracts, since it might be unclear where the contract ends. He believes improvements could be made in communication regarding the contracts.

Analysis

The project can be seen as a success, the construction management services in the eyes of the client however not. Roles and responsibility seemed clear to the client prior to the project. The expectation of the client seems to match with the consultant's offers, however the client did not perceive the construction management as such. The client expected the consultant and contractor to work as one team, instead of the consultant monitoring the contractor, and blaming each other. The consultant did not feel empowered enough to control the contractor.

Table 17: Analysis case 2

Misalignment	
Aspect	**Summary**
Expectation client	The consultant's on-site team forms one team with the contractor, manages him pro-actively and reports to the client. The client should be able to lay back on all outsourced services.
Offered by consultant	The consultant offers a leading pro-active role, 'taking ownership'. The consultant monitors the contractor and the client monitors the consultant.
CM perceived by Client as	- The client was impressed by the consultant's systems to manage budget, however missed pro-active management on planning. - However saw a blaming culture in managing quality and planning. Consultant and contractor blamed each other in cases of exceedance.
Causes for misalignment	
Aspect	**Summary**
Client	
Consultant	The client feels the consultant did not understood his personal needs
Client – Consultant interaction	- The client feels roles and responsibilities were clearly expressed, using a RACI matrix - Information should be frequently and open, without surprising the client.
Case observations	
Aspect	**Summary**
Case observations	- Little control over contractor since the client did not allow the consultant to use penalties. - Large consultant's on-site team - CM was replaced by the consultant after client dissatisfaction regarding his lack of pro-activeness - The consultant does not feel fully incentivized to deliver the project in time. Contractually no bonus/ penalty system was implemented. - Prior to the project the consultant tries to accept uncomfortable project characteristics without losing margins and freedom.

5.3 Case 3

Since Myanmar opened their borders in 2011 many Western multinationals started their business in the Asian country, so did the client of case 3. Due to the closed borders the construction market was inexperienced with Western clients and standards. After opening the borders the construction market overheated quite quickly. The consultant designed and managed the construction of a new brewery close to Yangon (2013-2015). There were 3 main contractors for respectively constructing the 'packaging and warehouse', civil works, and for Mechanical, Electrical and Plumbing works (MEP).

Table 18: Project success case 3

Project Success Criteria	Performance	Score
Budget	11-20% more	0,5
Planning	11-20% more	0,5
Quality	Half are met	0,5
Safety	0 LTI	1
Start-up Production	<50% achieved	0
Client Satisfaction	Not completely	0,5
Total		3

The project is considered to be unsuccessful, with both 11 to 20% budget and planning overruns, lacking quality, low start-up production and an unsatisfied client (table 18). The client's project manager has 35 years of experience in similar projects of which the last 10 years also include civil works instead of only installations, machinery and equipment. The consultant's project manager who was responsible for the construction management service managed this from the office in Bangkok, Thailand. He was on site every other week for around 2 to 5 days. At the time the project manager had 8 years of experience with comparable projects.

Client: What was expected?

This consultant was selected to do preliminary designs, since many projects are performed together. Due to past projects they expect the consultant to understand their specific needs. A long the way and due to time constraints client and consultant continued into the EPCM project. The client expected to be unburdened on construction by the consultant, since they should know all. The consultant should be responsible for tendering, reviewing and managing the contractors., and be part of the project team. The client expects the consultant to take over a certain part of responsibility of the project.

Due to time constraints client and consultant just started on the project without any discussion on all actors' roles, responsibilities and accountabilities, nor were they specifically written down or visualized. On hindsight the client concludes they neglected to discuss client and consultant's interpretations.

Consultant: What was offered?

The CM-team on-site is responsible to make sure the contractor builds according to contract. The contract includes technical drawings and budget, planning and safety specifications. Since the consultant and contractor do not share a contract, the consultant acts on behalf of the client in order

to fulfil his role. The client does not have civil in-house specialists; therefore the consultant is hired with his specialism. The consultant tries to unburden the client as much as possible. Since the project is an industrial plant there is an interface between the consultant and client. Not all construction activities are part of the consultant's scope.

There was no client session prior to the project discussing the contents of the construction management services. The roles, responsibilities and the overall process are described in the project proposal, however this is not discussed with the client. Multiple projects are executed with this client, they simply 'role' into the next project. In this case the construction management services were not elaborated on in a Construction Management Plan, since there was a hard time constraint from the client's side to start on the project. After the project proposal all consultant's services were agreed on with a simple framework contract.

Project: What happened?

Myanmar opened its borders for foreign companies after more than a decade of isolation. This led amongst other things to contractors not being used to western quality standards. The quality level of local contractors did not match the specified standards by the client. A couple of the six contractors who participated in the tender phase were able to reach a certain level of quality, however placed a bid exceeding the client's budget. The contractor who came closest to the budget was not the ideal candidate, however was the only option for the client. After an assessment of the risks the client ultimately decided to go for this contractor. The selection of this contractor turned out worse than anticipated.

The consultant checks off whether the contractor builds according to contract. In this case numerous reports were send to the contractor regarding contractual deviations. It is the contractor's responsibility to fix the reported errors. In this case it was frustrating for client and consultant to see the contractor simply would not follow these instructions. It came to a point where the consultant felt he had no control on the contractor. There was the possibility to use a penalty or to threaten to hire another contractor for the corrective construction work. However the consultant considers these as extreme measures, which also cause knock-off delays. In this case the contractor did not seem to be sensitive for these threats due to the overheated Myanmar construction market. The contractor expressed he could simply do other work. On hindsight the consultant believes the contractor selection should have been done more carefully. He considers the selection of the right contractor to be one of the most critical success factors. The client however believes the contractor selection process was done properly.

The consultant's project manager missed a certain mentality of his CM-team on-site, leading to them being reactive instead of pro-active. Especially in the case of a time delay the site team should have had the foresight and handled accordingly. According to the consultant this could partly be because of the cultural differences. Having working experience in multiple Asian countries he suggests it is part of the Asian business culture to avoid confrontation. The client also believes the success of construction management depends on the right person on the job. In this case the local construction manager was found to be incapable, and the client demanded the consultant to install an expat on site.

The consultant deemed the communication and teamwork with the client low in this project. The project manager thinks they should have 'mirrored' their site team to the client's. In this context

mirroring means installing a strong expat CM along the client's expat (Installation Manager). In the beginning of this project the consultant's site team was entirely local, resulting in being overrun by the client's team. The organisation chart of the consultant's team should have fitted the client's team from the start. The consultant thinks key for success is to form 1 team on site with the client.

There were incidents where the consultant was to blame, which lead to additional works for the contractor. Contractor and client however filed no claims. In the end a settlement was agreed on with the client, since they were not completely satisfied with the CM services. Accountability was not pinpointed on specific issues, but agreed on based on the overall project. Finally the consultant did not charge the last invoice for the CM services. The client however believes it can be pinpointed to the consultant mainly on three issues. Firstly the consultant made cuts from the plan without cutting the budget. Those cuts were noticed in a late stadium of the project where it already had consequences on other parts of the scope. Secondly the consultant should have reviewed the contractors' plans better. Concrete columns were selected even though they lead to a 2 month planning overrun compared to steel columns. Thirdly the client believes the consultant did not safeguard the planning of the master plan enough. The consultant did not review the contractors' planning thoroughly since some seemed unrealistic. According to the client the consultant was not willing to take responsibility of the contractor's planning. The client believes large parts of these planning and cost overruns can be lead back to the management of construction and budget. "Responsibility without accountability does not hurt".

The consultant thinks signals from clients are clear they should take on more accountability. However he thinks this would probably mean the fee for CM services need to go up, since risk is being allocated at the consultant instead of the client. An example could be to put a penalty related to the project planning. The consultant believes this would require a stronger input on the contractor selection process. In current practices the consultant provides advice on contractor selection, in case the consultant is accountable he should have a say in the selection. This could lead however to a disagreement between client and consultant in wanting to select respectively a cheaper contractor versus a more expensive but qualitative contractor. He warns for taking over responsibilities of the contractor, he should still be responsible for building according to contract. The consultant believes it would be possible to set up certain targets for budget and planning, but it should include bonuses as well as penalties. This would cause legal matters for all deviations of the milestones and budget targets. For each incident the question would arise who is to blame; a client's change order, contractor's error or consultant's mistake. This would lead to all parties documenting all events. More important is to have control on the contractor, what would require a different contract form allowing the consultant to directly instruct and penalize the contractor. An extreme form would be having the complete contract and being remunerated lump sum by the client. The strongest tool the consultant has in current practices is approving (monthly) invoices and additional work claims. Rejecting these payments has the biggest influence on the contractor but also has consequences.

The main difference between the installations and civil part of the scope is the project delivery system it is organized by. The client buys the installations with a no cure/ no pay contract, leaving the detailed design and installation completely to the supplier. This system represents an EPC, which is quite the opposite of EPCM. Even though the client would prefer a 'no cure / no pay' system for the civil scope as well, he realizes the consultant cannot bear this responsibility without taking over the

entire project. Also this would mean defining all key performance indicators of the consultant in managing contractors, what would be difficult to determine and monitor throughout the project.

Analysis

The project was unsuccessful and the CM services were perceived as such by the client. The Myanmar construction market, and especially the contractor himself made it hard to control the project. The site teams of client and consultant did not show good teamwork, nor performed as one team. The teams were not mirrored to each other, which lead to a misbalance on site. The client blames the consultant for not critically reviewing contractor's planning and construction methods.

Table 19: Analysis case 3

Misalignment	
Aspect	**Summary**
Expectation client	The consultant unburdens the client by managing the contractors
Offered by consultant	The CM-team is responsible to make sure the contractor builds according contract. The consultant acts on behalf of the client.
CM perceived by Client as	Consultant's site team missed a pro-active mentality, especially on planning.
Causes for misalignment	
Aspect	**Summary**
Client	Past experiences: due to multiple projects in the past the consultant is expected to understand the specific needs of the client
Consultant	- CM not concretely formulated - No CM Plan was set up due to time constraints
Client – Consultant interaction	No alignment session prior to the project regarding CM
Case observations	
Aspect	**Summary**
Case observations	- The chosen contractor was not the ideal candidate; the only bid within budget, with poor quality. - Contractor would not follow instructions, consultant felt he had no control - The consultant's site team was not mirrored to the client's, not performing as one team. - Local CM was not the right person on the job, an expat was installed on site later in the project. - Low communication and teamwork between client and consultant - The consultant is blamed for not critically reviewing contractor's planning and managing it during construction. - Agreed on settlement resulting in discount for client

5.4 Case 4

The client wanted to develop a shipyard in Haiphong City Vietnam to provide outfitting of various types of ships up to a length of 60 meters. The consultant was contracted for EPCM services of the new facilities (2011-2014). The design featured amongst other things a 2,5 ton ship lift, ship transfer pit and outfitting buildings. The total project costs 40 million USD and is supposed to generate +- 750 jobs. The project is supposed to help the client reach their objective of building 80 vessels a year.

Table 20: Project success case 4

Project Success Criteria	Performance	Score
Budget	>20%	0
Planning	>20%	0
Quality	Most met	1
Safety	0 LTI	1
Start-up Production	>80% achieved	1
Client Satisfaction	Satisfied	1
Total		4

The project is considered to be unsuccessful due to high budget and planning overruns (table 20). The consultant's project manager at that time had 8 years experience with EPCM projects, especially in Vietnam. The client's project manager specialized in installations and equipment, and has 15 to 20 years of experience in project management in civil and mechanical projects. The client installed a small site team with a local construction manager.

Client: What was expected?

The client kept budget control within his own scope, he expected the consultant to properly manage planning, quality and safety. These responsibilities were mentioned in the contractual agreement between client and consultant, excluded from any form of penalties. Prior to the project the consultant's role, responsibilities and accountability were not discussed.

Consultant: What was offered?

The consultant thinks roles were clear prior to the project. He was responsible for construction management and supervision, including Health and Safety. Construction management includes project management, scheduling, managing contractors, site administration etc. In the essence quality, costs and time are managed without bearing the risk, since all is performed under a FIDIC white contract. The consultant thinks the added value of hiring a consultant for EPCM is to be pro-active on site and always look for alternatives with the contractor. Similar to other projects both parties 'just started' on the project, without any discussion on the roles, responsibilities and accountability of the execution phase. The consultant considers this could be due to a misalignment between top management located in Ho Chi Minh City and the construction site elsewhere in the country.

Project: What happened?

The client accused the consultant of not designing or executing the most cost efficient methods together with the contractor, whilst the consultant does not consider this his primary role on site. Focus by the consultant was on timely planning since the project was at a standstill in an early stage, but also since budget control was kept in the scope of the client.

During the project the consultant felt little control over the contractor. He is mentioned in the contract between client and contractor as the representative, what gives little power. Invoices are passed by the consultant but in the end the client is paying. Penalties can only be awarded when the client and the contract back it. This results in the consultant not being able to push hard on the contractor. The client however believes the consultant's position was clear enough in the contractor's contract to perform properly.

In case of any type of overrun the consultant feels there will always be criticism on construction management, as was the case in this project. The client does not seem to see the hard work that is being delivered to prevent worse.

Analysis

The project is seen as unsuccessful, the client is not completely satisfied with the CM services as well. The consultant felt little power over the contractor, even though the client feels that should not be the case.

Table 21: Analysis case 4

Misalignment	
Aspect	**Summary**
Expectation client	The consultant properly manages planning, quality and safety. Budget control was not part of the scope.
Offered by consultant	Responsible for construction management and supervision. Quality, costs, and planning are managed without bearing risk, since it is performed under FIDIC white.
CM perceived by Client as	
Causes for misalignment	
Aspect	**Summary**
Client	
Consultant	
Client – Consultant interaction	No alignment session prior to the project regarding CM. Despite 'just starting' on the project the consultant believes roles were clear.
Case observations	
Aspect	**Summary**
Case observations	- The consultant felt little power over the contractor, even though he is mentioned in the contract as 'the representative'. - Agreed on settlement resulting in discount for client

5.5 Case 5

As part of a coffee powder plant the client wanted to add a decaffeinate plant in Vietnam (2011-2013). The consultant was hired for EPCM services for the civil and MEP works. The client and a second consultancy firm were responsible for detailed design and execution of the equipment. Concept design of the equipment was performed in collaboration by consultant and client.

Table 22: Project success case 5

Project Success Criteria	Performance	Score
Budget	11-20% more	0,5
Planning	Similar	1
Quality	Most were met	1
Safety	0 LTI	1
Start-up Production	>80% achieved	1
Client Satisfaction	Satisfied	1
Total		5,5

Despite the budget overrun of 11 to 20% the project is considered to be a success (table 22). The client's project manager was responsible for the project's budget, leading the engineers team and managing communication between all stakeholders. The consultant's project manager was responsible for all EPCM phases, stationed in Ho Chi Minh City, visiting the site regularly. The consultant's site team consisted of a resident engineer, a part time construction manager, disciplinary engineers for civil and mechanical works, and three safety officers. Staffing depended on project phasing, being either down- or up scaled. The client had a local engineer, industrial service engineer, three process engineers, electric engineer and a safety officer on site.

Client: What was expected?

The client expects the consultant to take on ownership regarding time delays. He wonders whether the consultant feels the same urge to push the planning as they do. The financial consequences in production loss can be significantly larger than costs of additional works on site. The consultant is expected to put pressure on the contractor if necessary in order to avoid missing the production start-up deadline. Secondly the consultant is expected to not only serve as a representative on site, but to have a steering role. These expectations were not expressed prior to the project, nor concretely formulated in contracts. There were no negotiations on these topics, nor were there any tools used to visualize the expectations. The client believes these expectations were also based on past projects with the same consultant.

Consultant: What was offered?

The consultant fulfils an independent role between client and contractor; his responsibility is to make sure the technical specifications of the design are met. This is done by mediating between client and contractor. A certain level of quality can be guaranteed by the consultant. Budget and planning matters are reported to the client, however the consultant is not accountable for overruns. This is contractually the case since the arrangement between client and consultant is set up by a FIDIC white

contract. This contract excludes the accountability of the consultant, however the consultant is obligated to report and try to make the contractor function as good as possible.

Even though in the contract 'construction management' is mentioned as the provided service the consultant believes this is not offered at all. He feels the contractor is supervised rather than managed, meaning keeping an eye on the bigger picture instead of directly managing the contractor. He believes the consultancy firm mainly does site supervision instead of construction management, which is wrongly being appraised in his eyes. He agrees the terminology could lead to misaligned expectations.

At the time the project manager joined the project the proposal was already send to the client. Afterwards he felt he could not take accountability for what was offered by the commercial department of the consultancy. He believes it is important for a project manager to write his own proposal.

Project: What happened?

The client believes the set-up and execution of safety management was very effective. Budget and planning management were not completely as expected. Planning could have been tighter; whilst budget was not always played according to the contractor's contract enough.

On site the four M's principle is applied; Men, Material, Machine and Method. In case a mitigation plan is required the contractor controls all four aspects. He is responsible to deliver the machinery, the personnel equipping them, and to write a safe method statement. The consultant feels he can only warn him about the upcoming time delay and advise him to initiate the plan.

Due to a time delay caused by the contractor the project was tending to miss its deadline. An agreement was made to allow the contractor to make up time by setting up a nightshift, meaning a second shift for the consultant as well. The consultant's costs were reduced from the contractor’s additional works, resulting in the contractor paying for the additional consultant fee. This construction allowed the contractor to make up his loss and avoid a penalty, without the client paying for additional consultancy fees.

The client never penalized the contractor, since the time delay did not directly lead to a production loss. Both client and consultant emphasize the downside of a penalty clause is the client in the end pays for it himself, since the contractor includes the sum in his fee.

After the initial project date was due the client did not want to continue on the same remuneration scheme. A settlement was agreed on resulting in the consultant cancelling their last monthly invoice. Despite agreeing on the settlement the consultant believes it is hard to pinpoint the accountability of the delay since the contractor made mistakes, the client made change orders, and the consultant could have pushed the contractor harder.

Analysis

The project can be seen as successful. The construction management services were perceived good with some remarks. The client expects a certain level of ownership of the consultant regarding planning overruns. Whilst the client has the start-up production in mind the consultant fulfils a reporting role regarding planning and budget. Past experiences of the client influence his expectations. The contents of CM that are offered by the commercial department do not match with the consultant's project manager's idea and the contractual arrangement, what causes misalignment.

Table 23: Analysis case 5

Misalignment	
Aspect	**Summary**
Expectation client	The consultant takes ownership regarding time delay; he puts pressure on the contractor in order to avoid missing the start-up deadline. The consultant has a steering role on site and does not only serve as a representative.
Offered by consultant	Consultant fulfils an independent role between client and contractor. The responsibility is to make sure the contractor builds according contract. A certain level of quality can be guaranteed; planning and budget matters are reported to the client. There is no accountability for project overruns.
CM perceived by Client as	Effective safety management. Planning and budget could have been tighter and stricter
Causes for misalignment	
Aspect	**Summary**
Client	Past experiences: these expectations were based on a successful project with the same consultant in the same area.
Consultant	The consultant believes 'construction management' is not offered, even though it is mentioned in the contract as such. He believes the provided service is site supervision; keeping an eye on the bigger picture, rather than 'managing'.
Client – Consultant interaction	No alignment session prior to the project regarding CM. CM is not concretely formulated in the contract.
Case observations	
Aspect	**Summary**
Case observations	The consultant feels little control over the contractor, only the ability to warn him about upcoming delays and provide advice.

6. INTERPRETATION AND IMPLICATION

This chapter cross-analyses the 5 case studies and shows the implications for practice of this research. The cross-case analysis contains the misalignment of expectations, its causes, and limitations of EPCM in practice. The implications in practice are explained by the main aspects of misalignment found in the structured interviews (aspect B, C, E, and H). Finally research limitations of the set-up and execution of this research are listed.

6.1 Cross case analysis and link to structured interview results

In order to conclude from the cases a cross case table summarizes all aspects. This table can be found in appendix E. In the analysis the following themes are investigated: misalignment of expectations, causes for misalignment of expectations, control on the contractor, reactive construction management, and accountability. In the subchapters 'the misalignment' and 'causes for misalignment of expectations' findings are also compared to the outcome of the structured interviews.

Misalignment of expectations

The structured interviews show clients have higher expectations regarding responsibility and accountability than the consultant offers. The in-depth interviews, as part of the case studies, gave the interviewees the opportunity to elaborate on their perspectives. In 3 out of 5 cases the clients formulate higher expectations than the consultant offers. In general the consultants offer monitoring and supervision, while the clients expect pro-active management. Theory depicts the organisation of EPCM as shown in figure 21 on the left, clients however expect the consultant to perform as shown on the right.

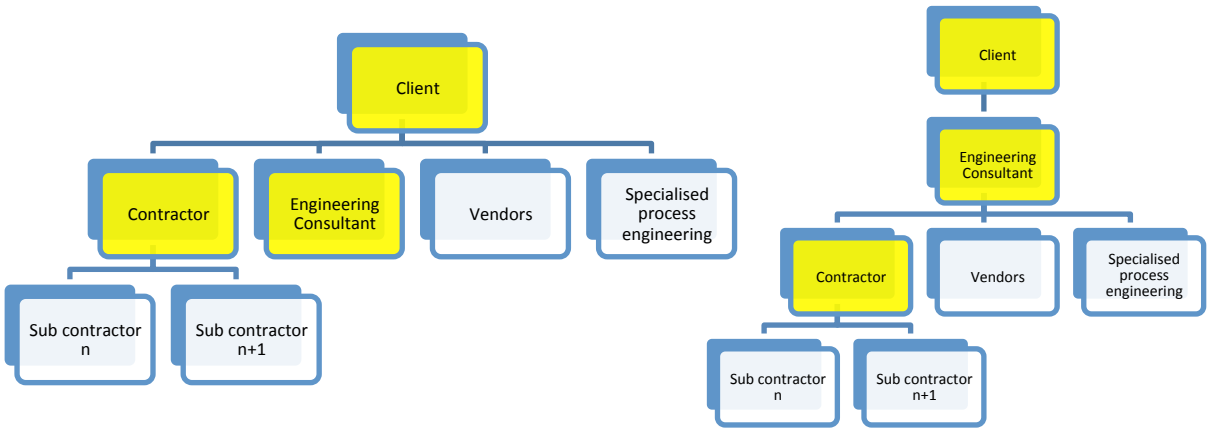

Figure 21: contractual relations (left) versus expected working relations (right)

In case 2 the consultant's offer was more or less equal to the client's expectations, however the consultant could not live up to this expectation. Clients expect a certain result obligation of the consultant, regardless of the outcome of the project. This means the problem of misalignment of client and consultant is not only a problem in unsuccessful projects. In all cases the consultant was free of any accountability due to the FIDIC white contract. Therefore contractually they do not have a result obligation, but rather a 'best effort' obligation. In general clients feel the current project organisation is unfair.

The major aspects found in the structured interviews contributing to the misalignment of client and consultant are: 1) the lack of the consultant's responsibility for the contractor's performances, 2) the lack of the consultant's accountability for project failure, 3) the missing obligation to deliver the project in time, and 4) the missing obligation to deliver the project with the desired start-up production. The obligation to deliver the project in time is specifically mentioned by clients of case 4 and 5. Clients of all five cases mention the consultant should be responsible for the contractor's performances, which is an expectation exceeding how EPCM is defined. According to theory the consultant is responsible for management, supervision and co-ordination of all construction activities and contractors, however not responsible for the contractor's performances per se.

Causes for misalignment of expectations

Case 1 shows the largest misalignment between client and consultant. The client expressed his expectations are a result of positive past experiences. Positive past experiences are also seen in case 5. The client of case 1 also believes the impression was made by the consultant the CM service is free of any risk. One of EPCM's advantages for the client is to keep control over the design development and construction (Norton Rose Fulbright, p. 6). Control by the client allows for instance flexibility in design changes. However control over construction does not seem to be the expectation of all clients. The client of case 2 expects to 'lie back' on the outsourced CM service, without having to control construction himself. The client of case 3 expects to be unburdened of construction by the consultant managing the contractors.

As the client of case 1 explained the consultant made the impression the CM service is free of any risk. The misalignment is not only caused by a delta between expectation and perception, but also between expectation and the consultant's offer. The structured interviews have shown consultants are not always aligned amongst themselves regarding the contents of the construction management service, due to their scattered answers on 4 out of 9 aspects. The consultant of case 2 even offers a role ("taking ownership") what is not in line with the contractual arrangements (no accountability). Terminology of the provided service is not consistently used within and amongst projects. The construction management service is also referred to as site supervision or site management. In cases 1, 3 and 5 the contents of the CM service were not concretely formulated in the project documents and/or contracts. The service is mentioned in general but not really elaborated on. In case 3 the CM plan was not set up due to time constraints.

Only in case 2 a tool was used to discuss roles, responsibilities and accountability. Event though a RACI table was used the client still indicated roles and responsibilities were not completely clear. The RACI table was included in the CM plan but never discussed with the client, therefore not used as a tool. In 3 out of 5 cases the client believes roles and responsibilities were 'somewhat' clear, the client of case 2 even believes it was unclear. Even though the client of case 3 believes roles and responsibilities were clear, he believes the consultant did not understand his specific needs. According to the clients in case 2, 4 and 5 the consultant somewhat understood his specific needs, only in case 1 this was fully the case. In none of the cases alignment sessions prior to the project were implemented, or were any tables or organograms used as tools.

Misalignment of expectations is caused by multiple factors and gaps on both client's and consultant's side. Communication plays a major role in how clients form their expectations.

Limitations of EPCM in practice: control over the contractor

In all cases the consultant expressed the feeling of low control on the contractor, including the cases that were successful and with positively perceived CM. Consultants indicate the main reason is the absence of a contract between consultant and contractor. Secondly the consultant has an advisory role instead of a deciding role in the contractor selection process. In current practices the consultant has a say in the contractor selection process by assisting in making the work packages, arranging invitations to tender and advising and contracting a suitable contractor. Consultants claim the client in general chooses the lowest bid, not always in line with the advice. Consultants in practice believe they need more saying in the actual selection in order to ensure control over the contractor during construction.

In case 1 the consultant sometimes did experience low control, however did not experience this limitation as much as the other consultants. The consultant of case 1 explains the level of control over the contractor is established by performing as one team with the client. By performing as one team, the consultant can make full use of the client's competences. This is important since the client holds the contract with the contractor and therefor decides on the use of penalties or even replacement of the contractor. The consultant's Project Managers of case 2 and 3 explained the client's prohibition to use penalties as one of the reasons for the lack of control over the contractor. In both cases the consultant was not allowed to make use of the contractual penalties due to the fear of knock-on delays and since these measures contradict with the client's company policy. In case 2 however the client expects the consultant and contractor to perform as one team, without him having to mediate too much. In case 2 there seems to be different expectations of what 'the team' on site should be, what is in line with the clients' expectations in case 2 and 3 of 'laying back' during construction.

Case 3, scoring lowest on project success, also shows the poorest teamwork and communication between client and consultant. Case 1, the most successful project of this study, shows the best teamwork and communication. Being in control over construction requires the client to install a relatively large and competent site team, especially in planning, cost and contract management (Berends, 2014). The lack of control over the contractor is not mentioned as a disadvantage in theory, nor is the fact client and consultant should perform as one team.

Limitations of EPCM in practice: reactive construction management

Clients and consultants on all 5 cases believe the consultant should perform construction management pro-actively; meaning problems are foreseen and mitigated rather than observed and handled. The service is offered as pro-active construction management, even though site supervision is perceived. The consultant has in practice a monitoring and reporting role on site towards the client instead of a pro-active role. This is also not in line with the role as described by Loots and Henchie (2007) where the consultant is responsible for overall management, supervision and co-ordination of all construction activities and contractors. However the client of case 1, the only completely successful project (score of 6/6), does believe the consultant performed construction management pro-actively. The cases show clients expect the consultant and contractor to perform as one team and expect the consultant to take ownership of what happens on site. Part of this problem, as indicated by both client and consultant, is not having the right person for the job. A malfunctioning construction manager prevents the consultant from being pro-active on site and taking responsibility. In case 2 and 3 the construction manager on site was replaced after insisting of the clients.

Limitations of EPCM in practice: accountability

In all cases the consultant is free of any accountability regarding project delays or overruns, due to the protective nature of FIDIC White or comparable contracts. In case 2, 3, 4 and 5 accountability issues are handled after project completion by a discount on the consultants' fee. In these cases invoices of the months exceeding the initial completion date were cancelled or reduced. Out of these cases only case 3 and 4 are unsuccessful according to Arkesteijns model, while case 2 and 5 both were successful with a score of 5,5 out of 6. Unsuccessful project success criteria in case 2 and 5 were respectively planning and budget. In case 1, where all project success were met, no discount was offered to the client. According to consultants of case 2, 3, 4 and 5 accountability of the delay or overruns could not always be pinpointed to one stakeholder of the project. The absence of a single point of responsibility is mentioned in theory as a disadvantage of EPCM projects. The discounts are also a means for ensuring client satisfaction and continuation of the relationship, according consultants. The feeling of 'unfairness' of the client in current EPCM practices is strong enough to take on accountability, even when projects were completed successfully.

6.2 Implications for practice

The findings of this research have implications for clients and consultants involved in EPCM projects. This chapter describes the improvements needed to align client and consultant. Since the misalignment is mainly due to four aspects, the focus of this chapter will be on B) the lack of consultant's responsibility for the contractor's performances, C) the lack of consultant's accountability for project failure, E) the missing obligation to deliver the project in time, and H) the missing obligation to deliver the project with the desired start-up production.

Lack of responsibility (B) and accountability (C) for the contractor's performances

In the studied EPCM projects the consultant shows low responsibility for the contractor's performances. Despite theory states he should ''be responsible for overall management, supervision and co-ordination of all construction activities and contractors'', that does not mean responsibility for the contractor's performances. In current practices the consultant has an independent status due to the 'protective' FIDIC White contracts, resulting in no accountability for the above-mentioned responsibility. The consultant cannot take accountability of the project outcome since the magnitude of the project costs are multiple times larger than the costs of the services they provide. However the consultant regularly takes on a certain level of accountability by cancelling last invoices for the construction management fee.

The missing contractual link between consultant and contractor causes a feeling of no control over the contractor's performances. The only two 'powerful' tools the consultant has are rejecting payment invoices and penalties for missing milestones. However in fear of knock-on delays, quality issues and due to corporate culture the client does not always allow the consultant to use those tools. Moreover the consultant is involved in the contractor selection process however has no final saying, which can lead to having to work with an unfavourable more risky contractor. The missing contractual link between consultant and contractor, low control on the contractor, and the advising role in the contractor selection process make the consultant unwilling to be accountable for construction.

In order to improve the consultant should be incentivized by a certain accountability fitting his responsibility, since responsibility without accountability causes a feeling of unfairness for clients. Accountability should be in proportion to the consultant's fee. Since the consultant cannot bear the risk of total project costs it is undesirable for the consultant to hold the contract with the contractor. Secondly it would define a different project delivery system than EPCM. Having more control over the contractor is a condition to take on this responsibility. Control can be achieved by client and consultant, performing as one team on site, with good teamwork and communication. Having the right person on the job is important, since the construction management team is one of the main tools for the consultant to control construction.

Missing obligation to deliver the project in time (E) and with the desired start-up production (H)

In the studied EPCM projects a time delay results in loss for the client but in additional fee for the consultant. In combination with the lack of accountability for project overruns this is one of the main problems for the client. Contracts are designed in such a way the consultant feels no 'pain' in case of planning overruns. In fact, planning overruns add up to the consultant's fee. This implication in practice results in a feeling of 'unfairness' for the client.

In industrial EPCM projects the consultant is not in all parts of the scope involved. The client has in-house knowledge and experts on installations and equipment, and in general manages detailed design, procurement and construction of the process equipment. Start-up production however is highly correlated to the quality and planning of the civil and MEP works, which are part of the consultant's scope. In current practices the consultant does not take responsibility and accountability for start-up production, even though the client expects a certain obligation to deliver the project with the desired start-up production.

In current practices settlements are agreed upon after project completion, even when the project was successful. Clients ask for a settlement since they have no single point of responsibility and it is unclear who is to blame for the planning overrun. Consultants agree on the settlement in order to minimize client dissatisfaction and safeguard the continuation of the client relationship. In order to improve the obligation to deliver the project in time, client and consultant should prior to the project make an agreement on how planning overruns are handled. In order to improve the obligation to deliver the project with the desired start-up production, process equipment should be part of the scope of the consultant. Expanding accountability and the scope of the consultant influences the fee.

6.3 Research limitations

The following limitations are found in the set up and execution of this thesis.

All data of the consultants originates from Royal HaskoningDHV, therefore there is no comparison to other consultants in the same branch. This limitation is hard to overcome in the set-up of performing a graduation internship at a single company. In order to minimize the limitation, in preliminary interviews consultants were asked on their experience on EPCM projects at other consultancy firms. Secondly online manuals and presentations of EPCM projects by PWC and Tebodin were compared. The conclusion was made RHDHV performs EPCM projects in a similar way to its main competitors.

Besides only studying Royal HaskoningDHV projects, other characteristics also cause the studied set of projects to be specific. As described in the research methodology all studied projects are light industrial within the branch of consumer's goods. Secondly all clients are Western, and the projects are executed in development countries in Africa and Asia. Conclusions therefore are applicable for these specific set of projects, however are tried to make generic with some reflection.

Consultants and clients can provide socially desired answers in both structured interviews and in-depth interview since the focus of research is on what went wrong in projects. In order to minimize this limitation for each in-depth interview the data from the structured interviews of both client and consultant of the specific case were analysed and compared. Contradicting or unexpected answers were asked for an explanation in the in-depth interviews. Secondly comparing the experiences of client and consultant does not only show their different perceptions but it also gives a certain validation.

7. CONCLUSION AND RECOMMENDATIONS

In order to answer the research question this chapter answers the four sub-questions followed by recommendations for practice and further research.

7.1 Answering the research questions

RQ1: On what aspects are the client's expectations misaligned with the construction management service the consultant offers?

Engineering, Procurement, and Construction Management is a project delivery system that defines the roles of participants, shares authority and responsibility, allocates profit and risk, and organizes and incentivizes participants to fulfil objectives. Clients have certain expectations of the role, responsibility and accountability the consultant has during the CM phase of projects. In current EPCM practices the consultant has an independent status and is contractually protected from accountability of overruns. In the studied set of projects a misalignment between client and consultant is observed in terms of the consultant's role, responsibility, accountability, and it's obligation to deliver the project successfully in terms of budget, planning, quality, safety, start-up production and client satisfaction. While clients expect a certain result obligation, the consultant offers a 'best effort' obligation.

Misalignment is observed on all nine aspects of the construction management service. In general the client of these projects has higher expectations of the service and expects the consultant to deliver the project successfully. Four aspects show the biggest misalignment and contribute most to the misalignment of client and consultant. These aspects are B) a lack of responsibility for the contractor's performances, C) a lack of accountability for project failure, E) the missing obligation to deliver the project in time, and H) the missing obligation to deliver the project with the desired start-up production.

Clients of industrial projects at RHDHV expect the consultant to fulfil the managerial layer between client and contractor. In EPCM projects the client however holds both contracts with the consultant and the contractor. The consultant in some cases seemingly offers the working relation the client expects. However in practice, due to limitations of EPCM, this seems to be unreachable. A 'monitoring and reporting' role of the consultant is perceived, instead of actually managing and steering.

RQ2: What causes the misalignment of clients and consultants' expectations?

Misalignment between the clients' expectations and the service consultants offer have varying causes. Besides factors and gaps on both the client and consultant's side there is also the overlapping communication between them, the gap between expectation and strategy, and the gap between the CM service and client perception. Clients are influenced by word of mouth, their personal needs and past experiences. The performance of the construction management service can be perceived different than expected due to the gaps from strategy to actual CM service. Factors and gaps coloured red in figure 22 represent causes for misalignment found in the studied set of EPCM projects. The main factors and gaps found in the case studies are elaborated on below; past experience of the client, communications between client and consultant regarding the strategy, and the development of strategy to actual CM service.

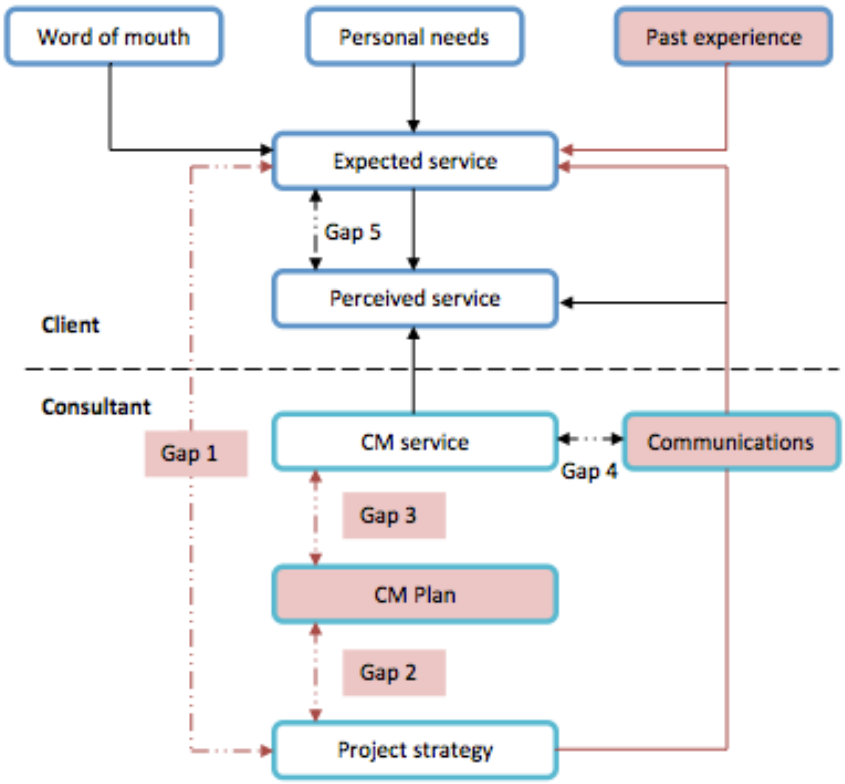

Figure 22: Causes for misalignment of expectations

On the consultant's side the following causes are found. Even though the studied cases are similar the consultant's project managers have different standings on the contents of the construction management services; there seems to be no unanimous company policy. Also a distinction between the commercial department and the project management department was found, where commercially the service is overpraised in order to award the project. However in practice the project manager cannot live up to this expectation. Besides inconsistency amongst project managers a lack of consistency is also found within cases. Throughout early project phases different terminology is found in project documents communicated with the client, ranging from site supervision, site management to construction management. Adding to this confusion the role, responsibility and accountability of the consultant are not concretely formulated. In one case the entire CM Plan was missing due to time constraints.

Clients base their expectations on past experiences. Successful projects in the past cause clients to organize new projects the same way, what might be unjustified. Consultant and client often "just start on the project". A wrong attitude of the client could mismatch with EPCM projects. Clients cannot lie back on the design and construction and wait for the end result. EPCM is a more dynamic system, offering advantages in terms of planning, budget and flexibility, however demanding control and participation of the client.

Communication between client and consultant influences the expectations and how the client perceives the CM service. The more unknown expectations are to the consultant and the project strategy is to the client, the larger the gap between them can grow. In none of the cases meetings are set up to discuss expectations or the contents of the CM service. Also tools to clarify and discuss roles, responsibility and accountability are hardly used. The importance of communication also becomes apparent in projects since clients believe the consultant does not always understand their specific needs.

RQ3: What limitations of the construction management service are found in EPCM projects in practice?

Consultants at RHDHV experience a feeling of low control on the contractor in the EPCM studied projects. This starts by their advising role in the contractor selection process, where the consultant is not always put up with the most desirable contractor. The consultant believes he needs a bigger saying in the contractor selection process, despite already having influence by making work packages, arranging invitations to tender, advising on suitable contractors, and putting contracts in place. Consultants indicate the missing contractual link between the contractor and them is the main reason for low control. When clients are not willing to award penalties to the contractor, the consultant is stripped from one of the remaining tools to put pressure on the contractor. Due to this low control the construction management service is in practice experienced as 'site supervision', where the consultant 'monitors and reports' to the client, instead of pro-actively managing all construction activities. According to theory however the consultant is supposed to be responsible for overall management, supervision, and co-ordination of all construction activities and contractors. Besides the lack of control on the contractor, the consultant is not able to perform as he should due to not having 'the right person on the job'.

RQ4: What needs to improve in order to align client and consultant in EPCM projects?

The four aspects that show the largest misalignment for the studied set of EPCM projects are responsibility for the contractor's performances, accountability for project overruns, obligation to deliver the project in time, and obligation to deliver the project with the desired production start-up. In order to align those aspects the two improvement areas are communication and performance. Communication issues as explained in the answer of research question 2 cause the misalignment of expectations. Performance limitations as explained in the answer of research question 3 cause the construction management service to be substandard.

As explained in the answer of research question 2 misalignment of expectations is caused by communicational factors and gaps. Clients should better understand advantages and disadvantages of EPCM, without letting their expectations be formed too much by past experiences. Consultants should work on consistency throughout and amongst projects, and ensure concretely and uniformed definition of the contents of the construction management service.

The consultant can only be responsible for the contractor's performances when there is more control over the contractor, what is currently not the case. In order to have more control over the contractor the client and consultant should perform as one team on site. Good teamwork between client and consultant contribute to control over the contractor, since full use can be made of each other's competences. It is therefore required for the client to install a relatively large site team. The client should not expect to lie back on the construction management services that are outsourced, but should pro-actively participate. The competency of the site team is a requirement for the consultant to be able to be responsible for the contractor's actions. In order for the consultant to take on a certain level of accountability not only more control over the contractor is needed, the consultant should also participate more in the contractor selection process. Secondly a certain level of accountability should be in proportion to the consultant's fee, since total project costs exceed the consultant's fee numerous times.

From all project success criteria clients are mainly misaligned on the obligation to deliver the project on time and with the desired start-up production. In current EPCM practices the consultant's fee adds up in case of planning overruns. Incentives on planning, such as remuneration on milestones or shared 'pain and gain', should give client and consultant a shared goal and incentivize the consultant. Even though the effect of incentives on project success is not proven, it would make the project fairer from the client's perspective.

There is no obligation to deliver the project with the desired start-up production because clients intentionally leave it out of the consultant's scope. Clients expect a certain obligation since production is correlated to quality and planning of the project. In the studied light industry projects the EPCM system is only applied to civil and MEP works. Clients engineer, procure and manage the installations and equipment themselves. In order to ensure this obligation also installation and equipment works need to be included in the consultant's scope.

RQ: How can client dissatisfaction with the construction management service in industrial EPCM projects be prevented?

Misalignment should be avoided since it leads to dissatisfaction and a feeling of 'unfairness' for the client. Clients and consultants are mainly misaligned on the consultant's responsibility, accountability, and the obligation to deliver the project in time and with the desired start-up production. Even in successful projects an unsatisfied client results in a discount on the consultant's fee. Ideally in successful cases there should be no need to give the client a discount on the consultant's services. Client dissatisfaction can be prevented by aligning expectations and by improving the construction management service. The answer of the research question is therefore in twofold; client and consultant can be aligned by improving communications and by improving the performance of EPCM practices.

Prior to the project it is important to align both parties regarding roles, responsibilities and accountability. The client should be made aware of his own and the consultant's role, responsibility and accountability before commencing the project. For the client it is important to realise he bears the risk and he should actively control design and construction, by installing a relatively large team. *Look before you leap.* The consultant should realize their added value should be to 'upgrade' the contractor's performances. Therefore the consultant should be responsible for overall management, supervision and co-ordination of all construction activities and contractors (within the scope), and

not solely monitor and report. Consultants should have an aligned definition of the offered construction management service amongst their project managers. The service should be defined concretely in proposal and contract, leaving no room for misconceptions. Throughout the project terminology should be consistent.

In order to act as the client expects the consultant needs to take on more responsibility of the contractor's performances, and take on a certain level of accountability, especially on planning and start-up production. In order to meet those expectations certain limitations should be overcome. Good teamwork between client and consultant should be strived for in order to function as one team and to make full use of each other's competences. The client should control design and construction by installing a relatively large team. This should ensure control on the contractor, in order to minimize the limitation of the missing contractual link between consultant and contractor. Accountability should be proportionate to the consultants' fee, and ideally the consultant is asked to participate more in the contractor selection process. Incentives on planning, such as remuneration on milestone basis or share 'pain and gain' could ensure the obligation to deliver in time. Even though the effect of incentives is not proven, it would make the project fairer from the client's perspective. Obligation on start-up production is only realistic when the scope of the consultant includes installations and equipment.

7.2 Recommendations

Recommendations for practice

In order to prevent client dissatisfaction of the construction management service of industrial EPCM projects at RHDHV, the misalignment between client and consultant should be bridged. The recommendations are in twofold. The consultant should be aware of factors and gaps contributing to misalignment and is recommended to organize EPCM projects differently in order to perform as the client expects.

Prior to the project the consultant and client should assess whether EPCM is the right strategy for the specific project. Topics of discussion should be 1) willingness of the client to bear risk, no single point of responsibility, 2) willingness of the client to control construction by installing a relatively large site team, 3) the role, responsibility and accountability of the consultant during CM. This should not only help client and consultant decide on the fitting strategy, but should also avoid misalignment of expectations.

Secondly the consultancy firm should incorporate a company policy on the definition of its construction management service. The consultant project managers should be aligned amongst themselves in order to avoid wrong expectations. The contract and construction management plan should elaborate concretely on the roles, responsibilities and accountability of client, consultant and contractor. Terminology of the service should be consistent within and amongst project, in case a similar service is offered.

In case the outcome is EPCM as the preferred strategy the following checklist should be discussed in order to align client and consultant and contribute to client satisfaction.

1) **Roles:** Discuss what 'the team' is, and what the roles are. Establish good teamwork between client and consultant in order to function as one team.
2) **Responsibility:** Establish a pro-active managing style on site with competent construction managers. Discuss the willingness of the client to award penalties to the contractor.
3) **Accountability:** Discuss shared 'pain and gain' mechanisms in order to create an incentive for the consultant and avoid a feeling of 'unfairness' of the client. Decide on the level of involvement of the consultant in the contractor selection process.
4) **Planning:** In continuation of the shared 'pain and gain', discuss settlement of planning deviations. Implications of current rate base remuneration should be explained, and alternatives like remuneration based on milestones or a bonus/penalty system should be offered.
5) **Start-up production:** Limitations of current scoping and its interfaces should be explained. Discuss inclusion or exclusion of production in the scope of the consultant's services.

Figure 23 shows how the recommendations should affect alignment of expectations. The checklist should minimize the gap between strategy and client expectations. Concrete and consistent terminology and aligned consultants should minimize the gaps between strategy and CM service.

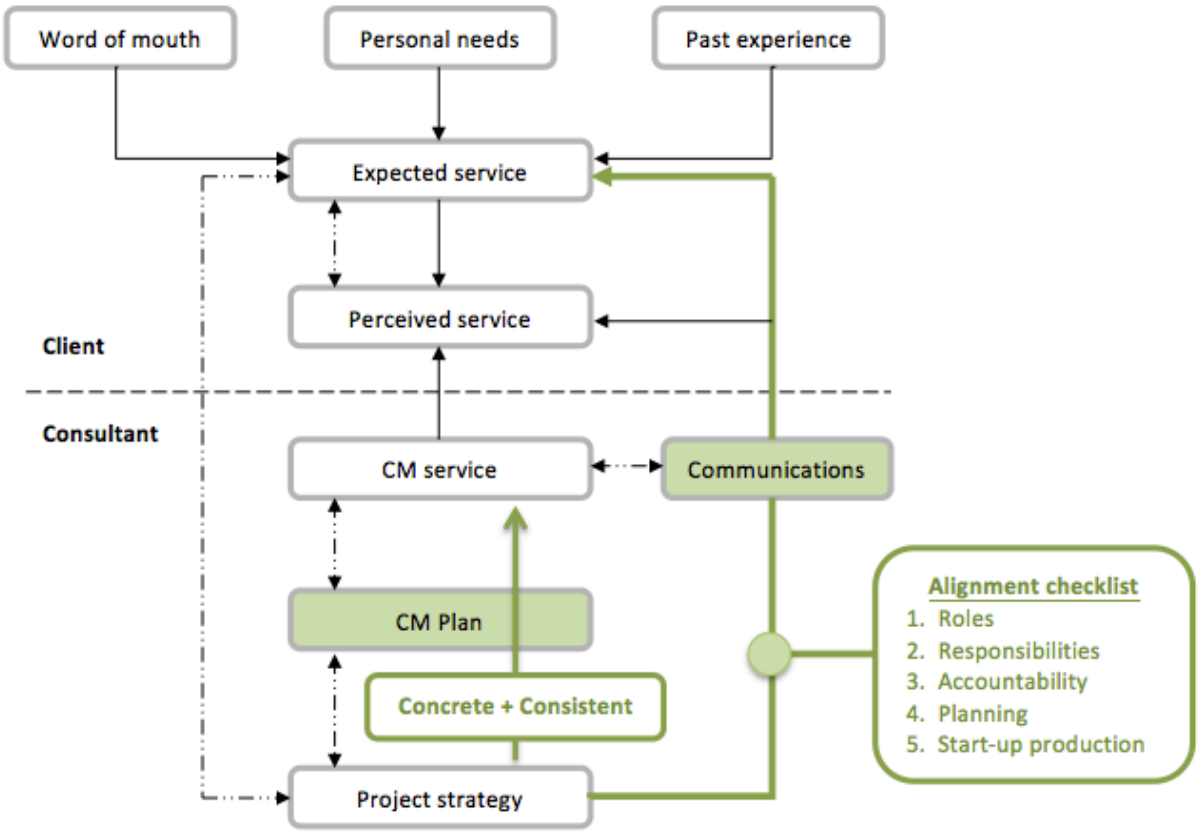

Figure 23: Recommendations

Further research

Besides recommendations in practice the following topics are recommended for further research. The topics are partly based on the limitations of this thesis in order to strive for validity and completeness.

The structured interviews as starting point of the in-depth case studies are send out in a survey-like manner. However due to the small number of measurable units it cannot be treated as such. A cross sectional survey could therefore test the misalignment of client and consultation on a larger number of participants. By including various clients and consultants it would overcome the limitation of only studying projects of Royal HaskoningDHV. A survey with more measurable units could validate whether higher expectations of the client are observed on all 9 aspects, and whether aspect B (responsibility), C (accountability), E (obligation to deliver in time) and H (obligation to deliver with the desired start-up production) are main contributors to this misalignment. Moreover differences between sectors, such as heavy industry, infrastructure and architecture could be included in order to overcome the limitation of just studying the specific set of projects.

Secondly quantitative research on causes and EPCM limitations is recommended. Quantitative research on causes of misalignment of expectations with the Servqual model as under layer can validate the qualitative study on causes of this thesis. Not only the gaps and factors that cause the misalignment can be studied, service quality of construction management itself can be studied by findings its 'RATER' factors. A complete Servqual model, with defined gaps, factors and service quality factors, can be used as a tool to align client and consultant prior the project and to measure and discuss the quality of the executed construction management after the project. Quantitative research on limitations of EPCM projects in practice could validate the findings of this thesis. Further research could determine whether these limitations can be added to current disadvantages of EPCM.

Finally further research could make use of the contractor's input in order to triangulate and validate data from only consultant and client. Since the study focuses on expectation and perception, adding one more point of view could give new insights and eliminate this research limitation.

8. PERSONAL REFLECTION

I would like to end this thesis with a personal reflection on product and process. Since I believe my graduation process has been quite unusual, it might be interesting to share my thoughts on the final product and the process itself. To summarize I started my graduate internship at Royal HaskoningDHV in December 2015, after a year of reading, writing, and performing all empirical work the project came to an absolute standstill in the beginning of 2017. After taking an academic break, I 'rebooted' the project in May 2018, with Marian Bosch-Rekveldt as my first supervisor. With only preserving sections of Chapter 2 and raw data of the structured interviews and in-depth interviews, this thesis is the product of the last 5 months.

When I started on this thesis my goal of this research was to find all problems, limitations, and disadvantages consultants and clients face in the practice of EPCM projects. In a way I wanted to find all answers and improve the EPCM project. The results I have now are just a tiny fraction of my initial goal, a long the way certain reality checks made me change my goals into something more manageable.

Product

- How do I feel about the results?

Numerous articles study project success factors and criteria, with the focus on contractor performances within EPC contracts. Studies on performances of EPCM projects were only found a handful, however none with the focus on the consultant's performances or the consultant-client relation. The consultant's performance of EPCM services seems to be an understudied subject, especially with the focus on client's expectations.

I was surprised by the vagueness of the EPCM definition encountered in practice. During the first meeting with my professor, Hans Bakker expressed his incomprehension for the contractual set up of these projects. In theory the indistinctness of the contents of EPCM is even mentioned. During the interviews I spoke to clients who only during an unsuccessful EPCM project found out about the real limitations of EPCM. Aren't they supposed to know about all the contractual whereabouts? After preliminary interviews I expected to find a certain misalignment of client and consultant regarding expectations on ' result versus best effort'. The expected obligation to deliver the project with the desired start-up production was however surprising, since installations are not part of the consultant's scope in all studied projects. I think the case studies show the misaligned and unsatisfied client and a consultant trying to overcome limitations of current EPCM practices.

Process

- How did I experience graduating?

Given the summary of my process in the introduction of this chapter it is needless to say I expected the process of graduating to be quite different. In order to explain, I'll breakdown the process into 4 phases. The first phase between kick-off and first mid-term was an interesting and exciting phase. I explored all fields within Project Management related to my subject, I held preliminary interviews with senior PM's at RHDHV in order to define the problem definition, and I started on the empirical work by selecting cases and sending out the structured interviews. The second phase between the first mid-term and taking a break was confusing, where I could not scope down my research into something manageable. Ambition retained me from cutting out aspects that I felt were vital for my

story. The 10 interviews I held were extensive and interesting, however not always focussing enough. The third phase is less defined by time; demotivation gradually took over and the word 'graduation' caused a freezing effect. Daily work was suspended, daily pondering unfortunately not. The fourth phase started right before summer and brought me to where I am now. Reshaping and rewriting existing text, especially your own, is a laborious process. After restructuring the methodology and backbone of the thesis, I even found back the fun and confidence in writing my new chapters. Each meeting with Marian was constructive and a push in the right direction.

Overall

- What would I have done differently?

In terms of process I think the open and explorative nature of this thesis do not completely suit me. A clearer definition of the studied objects would have helped me keeping structure in my thesis. Secondly I would ask for help sooner, as I did now in a very late stage. In hindsight I should have sorted my struggles with the methodology before commencing with the interviews.

Concerning the contents I would have liked to conclude with a more concrete tool for RHDHV, but maybe that should be the next step.

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APPENDIX

Appendix A. Structured interview

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so		#N/A	
B	The consultant is responsible for the contractor's actions and performances		#N/A	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's		#N/A	
D	The consultant is obligated to deliver the project within budget		#N/A	
E	The consultant is obligated to deliver the project within time		#N/A	
F	The consultant is obligated to deliver the project within the desired quality		#N/A	
G	The consultant is obligated to deliver the project without any Lost Time Incidents (LTI's)		#N/A	
H	The consultant is obligated to deliver the project with a start-up production as expected		#N/A	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client		#N/A	
	Additional data			
1	Roles and responsibilities should be clear prior to the project		#N/A	
2	Employees of the consultant should understand the specific needs of the client		#N/A	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)		#N/A	
4	The level of teamwork quality between the consultant and client should be high		#N/A	
5	The level of teamwork quality between the consultant and contractor should be high		#N/A	
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction			#N/A	
B	The consultant took responsibility for the contractor's actions and performances			#N/A	
C	Risk of project exceedance (cost, time, quality) was at the consultant's			#N/A	
	Project performance				
D	Budget		n.a.	#N/A	
E	Planning		n.a.	#N/A	
F	Quality		n.a.	#N/A	
G	Safety		n.a.	#N/A	
H	Start-up production		n.a.	#N/A	
I	Satisfaction		n.a.	#N/A	
	Additional data				
1	Roles and responsibilities were clear prior to the project			#N/A	
2	Employees of the consultant understood the specific needs of the client			#N/A	
3	The consultant performed CM activities pro-actively, and not only when problems occured			#N/A	
4	The level of teamwork quality between the consultant and client was high			#N/A	
5	The level of teamwork quality between the consultant and contractor was high			#N/A	
	CM Service				
6	The consultant had adequate means to control the costs of the project			#N/A	
7	The consultant had adequate means to control the progress of the contractor			#N/A	
8	The consultant had adequate means to control the quality of work			#N/A	
9	The consultant had adequate means to supervise the safety on site			#N/A	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs			#N/A	
	Where there any additional factors which affected the CM service in your experience?				

Appendix B. Interview Client

Background questions

1. Could you briefly explain the project's background (type of project, contractor(s), scope, contract forms etc.) and your role in the project?
2. What is your experience with EPCM projects?

Expectations

3. How do you see the role of the CM team regarding responsibility and accountability in managing budget, planning, quality and safety of the contractor(s)? In other words; what do you expect from the consultant?
4. How were those expectations expressed in the beginning of the project together with the consultant? How clear were roles and responsibilities of all parties in the beginning of the project?

EPCM in practice

5. How did construction management go in practice in terms of budget, planning, quality, and safety? How was the control on the contractor(s)? How come?
6. Can you give an example of a dispute regarding planning, budget, quality, safety? How was this handled in terms of responsibility/accountability? Can you name a situation in which the Consultant took accountability?
7. How do you think the current EPCM risk register / contract form match with your expectations? What improvements could be made?

Appendix C. Interview Consultant

Background questions

1. Could you briefly explain the project's background (type of project, contractor(s), scope, contract forms etc.) and your role in the project?
2. What is your experience with EPCM projects?

Expectations

3. How do you see the role of the CM team regarding responsibility and accountability in managing budget, planning, quality and safety of the contractor(s)? In other words; what do you offer the client?
4. How were those expectations expressed in the beginning of the project together with the client? How clear were roles and responsibilities of all parties in the beginning of the project?

EPCM in practice

5. How did construction management go in practice in terms of budget, planning, quality, and safety? How was the control on the contractor(s)? How come?
6. Can you give an example of a dispute regarding planning, budget, quality, safety? How was this handled in terms of responsibility/accountability? Can you name a situation where you took accountability?
7. How do you think the current EPCM risk register / contract form match with the Clients' expectations? What improvements could be made?

Appendix D. Data structured interviews

Client 1

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Somewhat agree	5	
B	The consultant is responsible for the contractor's actions and performances	Somewhat disagree	3	The consultant plays an important role but can, in the end, not held responsible for all the activities of the contractor
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Neither agree or disagree	4	My experience says that to it is neccessary, to some extend, that the consultant feels it in his pocket when they make mistakes that lead to damage for the client.
D	The consultant is obligated to deliver the project within budget	Somewhat agree	5	
E	The consultant is obligated to deliver the project within time	Somewhat agree	5	
F	The consultant is obligated to deliver the project within the desired quality	Somewhat agree	5	
G	The consultant is obligated to deliver the project without any Lost Time	Somewhat agree	5	
H	The consultant is obligated to deliver the project with a start-up production as	Somewhat agree	5	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Agree	6	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Agree	6	
2	Employees of the consultant should understand the specific needs of the client	Somewhat agree	5	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	
4	The level of teamwork quality between the consultant and client should be high	Strongly agree	7	
5	The level of teamwork quality between the consultant and contractor should be high	Somewhat agree	5	

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors		Somewhat agree	5	
B	The consultant took responsibility for the contractor's actions and		Disagree	2	
C	Risk of project exceedance (cost, time, quality) was at the consultant's		Strongly disagree	1	
	Project performance				
D	Budget	Similar to estimate	n.a.	1	
E	Planning	Duration was 1-10% more than estimated	n.a.	1	
F	Quality	All quality requirements were met	n.a.	1	
G	Safety	0 Lost Time Incidents	n.a.	1	
H	Start-up production	> 80% of the planned production achieved during start-up	n.a.	1	
I	Satisfaction	Very satisfied	n.a.	1	
	Additional data				
1	Roles and responsibilities were clear prior to the project		Somewhat agree	5	
2	Employees of the consultant understood the specific needs of the client		Agree	6	
3	The consultant performed CM activities pro-actively, and not only when		Strongly agree	7	
4	The level of teamwork quality between the consultant and client was high		Agree	6	
5	The level of teamwork quality between the consultant and contractor was high		Neither agree or disagree	4	
	CM Service				
6	The consultant had adequate means to control the costs of the project		Somewhat agree	5	
7	The consultant had adequate means to control the progress of the contractor		Somewhat agree	5	
8	The consultant had adequate means to control the quality of work		Somewhat agree	5	
9	The consultant had adequate means to supervise the safety on site		Somewhat agree	5	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs		Agree	6	

Client 2

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Strongly agree	7	
B	The consultant is responsible for the contractor's actions and performances	Strongly agree	7	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Agree	6	Depends on cause of risk which should be jointly discussed and agreed upon
D	The consultant is obligated to deliver the project within budget	Strongly agree	7	
E	The consultant is obligated to deliver the project within time	Strongly agree	7	
F	The consultant is obligated to deliver the project within the desired quality	Strongly agree	7	
G	The consultant is obligated to deliver the project without any Lost Time	Strongly agree	7	
H	The consultant is obligated to deliver the project with a start-up production as	Strongly agree	7	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Strongly agree	7	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	
2	Employees of the consultant should understand the specific needs of the client	Strongly agree	7	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	
4	The level of teamwork quality between the consultant and client should be high	Strongly agree	7	
5	The level of teamwork quality between the consultant and contractor should be high	Strongly agree	7	

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors		Somewhat agree	5	
B	The consultant took responsibility for the contractor's actions and performances		Strongly disagree	1	This was one big gap that didn't go well with the project
C	Risk of project exceedance (cost, time, quality) was at the consultant's		Disagree	2	Consultant was reluctant to take risk as
	Project performance				
D	Budget	Costs were 1-10% more than estimated	n.a.	1	
E	Planning	Duration was 11-20% more than estimated	n.a.	0.5	
F	Quality	Most of all requirements were met	n.a.	1	
G	Safety	0 Lost Time Incidents	n.a.	1	
H	Start-up production	> 80% of the planned production achieved during start-up	n.a.	1	
I	Satisfaction	Satisfied	n.a.	1	
	Additional data				
1	Roles and responsibilities were clear prior to the project		Strongly disagree	1	
2	Employees of the consultant understood the specific needs of the client		Somewhat agree	5	The remote PM and Rotterdam team were mostly aligned on the specific needs but most times team on site are not synched in like manner
3	The consultant performed CM activities pro-actively, and not only when problems occured		Neither agree or disagree	4	There were lots of cases where on-site management was not proactive as expected
4	The level of teamwork quality between the consultant and client was high		Agree	6	
5	The level of teamwork quality between the consultant and contractor was high		Somewhat disagre	3	There was mostly a blaming culture from the consultant to the contractor and that affected work pace / collaboration on site which affected schedule
	CM Service				
6	The consultant had adequate means to control the costs of the project		Strongly agree	7	
7	The consultant had adequate means to control the progress of the contractor		Agree	6	
8	The consultant had adequate means to control the quality of work		Somewhat agree	5	
9	The consultant had adequate means to supervise the safety on site		Strongly agree	7	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs		Agree	6	

Client 3

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Strongly agree	7	
B	The consultant is responsible for the contractor's actions and performances	Neither agree or disagree	4	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Neither agree or disagree	4	
D	The consultant is obligated to deliver the project within budget	Neither agree or disagree	4	
E	The consultant is obligated to deliver the project within time	Strongly agree	7	
F	The consultant is obligated to deliver the project within the desired quality	Strongly agree	7	
G	The consultant is obligated to deliver the project without any Lost Time Incidents (LTI's)	Neither agree or disagree	4	
H	The consultant is obligated to deliver the project with a start-up production as expected	Neither agree or disagree	4	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Agree	6	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Agree	6	
2	Employees of the consultant should understand the specific needs of the client	Strongly agree	7	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	
4	The level of teamwork quality between the consultant and client should be high	Agree	6	
5	The level of teamwork quality between the consultant and contractor should be high	Agree	6	

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors		Strongly disagree	1	
B	The consultant took responsibility for the contractor's actions and performances		Disagree	2	
C	Risk of project exceedance (cost, time, quality) was at the consultant's		Strongly disagree	1	
	Project performance				
D	Budget	Costs were over 20% more than estimated	n.a.	0	
E	Planning	Duration was over 20% more than estimated	n.a.	0	
F	Quality	Half of the requirements were met	n.a.	0.5	
G	Safety	0 Lost Time Incidents	n.a.	1	
H	Start-up production	< 50% of the planned production achieved during start-up	n.a.	0	
I	Satisfaction	Not completely satisfied	n.a.	0.5	
	Additional data				
1	Roles and responsibilities were clear prior to the project		Agree	6	
2	Employees of the consultant understood the specific needs of the client		Somewhat disagree	3	
3	The consultant performed CM activities pro-actively, and not only when problems occured		Disagree	2	
4	The level of teamwork quality between the consultant and client was high		Somewhat agree	5	
5	The level of teamwork quality between the consultant and contractor was high		Strongly disagree	1	
	CM Service				
6	The consultant had adequate means to control the costs of the project		Neither agree or disagree	4	
7	The consultant had adequate means to control the progress of the contractor		Strongly disagree	1	
8	The consultant had adequate means to control the quality of work		Disagree	2	
9	The consultant had adequate means to supervise the safety on site		Strongly disagree	1	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs		Strongly disagree	1	

Client 4

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Somewhat agree	5	
B	The consultant is responsible for the contractor's actions and performances	Agree	6	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Agree	6	
D	The consultant is obligated to deliver the project within budget	Agree	6	
E	The consultant is obligated to deliver the project within time	Agree	6	
F	The consultant is obligated to deliver the project within the desired quality	Agree	6	
G	The consultant is obligated to deliver the project without any Lost Time Incidents	Agree	6	
H	The consultant is obligated to deliver the project with a start-up production as expected	Agree	6	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Agree	6	end risk always stays with owner, overall cost due to time overrun will
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	
2	Employees of the consultant should understand the specific needs of the client	Agree	6	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Agree	6	
4	The level of teamwork quality between the consultant and client should be high	Agree	6	
5	The level of teamwork quality between the consultant and contractor should be high	Agree	6	

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors		Agree	6	
B	The consultant took responsibility for the contractor's actions and performances		Somewhat agree	5	
C	Risk of project exceedance (cost, time, quality) was at the consultant's		Strongly disagree	1	
	Project performance				
D	Budget	Costs were over 20% more than estimated	n.a.	0	
E	Planning	Duration was over 20% more than estimated	n.a.	0	
F	Quality	Most of all requirements were met	n.a.	1	
G	Safety	0 Lost Time Incidents	n.a.	1	
H	Start-up production	> 80% of the planned production achieved during start-up	n.a.	1	
I	Satisfaction	Satisfied	n.a.	1	
	Additional data				
1	Roles and responsibilities were clear prior to the project		Somewhat agree	5	
2	Employees of the consultant understood the specific needs of the client		Somewhat agree	5	
3	The consultant performed CM activities pro-actively, and not only when problems occured		Agree	6	
4	The level of teamwork quality between the consultant and client was high		Somewhat agree	5	
5	The level of teamwork quality between the consultant and contractor was high		Somewhat agree	5	
	CM Service				
6	The consultant had adequate means to control the costs of the project		Disagree	2	
7	The consultant had adequate means to control the progress of the contractor		Somewhat agree	5	was a joint effort between client and
8	The consultant had adequate means to control the quality of work		Agree	6	
9	The consultant had adequate means to supervise the safety on site		Strongly agree	7	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs		Agree	6	

Client 5

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant should be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Agree	6	
B	The consultant is responsible for the contractor's actions and performances	Agree	6	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Somewhat agree	5	It is preferable for the consultant to provide with a lumpsum agreement.
D	The consultant is obligated to deliver the project within budget	Agree	6	
E	The consultant is obligated to deliver the project within time	Agree	6	
F	The consultant is obligated to deliver the project within the desired quality	Agree	6	
G	The consultant is obligated to deliver the project without any Lost Time Incidents (LTI's)	Agree	6	Leading actions / preventive measures are the key to deliver a project without LTI. Incentive schemes to achieve LTI free projects may not be part of the teams objectives.
H	The consultant is obligated to deliver the project with a start-up production as expected	Neither agree or disagree	4	In Nestlé projects it is the Nestlé team that is responsible and leading the start-up of the plant. The consultant needs to make sure that all preliminary requirements, in their scope, have been fullfilled. I.e. Civil completion, MEP
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Somewhat agree	5	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Somewhat agree	5	In projects where client project team is on site and finalizing designs a certain level of dynamics is to be expected.
2	Employees of the consultant should understand the specific needs of the client	Somewhat agree	5	More improtant for project manager / construction manager
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	CM has to be able to understand client requirements and work jointly
4	The level of teamwork quality between the consultant and client should be high	Strongly agree	7	
5	The level of teamwork quality between the consultant and contractor should be high	Strongly agree	7	

PERCEPTION AFTER THE PROJECT					
	Statement		**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability				
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors		Agree	6	Frequent allignment between Nestlé and consultant were required due to
B	The consultant took responsibility for the contractor's actions and performances		Agree	6	
C	Risk of project exceedance (cost, time, quality) was at the consultant's		Agree	6	Variations in fees were addressed
	Project performance				
D	Budget	Costs were 11-20% more than estimated	n.a.	0.5	
E	Planning	Similar to estimate	n.a.	1	
F	Quality	Most of all requirements were met	n.a.	1	
G	Safety	0 Lost Time Incidents	n.a.	1	
H	Start-up production	> 80% of the planned production achieved during start-up	n.a.	1	
I	Satisfaction	Satisfied	n.a.	1	
	Additional data				
1	Roles and responsibilities were clear prior to the project		Somewhat agree	5	
2	Employees of the consultant understood the specific needs of the client		Somewhat agree	5	
3	The consultant performed CM activities pro-actively, and not only when problems occured		Neither agree or disagree	4	
4	The level of teamwork quality between the consultant and client was high		Somewhat agree	5	
5	The level of teamwork quality between the consultant and contractor was high		Somewhat agree	5	
	CM Service				
6	The consultant had adequate means to control the costs of the project		Somewhat agree	5	
7	The consultant had adequate means to control the progress of the contractor		Somewhat agree	5	
8	The consultant had adequate means to control the quality of work		Somewhat agree	5	
9	The consultant had adequate means to supervise the safety on site		Agree	6	Very strong leadership from consultants safety team
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs		Somewhat agree	5	

Consultant 1

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant is be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Agree	6	
B	The consultant is responsible for the contractor's actions and performances	Strongly disagree	1	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Strongly disagree	1	
D	The consultant is obligated to deliver the project within budget	Somewhat disagree	3	
E	The consultant is obligated to deliver the project within time	Somewhat disagree	3	
F	The consultant is obligated to deliver the project within the desired quality	Somewhat disagree	3	
G	The consultant is obligated to deliver the project without any Lost Time	Somewhat disagree	3	
H	The consultant is obligated to deliver the project with a start-up production as	Somewhat disagree	3	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Somewhat disagree	3	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	
2	Employees of the consultant should understand the specific needs of the client	Agree	6	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	
4	The level of teamwork quality between the consultant and client should be high	Neither agree or disa	4	
5	The level of teamwork quality between the consultant and contractor should be high	Somewhat disagree	3	
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT				
	Statement	**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors	Agree	6	
B	The consultant took responsibility for the contractor's actions and	Somewhat disagree	3	
C	Risk of project exceedance (cost, time, quality) was at the consultant's	Disagree	2	
	Additional data			
1	Roles and responsibilities were clear prior to the project	Agree	6	
2	Employees of the consultant understood the specific needs of the client	Agree	6	
3	The consultant performed CM activities pro-actively, and not only when	Agree	6	
4	The level of teamwork quality between the consultant and client was high	Agree	6	
5	The level of teamwork quality between the consultant and contractor was high	Agree	6	
	CM Service			
6	The consultant had adequate means to control the costs of the project	Disagree	2	
7	The consultant had adequate means to control the progress of the contractor	Disagree	2	
8	The consultant had adequate means to control the quality of work	Disagree	2	
9	The consultant had adequate means to supervise the safety on site	Disagree	2	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs	Agree	6	
	Where there any additional factors which affected the CM service in your experience?			

Consultant 2

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant is be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Strongly agree	7	
B	The consultant is responsible for the contractor's actions and performances	Strongly agree	7	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Strongly agree	7	
D	The consultant is obligated to deliver the project within budget	Strongly agree	7	
E	The consultant is obligated to deliver the project within time	Strongly agree	7	
F	The consultant is obligated to deliver the project within the desired quality	Strongly agree	7	
G	The consultant is obligated to deliver the project without any Lost Time	Strongly agree	7	
H	The consultant is obligated to deliver the project with a start-up production as	Strongly agree	7	
I	The consultant is obligated to deliver the project with a high overall satisfaction	Strongly agree	7	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	
2	Employees of the consultant should understand the specific needs of the client	Strongly agree	7	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Strongly agree	7	
4	The level of teamwork quality between the consultant and client should be high	Strongly agree	7	
5	The level of teamwork quality between the consultant and contractor should be high	Strongly agree	7	
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT				
	Statement	**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors	Agree	6	
B	The consultant took responsibility for the contractor's actions and performances	Agree	6	
C	Risk of project exceedance (cost, time, quality) was at the consultant's	Neither agree or disagree	4	PG would have liked RHDHV to take more contractual risk
	Additional data			
1	Roles and responsibilities were clear prior to the project	Agree	6	
2	Employees of the consultant understood the specific needs of the client	Agree	6	
3	The consultant performed CM activities pro-actively, and not only when problems occured	Somewhat agree	5	Client expressed concerns on pro-activeness of site supervision (mainly Civil)
4	The level of teamwork quality between the consultant and client was high	Somewhat agree	5	on site this could have been better
5	The level of teamwork quality between the consultant and contractor was high	Somewhat agree	5	on site this could have been better
	CM Service			
6	The consultant had adequate means to control the costs of the project	Strongly agree	7	PG was very satisfied with RHDHV cost management
7	The consultant had adequate means to control the progress of the contractor	Somewhat agree	5	could have been better
8	The consultant had adequate means to control the quality of work	Somewhat agree	5	good procedure, but some supervisor lacked experience
9	The consultant had adequate means to supervise the safety on site	Strongly agree	7	PG was very happy with Safety Supervision on the project
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs	Agree	6	Some point of improvement
	Where there any additional factors which affected the CM service in your experience?			

Consultant 3

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant is be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Neither agree or disagree	4	Not all contractors on site. Coordination of the equipment / utilities contractors was the responsibility of Heineken. RHDHV was responsible for the "civil" contractors
B	The consultant is responsible for the contractor's actions and performances	Disagree	2	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Disagree	2	
D	The consultant is obligated to deliver the project within budget	Neither agree or disagree	4	Depending what the cost overuns are. Some can be out of the consultants control
E	The consultant is obligated to deliver the project within time	Neither agree or disagree	4	Same as above
F	The consultant is obligated to deliver the project within the desired quality	Strongly agree	7	Only for the "civil" scope yes
G	The consultant is obligated to deliver the project without any Lost Time	Agree	6	
H	The consultant is obligated to deliver the project with a start-up production as	Disagree	2	Not in RHDHV scope
I	The consultant is obligated to deliver the project with a high overall satisfaction	Strongly agree	7	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	
2	Employees of the consultant should understand the specific needs of the client	Strongly agree	7	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Agree	6	
4	The level of teamwork quality between the consultant and client should be high	Strongly agree	7	
5	The level of teamwork quality between the consultant and contractor should be high	Strongly agree	7	
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT				
	Statement	**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors	Somewhat disagree	3	
B	The consultant took responsibility for the contractor's actions and	Disagree	2	
C	Risk of project exceedance (cost, time, quality) was at the consultant's	Disagree	2	
	Additional data			
1	Roles and responsibilities were clear prior to the project	Agree	6	
2	Employees of the consultant understood the specific needs of the client	Disagree	2	
3	The consultant performed CM activities pro-actively, and not only when problems occured	Strongly disagree	1	This was the biggest issue for the client. The CM team didn't have a pro-active attitude.
4	The level of teamwork quality between the consultant and client was high	Neither agree or disagree	4	
5	The level of teamwork quality between the consultant and contractor was high	Somewhat agree	5	
	CM Service			
6	The consultant had adequate means to control the costs of the project	Somewhat agree	5	
7	The consultant had adequate means to control the progress of the contractor	Somewhat disagree	3	
8	The consultant had adequate means to control the quality of work	Somewhat disagree	3	
9	The consultant had adequate means to supervise the safety on site	Strongly disagree	1	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs	Somewhat disagree	3	Client was not satisfied by the CM services (see CSS and project evaluation)
	Where there any additional factors which affected the CM service in your			

Consultant 4

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant is be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Agree	6	
B	The consultant is responsible for the contractor's actions and performances	Somewhat agree	5	
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Agree	6	
D	The consultant is obligated to deliver the project within budget	Somewhat agree	5	
E	The consultant is obligated to deliver the project within time	Somewhat agree	5	
F	The consultant is obligated to deliver the project within the desired quality	Agree	6	
G	The consultant is obligated to deliver the project without any Lost Time	Neither agree or disa	4	
H	The consultant is obligated to deliver the project with a start-up production as expected	Neither agree or disa	4	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Agree	6	
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Agree	6	
2	Employees of the consultant should understand the specific needs of the client	Agree	6	
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Agree	6	
4	The level of teamwork quality between the consultant and client should be high	Agree	6	
5	The level of teamwork quality between the consultant and contractor should be high	Agree	6	
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT				
	Statement	**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors	Somewhat agree	5	
B	The consultant took responsibility for the contractor's actions and	Somewhat disagree	3	
C	Risk of project exceedance (cost, time, quality) was at the consultant's	Disagree	2	
	Additional data			
1	Roles and responsibilities were clear prior to the project	Neither agree or disagree	4	
2	Employees of the consultant understood the specific needs of the client	Neither agree or disagree	4	
3	The consultant performed CM activities pro-actively, and not only when problems occured	Neither agree or disagree	4	
4	The level of teamwork quality between the consultant and client was high	Somewhat agree	5	
5	The level of teamwork quality between the consultant and contractor was high	Somewhat agree	5	
	CM Service			
6	The consultant had adequate means to control the costs of the project	Somewhat disagree	3	
7	The consultant had adequate means to control the progress of the contractor	Neither agree or disagree	4	
8	The consultant had adequate means to control the quality of work	Neither agree or disagree	4	
9	The consultant had adequate means to supervise the safety on site	Agree	6	
10	The quality of the CM services provided by the Engineering Consultant satisfies my needs	Neither agree or disagree	4	
	Where there any additional factors which affected the CM service in your			

Consultant 5

EXPECTATIONS PRIOR TO THE PROJECT				
	Statement	**Expectation**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant is be responsible for overall management, supervision, and co-ordination of all construction activities and contractors and be capable to do so	Somewhat disagree	3	Depends on the scope. I still have to see the first project where we are involved in all construction activities
B	The consultant is responsible for the contractor's actions and performances	Strongly disagree	1	Depends on too many factors. Who has chosen the contractor, when has the contractor been chosen, etc. some contractors are simply not capable of doing the job right with or without support
C	Risk of project exceedance (cost, time, quality) should be at the consultant's	Strongly disagree	1	Depends on contract and remuneration package
D	The consultant is obligated to deliver the project within budget	Somewhat agree	5	
E	The consultant is obligated to deliver the project within time	Neither agree or disagree	4	
F	The consultant is obligated to deliver the project within the desired quality	Neither agree or disagree	4	
G	The consultant is obligated to deliver the project without any Lost Time Incidents (LTI's)	Neither agree or disagree	4	
H	The consultant is obligated to deliver the project with a start-up production as expected	Neither agree or disagree	4	
I	The consultant is obligated to deliver the project with a high overall satisfaction of the client	Agree	6	satisfaction related to scope of services can be something else than project success
	Additional data			
1	Roles and responsibilities should be clear prior to the project	Strongly agree	7	This applies for both teams (client side and consultant side)
2	Employees of the consultant should understand the specific needs of the client	Somewhat agree	5	Differs per level in the project organization
3	The consultant should perform Construction Management pro-actively, and not only when problems occur (reactive)	Agree	6	
4	The level of teamwork quality between the consultant and client should be high	Agree	6	
5	The level of teamwork quality between the consultant and contractor should be high	Agree	6	Conflict of liability exists when the consultant is leading
	Where there any additional factors which reflect your expectations of the CM service by an Engineering Consultant?			

PERCEPTION AFTER THE PROJECT				
	Statement	**Perception**	**Score**	**Comments**
	Roles, Responsibility and Accountability			
A	The consultant was capable enough to manage, supervise, and co-ordinate all construction activities and contractors	Agree	6	
B	The consultant took responsibility for the contractor's actions and performances	Disagree	2	Maybe according to the client, however we have no contractual obligation nor tools, meanse to do so
C	Risk of project exceedance (cost, time, quality) was at the consultant's	Disagree	2	Maybe according to the client, however we have no contractual obligation nor tools, meanse to do so
	Additional data			
1	Roles and responsibilities were clear prior to the project	Somewhat agree	5	
2	Employees of the consultant understood the specific needs of the client	Agree	6	
3	The consultant performed CM activities pro-actively, and not only when problems occured	Strongly disagree	1	
4	The level of teamwork quality between the consultant and client was high	Agree	6	
5	The level of teamwork quality between the consultant and contractor was high	Agree	6	
	CM Service			
6	The consultant had adequate means to control the costs of the project	Agree	6	within our contractual scope
7	The consultant had adequate means to control the progress of the contractor	Agree	6	
8	The consultant had adequate means to control the quality of work	Agree	6	
9	The consultant had adequate means to supervise the safety on site	Agree	6	
10	The quality of the CM services provided by the Engineering Consultant satisfies	Agree	6	
	Where there any additional factors which affected the CM service in your			

Appendix E. Cross case table

Misalignment					
Aspect	**Case 1**	**Case 2**	**Case 3**	**Case 4**	**Case 5**
Project success	Yes (6)	Yes (5,5)	No (3,0)	No (4,0)	Yes (5,5)
Expectation client	Consultant's trained personnel, instead of hired. CM free of risk.	Pro-active managing. Forming one team with the contractor. The client should lie back on all outsourced activities.	Unburdening the client by managing the contractors.	Managing planning, quality and safety. Budget control was not part of the scope.	Steering role, not just a representative. Putting pressure on contractor. Taking ownership regarding time delay.
Offered by consultant	Supervision of a local contractor in order to 'upgrade' his performances.	Pro-active role, monitoring contractor, taking ownership. Remuneration based on initial mile stone planning	Acting on behalf of client. Checking if contractor builds according contract.	Responsible for CM and supervision without accountability. FIDIC white	Independent role between client and contractor. Site supervision, not CM. No accountability. FIDIC white
CM perceived by Client as	- Highly involved and committed site team. client. Consultant felt 'backed' by client, making full use of each other's competences.	- Impressed by budget managing - Not pro-active on planning - Blaming culture instead of 1 team regarding planning and quality.			Effective safety management. Planning and budget could have been tighter and stricter
Settlement	No	Discount, since client felt time delay was also due to the consultant.	Discount	Discount	Discount
Causes for misalignment					
Aspect	**Case 1**	**Case 2**	**Case 3**	**Case 4**	**Case 5**
Client	Positive past experience		Positive past experience		Positive past experience
Consultant	CM not concretely formulated	Not understanding client's needs	- CM not concretely formulated. - No CM Plan		CM not concretely formulated
Client – Consultant overlap		Roles and responsibilities were expressed with a RACI matrix	No alignment session prior project	No alignment session prior project	No alignment session prior project
	Roles and responsibilities	Roles and responsibilities	Roles and responsibilities	Roles and responsibilities	Roles and responsibilities

	were somewhat clear	were not clear	were clear to the client	were somewhat clear	were somewhat clear
	The client believes the consultant understood his specific needs	The client believes the consultant somewhat understood his specific needs	The client believes the consultant did not completely understood his specific needs	The client believes the consultant somewhat understood his specific needs	The client believes the consultant somewhat understood his specific needs
Limitations					
Aspect	**Case 1**	**Case 2**	**Case 3**	**Case 4**	**Case 5**
Control on contractor	- CM feels like monitoring sometimes; consultant feels low control on progress, cost, quality and safety.	- Little control over contractor since the client did not allow the consultant to use penalties.	-Little control over contractor; he ignored reports for repair. Due to the overheated construction market the contractor felt no commitment for the project. Also, the client was not willing to penalize or replace the contractor. Only bid within the client's budget was not favourable.	- Little control over contractor	- Little control over contractor
Pro-active CM	CM was pro-active according to the client	CM was somewhere between reactive and pro-active	CM was not pro-active according to the client - Consultant's site team missed a pro-active mentality, especially on planning.	CM was pro-active according to the client	CM was somewhere between reactive and pro-active
Teamwork consultant – client	- Good teamwork between consultant and client. Frequent open communication, warning the client rather than informing. Small client's site team: a representative and installations	Good teamwork between consultant and client. Large consultant's on-site team	- Poor communication and teamwork between client and consultant. Consultant's team was not mirrored to client's, not performing as one team.	Somewhat good teamwork between consultant and client	Somewhat good teamwork between consultant and client

	manager.				
Teamwork consultant-contractor	No remarkable comments.	Somewhat poor teamwork between consultant and contractor	Poor teamwork between consultant and contractor	Somewhat good teamwork between consultant and contractor	Somewhat good teamwork between consultant and contractor
Additional observations	- Difficulty in finding the right person on the job therefore hiring external employees. - Right person on the job. - Client thinks lessons learned by consultant are not implemented.	- CM was replaced by the consultant after client dissatisfaction regarding his lack of pro-activeness - The consultant does not feel fully incentivized to deliver the project in time. Contractually no bonus/ penalty system was implemented. - Prior to the project the consultant tries to accept uncomfortable project characteristics without losing margins and freedom.	- Local CM was not the right person on the job, an expat was installed on site later in the project. - The consultant is blamed for not critically reviewing contractor's planning and managing it during construction.		


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