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IMPROVEMENT OF E&P PROJECT OUTCOMES

FROM A NOP PERSPECTIVE

A Qualitative Study conducted on Project Improvements for a Non-Operating Partner and E&P Operators

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Acknowledgment

I started research on this thesis in July 2015. In the following year that I worked on this paper, I gained a lot of knowledge about how management practice is conducted in real life. However, I am pleased that I have reached the end of this thesis and can close this chapter of my life and begin a new one.

This master thesis was a challenge that I started with a lot of enthusiasm, followed by some difficulties. I managed to tackles those problems and gain insight on using the q-sort method and achieved a final result I am satisfied with. Going through the different phases of this thesis was made a bit easier by the people that helped me finish it.

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Farid Seyedullah 28th October, 2016.

Summary

A lot of research is available on the use of Critical Success Factors (CSFs) that contribute to project success for the company executing a project (henceforth the operator). Despite the known relationships between project outcomes and steering CSFs, for example, between cost performance and Front-End Loading, many projects still fail to meet agreed upon targets. Another feature that many projects have, for a variety of reasons, is several owners. This master thesis researches how the other owners (henceforth the non-operator) can apply CSFs to improve project outcomes. The literature research revealed that there is lack of research that specifically looks at the use of the CSFs from the point of view of a Non-Operating Partner (NOP). This thesis is written with a focus on EBN, because EBN supported this research and made the necessary data available.

There is one research goal formulated for this thesis: recognition of CSFs with which to steer and evaluate (front-end) projects for an NOP. With this research goal, the following main research question is formulated: "How can a non-operating partner influence a project towards successful performance?”

To answer the main research question, the following four sub questions are formulated:
1) What are the roles and influence of EBN and that of an operator in a joint venture?
2) What is a project success for a non-operating partner?
3) What are the important CSFs for a non-operating partner to steer a project?
4) In which phase do the identified CSFs have the biggest impact?

The main research method consists of a literature review and project analysis, followed by the Q-methodology and two case studies. The complete analysis and the case studies can be found in the appendix B to E. The Q-methodology was chosen due to the lack of data for statistical research. The relevance of this study lies in researching the use of the CSFs from the viewpoint of an NOP, which is lacking in the current research.

From the literature review an array of known CSFs are derived. The CSFs are divided into several major critical success factor domains, including common investment objectives, targets, scope, execution, external, and project organization. On each of these domains, 34 CSFs are distributed.

The project analysis was conducted on all recent large projects EBN was involved in with the operators for the last few years. In total, 25 projects are analysed. From this analysis, arrays of 18 applied CSFs are derived. These 18 CSFs from the projects are compared with the known CSFs from the literature and combined into one complete table; CSFs from the project analysis that were mentioned before in literature were removed.

When the Q-set is completed a Q-analysis is performed with 13 interviewees, both employees of EBN and operators. From that analysis, three perspectives are derived. A perspective in this thesis means what kind of attitude the interviewee had regarding completing a project successfully and what was their point of view on the factors that contribute to successful project. The perspectives found are:

-Perspective 1: Control the project (focus on execution phase).
-Perspective 2: Front-end development (focus on identify and select phase).
-Perspective 3: People are key (focus on the develop and execution phase).

From these perspectives, the following 4 CSFs are derived that a non-operating partner can use to steer a project towards a success.

CSF's
Project understanding
Project definition quality
Realistic project schedule and plan
Resources planning

Table S.1: CSF's that a non-operating partner can use.

Once these perspectives are formulated, the last step of this thesis is to conduct case studies to discover where these factors can be used. From the case studies, it can be concluded that when the CSFs are used in the beginning of the project, the involvement of EBN positively impacted the end result. The timely use of the CSFs, that is, the early involvement of EBN in project life, is of crucial importance. Therefore, a non-operating partner can influence the project towards good performance by using the CSFs that are derived here with the help of the three perspectives. Being actively involved from the beginning, preferably from the early part of phase two (often called the concept selection phase). The choices made in the first phases of project have a big influence on the project end result. Due to the difficulty and high cost of changing the project planning in later phases.

Contents

1 Introduction

1.1 Background

The global demand for oil and gas is still growing, and the demand for the future is predicted to be higher than in previous years (IEA, 2015). In the Netherlands, the demand for hydrocarbon-based fuel will remain constant for a long time, with a slight decrease in energy consumption of approximately 1% in 2030, as predicted by National Energy Outlook in 2014. As production from current fields declines over time, production levels will be sustained by investing in new wells and new platforms. This leads to an array of projects that needs to be finished on time and within budget. In addition, the array of projects needs to meet the quality (production and safety) norms. Unfortunately not every project is a success story; many of them—almost 40% according to one study (McKenna, Wilczynski, & VanderSchee, 2006)—end in cost overruns, or are not finished on time, and the quality of some of the projects is far from desirable. According to another study by Ernst and Young (2014), this percentage is even higher. Evidence suggests that in 2014, 70% of the projects were delayed with cost overruns (Ernst & Yong, 2014). However, it needs to be kept in mind that the study of Ernst and Yong mainly focussed on large projects.

Prior to the realization of a new oil and gas development, many processes are undertaken before the first drill touches the ground. Each process includes a mix and workflow of different kinds of disciplines that works together or at least try to work together, as well as possible. How those processes are defined and shaped and how they influence the end result is regarded differently by many researchers of E&P projects. In this thesis, the role of a non-operating partner (NOP) is the main leading point. How the NOP deals with the project and how it can influence the process to come up with a more satisfying end result are interesting questions. The answer will not be easy to find, because the primary subject of research and scientific literature on project performance is the operator that does the drilling and producing, not the NOP.

The NOP in this thesis is Energie Beheer Nederland B.V. (EBN). This state-owned company finances typically 40% of gas and oil exploration and production (E&P) projects in the Netherlands (EBN, 2014). Due to the large investment in concurrent projects that EBN is involved in, the necessity to have a good predictable financial planning is evident; if one project has large cost overruns, it can use up the money and resources needed for other projects. Also, lately lower oil and gas prices have increased the pressure to improve the efficiency of investment projects.

Not every type of project has the same risk of having delays or cost overruns. Large projects are inherently more fragile, as they are more sensitive to the quality of practices and are more difficult to manage because of their complexity than their simpler and smaller counterparts. Merrow (2011a) found that around 65% of major E&P projects around the world fail, and a key factor for these poor results is the level of definition achieved at the front-end loading (FEL) stage (Merrow, 2011a). Poor definition makes projects prone to changes during construction when project costs are highest. van der Weijde (2008) confirmed the importance of FEL for a batch of smaller projects executed by Shell (by far the largest operator in the Netherlands). However, while FEL is the most important factor according to previously quoted researchers, it is not the only factor that influences performance; van der Weijde found that the integration of team members and value improving practices are also critical success factors (CSF).

R. Arkesteijn's (2009) study on project success found other CSFs. He researched CSFs that focussed on communication, project management, surroundings, safety, health and environment (SHE), teams and technology.

1.2 Project Role of EBN and that of Operators

1.2.1 EBN

This thesis focusses on EBN, because EBN supported this research and made data available (and through the help of EBN operators active in the Dutch E&P sector made data available). Therefore, the problem formulation is based on the point of view of this company and the company's primary partners, the Dutch E&P operators. General information was gathered internally at EBN first to gain insight into the role of EBN and that of the operators and second to compose the problem statement.

EBN B.V. is a fully state-owned organization. However, its governance is not affiliated with the state and it therefore acts in an independent manner. EBN is actively involved in searching, producing, storing and distributing gas and oil. This company is managed by the Ministry of Economic Affairs, which is also responsible for the policy department (EBN, 2014).

EBN aims to maximize the profit from the oil and gas exploration for the Netherlands in a safe and environmental friendly way. The profits from the organization, as in many other companies, are paid as dividends to its shareholders. By law, EBN's activities are limited and the company cannot act as an operator or permit holder in projects, and it typically does not start an initiative in the execution of project activities. It does actively share knowledge where possible on the (deep) underground and facilitates project activities. This is done by investing between 40-50% of the total budget in the projects (EBN, 2014).

EBN is also tasked with advising the Ministry of Economic Affairs about the mining climate in the Netherlands. Its main tasks involve stimulating activities in the field of exploration, development and production through national and international oil and gas companies. The interests of EBN do not only involve oil and gas activities, but also gas collector pipes in the sea, underground gas storages on land and an interest of 40% in Gas Terra B.V., a wholesale company in natural gas. EBN's profits are delivered to the Dutch state. The incomes and taxes that EBN delivers comprise almost half of all state gas benefits, which is one of the most important income sources for the Dutch state (EBN, 2014). The importance of knowledge of activities and societal acceptance for natural gas projects is another of EBN's focus points.

In conclusion, the main targets EBN strives for are:

- To actively govern the participations in exploration and production activities.
- To ensure profitable use of underground resources.
- To ensure E&P continuity over a period of 30+ years.

1.2.2 Operators

As previously mentioned, EBN is a non-operating partner. This menas that the work in the field, for example the drilling and extracting, is not performed by EBN but by another company, the operator. The operator and EBN sign a "Overeenkomst van Samenwerking" (OvS) or "Joint Operating Agreement" (JOA). This JOA forms the basic legal framework between EBN and the operator. The number of JOAs is large—around 185 (EBN, 2015). EBN partners with just four operators (see Figure 1) that are responsible for 80% of the production. Of these four, NAM, by far the largest operator in the Netherlands, has more than 50% of potential production (EBN, 2015).

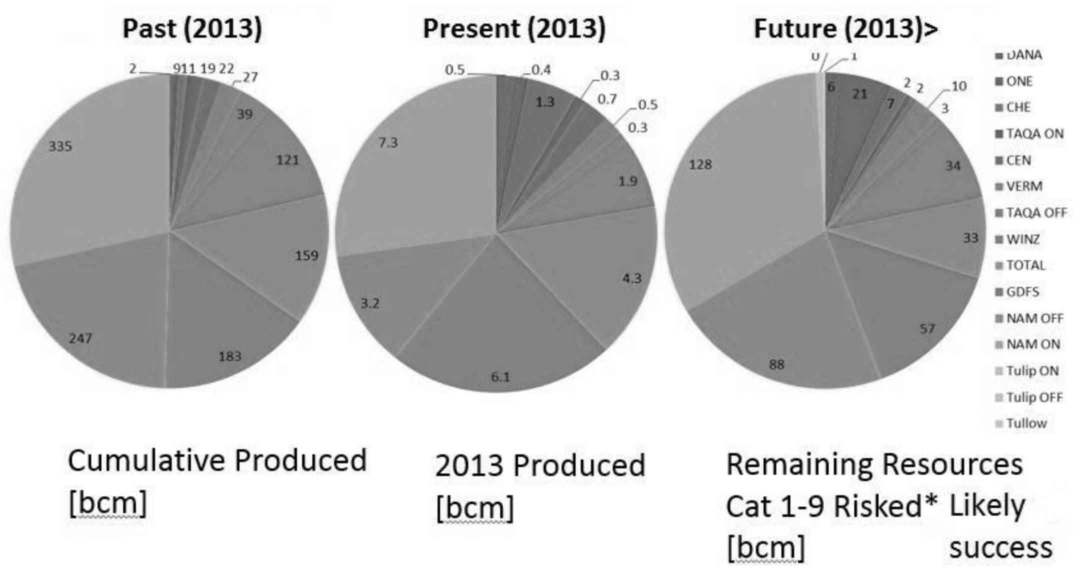

Figure 1: Gas production and potential by operator (EBN, 2015).

Figure 2 shows all the phases of a project. EBN is typically involved in all these phases.

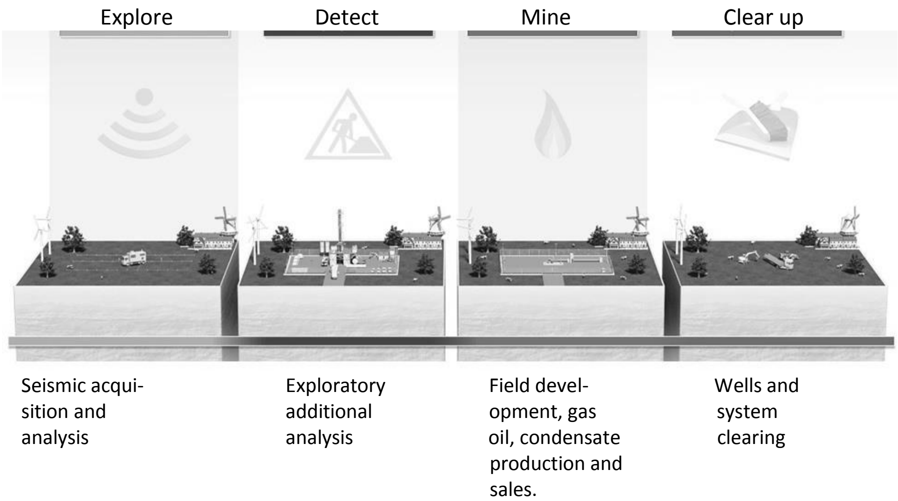

Figure 2: Exploration and production phases in a license (EBN, 2015).

The main role of the operators can be divided into four major phases. Phase one consist of exploring the underground by seismic acquisition and analysis. Phase two involves detecting hydrocarbon fuels by conducting exploratory analysis. Phase three involves field development and production. The last phase is decommissioning and removal. The operators plan and perform project management with the intention of performing the physical activities. In addition, the operator has the responsibility for safety on site, environmental issues like earthquakes and leakages and damages as a direct consequence of its activities. Also, the operator typically has the largest stake in costs and profits.

If an operator has detected the presence of hydrocarbon fuel in a specific place and wants to extract it, the operator needs to ask investors and EBN for approval due to shared investment costs and revenues. For example, the operator in charge delivers the Well Proposal, a document containing technical, geological and economic information regarding a project. Another document is also delivered, an Authorization for Expenditure (AFE) request. This document contains a detailed cost description. This information is used by the non-operating partners, including EBN, in the economic analysis to whether if the project is sufficiently profitable to approve.

EBN will evaluate a project with its own evaluation method, which distinguishes between projects in terms of investment size. If the investment of the project is larger than €50 million, it needs to undergo a peer review. When necessity arises, EBN makes an exception and uses peer review for smaller complex or critical projects, but this does not happen very frequently. Typically, one of the three asset managers determines the level of security required to evaluate a new capital investment project and determines which subject matter experts from the other departments will be needed. The asset managers (AMs) holistically look at investment opportunities and give approval at certain stages, taking into consideration the overall asset development and the evaluation results of the subject matter experts. Experts from the Technical Department (TD) assess the technical feasibility and risks of a new development and evaluate and adjust (for example geological) parameters that are given by the operator if needed. Other departments of EBN also have their own input; the Commercial Department (CD) is involved with issues concerning the price estimates and the Legal Department (LD) gives advice on law and regulations. After the evaluation of the technical parameters with the subsequent investment risk profile, the assessment is passed on to the Business Control Department, which also plays a major role. This department calculates the economic analysis to see whether the project is cost effective. The end result of the economic analysis is summarized within a Final Investment Approval Form. This document consists of a summary of information that is needed for management to make the final decision to proceed with the capital investment. If EBN invests, the company will have a claim on the profit equivalent to the percentage of money that is invested in the project; typically, 40-50%. The involvement of EBN in all of these phases is shown in Table 1 (EBN, 2014).

Department	Explore	Detect	Mine	Clear up
Asset management	←	—	—	→
TD Asset support	←	—	—	→
Business Control	←	—	—	→
TD Exploration	←	→		
TD Production & Infrastructure		←	—	→
Commercial Department		←	→	
Accounting & Reporting	←	—	—	→
Communication & Public affairs	←	—	—	→
ICT	←	—	—	→
Legal	←	—	—	→
Treasury	←	—	—	→

Table 1: Involvement of EBN departments by project-phase (EBN, 2015).

1.2.3 Current situation for E&P Operators

It is also important to know what the operators do to achieve success. Due to involvement of EBN in many different projects with different operators, an overview of the approaches that the operators use could be collected. The figure below gives three approaches of different operators. For privacy reasons, the names are made anonymous.

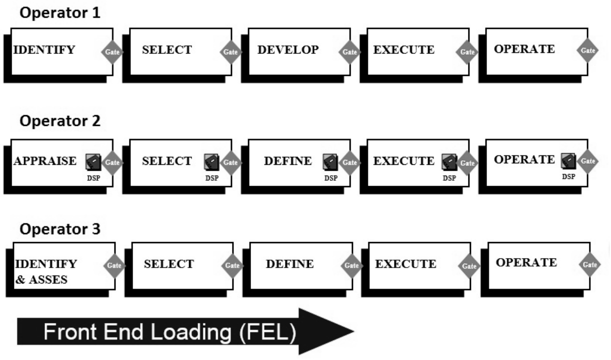

Figure 3: Operators project approach (EBN, 2011).

Figure 3 clearly shows that the project investment approach of the different operators is a typical stage gated approach, where each operator has slightly different names for each phase. Although the names of the phases differ by operator, overall the project delivery systems are near identical for most of the operator's active in the Netherlands. This presents EBN or any other non-operating partner that works with different E&P operators with the opportunity to come up with CSFs that can be used consistently with all the operators, instead of developing different CSFs for each operator. Furthermore, in each phase there is a decision gate where the project is evaluated. This is necessary in order to review the project and see whether there is a need to add additional funding and whether the project is on track or not. After the first three phases, the project goes through project authorization. This is the point in the project life cycle where the owner organization commits the majority of the project's capital investment and contracts. As shown in Table 2, the stage gated process shows major improvements in overall project planning.

Project Outcomes	Improvement With Gated Process
Cost	- 5%
Cost Growth	-9%
Cycle Time	-15%
Execution Time	-15%

Table 2: Improvements with Gated Process (DOE, 2011).

Generally, in most industries there is a rule of thumb that states that the cost of correcting a mistake non-linearly increases as the project progresses (Turner, 2008). Figure 4 visualizes this in a correct manner. Due to uncertainties and risk playing a major role in current project management (Hillson & Simon, 2007), serious attention is needed for the identification of these risk and uncertainties. If the risk and uncertainties can be detected in the first three phases (which together are called the Front-End Loading phase) the project has a better chance ending up a success.

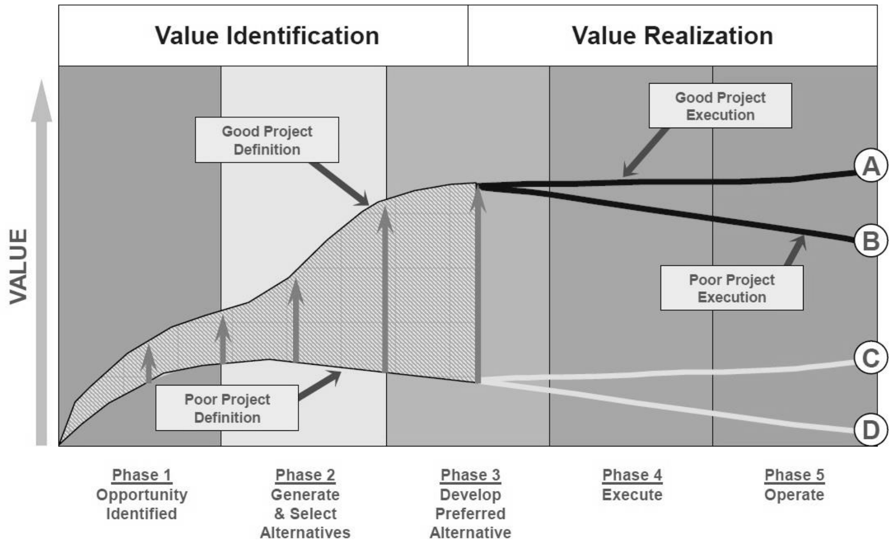

Figure 4: Influence of FEL on project outcome (Hutchinson & Wabeke, 2006).

1.3 Problem statement

Recently published literature on large offshore oil and gas development projects executed worldwide shows that only one quarter have achieved success and that success was heavily influenced by favourable economic circumstances (e.g., increase of gas and oil prices that changed during project execution) that helped make the project economically viable (Sterling, 2013). As briefly mentioned in the introduction, the success of any offshore oil or gas project depends on several CSFs. According to a wide variety of research (e.g., Merrow and van der Weijde, 2008), these CSFs include proper development and quality of project definition, effective integrated teams and good appliance of VIPs. To understand how projects' chances of success can improve, an understanding of the main problem project cost and schedule overrun is necessary.

According to Ernst and Young (2014), the majority of schedule delays and cost overruns in E&P projects were caused by non-technical problems. The factors that contribute to these problems can be divided into two major categories: internal and external (Ernst & Young, 2014). Although this paper focussed on mega-oil and gas projects, there are similarities between the factors of the mega-projects and those of regular or small ones, like EBN's. An overview of the external and internal factors is given in Figure 5.

An important external factor that is not included in the scheme of Ernst and Young is the fluctuation of oil prices, which can be unpredictable most of the time. This unpredictability leads to pressure on the oil and gas industry to increase or decrease production, but as stated before, can positively influence project outcomes if prices are higher than anticipated.

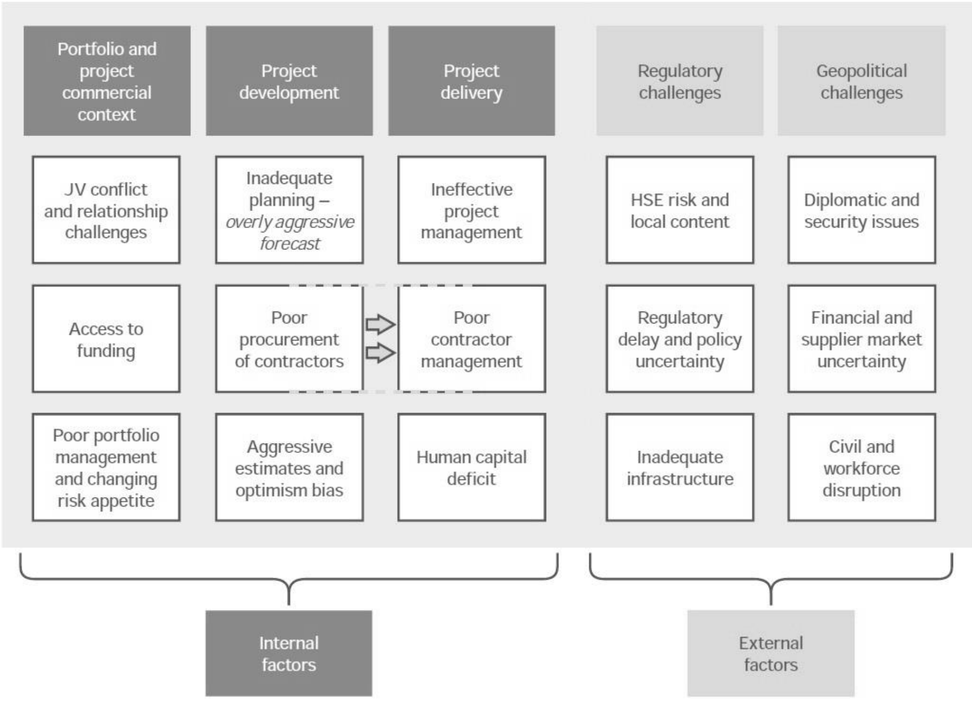

Figure 5: Factors responsible for cost overruns and delay (Ernst & Young, 2014).

For example, the price of Brent crude oil was stable around $110 per barrel from 2010 until mid-2014 (Bowler, 2015), but then quickly fell below $50. The reasons for this change were twofold: weak demand in many countries due to stagnating economic growth and surging US production. In addition, the oil cartel OPEC is determined not to cut production as a way to prop up prices (Bowler, 2015). Although this may sound contradictory with what was mentioned earlier about the increasing global demand for oil and gas, it must be kept in mind that in short time intervals, a fluctuation in prices can occur that may give an impression that demand is dropping. However, this price drop does not mean that the demand over a long period of time will also drop. The fluctuation in oil prices is one factor that leads to the disappearance of the anticipated value of the project. Another reason that anticipated value disappears was researched by the consultancy agency Deloitte (2012). Deloitte states that up to 30% of anticipated value disappears during the turnover/commissioning and ramp-up phases of new asset lifecycles.

According to Williams (2002), another factor that contributes to negative project performance is technological complexity. Technological complexity may refer to the project of parts of the project. In most oil and gas engineering procurement and construction (EPC) projects, the technological complexity is in the parts of the project. In some cases, it is in the project itself; a recent example is the newly emerging fleet of Floating Liquefied Natural Gas Facilities (Fuels & Inc, 2009). Many research results indicate that technological complexity contributes to project complexity, however, some researchers that state the opposite. According to Wood and Ashton (2009), the technological complexity has proven to be the least influencing factor in the overall project complexity factors.

Other literature that takes into account complexity in a project is the dissertation of Bosch-Rekveldt (2011), which shows that complexity has a negative influence on the project performance. The complications that every oil and gas project brings can be explained in numerous ways, and there are many individual cases with their own unique problems. Mentioning all of them would be time consuming. However, to give a complete overview of where most problems arise, a list of major problems composed by Richard and Long (2015) is shown on the next page. Of course this list is not complete. However, it gives a good perspective of what and where things can go wrong in a project that can result in project failure.

1. Insufficiently defined FEED
2. Inadequate design basis for production rates and properties
3. Inaccurate contractor cost estimates
4. Ambiguity of the contract documents
5. Inadequate documentation
6. Multiple change orders
7. Insufficient management of contractor design and construction interfaces
8. Insufficient and inexperienced owner technical personnel.
9. Inadequate baseline schedule development and updating by contractors
10. Insufficient and unrealistic integrated master project schedule
11. Insufficiently sized camp facilities for housing the onsite construction and startup work force on remotely located projects, leading to delays and large cost increases for additional camp construction or hostels.
12. Incomplete onshore fabrication prior to shipping for offshore oil & gas projects; leading to large amounts of carryover work offshore.
13. Failure by owners to have a sufficient and experienced management team in place to manage change orders, requests for time extensions and claims (Richard & Long, 2015).

In conclusion, the complications and factors that contribute to the delays and cost overruns in the industry are extensive. These complications can be divided into to five domains:
- Political: government regulations and changing restrictions or different interpretation can affect the oil and gas production in a negative way.
- Geological: many wells are drying up and exploration in new areas is difficult or the estimation of those reserves was smaller than predicted.
- Price risk: the price is one of the factors that will decide whether the reserve is economically feasible or not.
- Supply and demand risk: fluctuation of supply and demand for the product brings uncertainty in the schedule and planning of the project.
- Cost risks.

Due to the need for oil and gas products, gas and oil investment is still necessary and investing in E&P project might still be beneficial for the involved parties.

1.4 EBN viewpoint

As discussed before, research on worldwide large E&P project performance shows that a majority of the projects failed to meet their objectives. This international research was one driver for EBN to analyse the performance of larger Dutch E&P projects. The business control department has evaluated the projects since 2005 and the analysis showed that almost all the Dutch E&P projects have cost overruns. The performance of the Dutch E&P projects was basically the same as the research on worldwide executed projects, as shown earlier. As a result of the analysis, EBN made several improvements in 2008-2009 including:

1. Internal Peer Reviews
2. Operator performance Matrix
3. NOV management cycles.

These three points are complemented with the three focal points of the operator, namely an operator consistently following its own project management process, improving the quality of decision making and letting EBN participate in reviews, workshops and ad hoc interventions. The improvement strategy resulted in a positive trend, as shown in Figure 6. More time is needed to evaluate whether this trend is permanent.

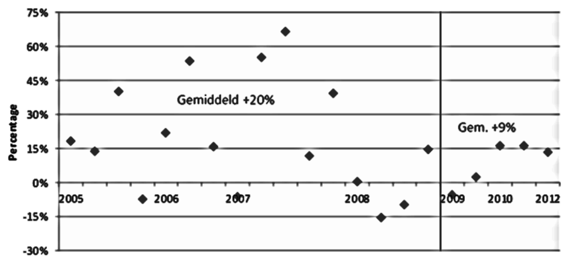

Figure 6: CAPEX overruns (EBN).

It should be noted that the cost overruns were more than compensated for by favourable market circumstances (higher gas prices then estimated, which in an indirect way also contributed to the cost overruns) and nearly all projects resulted in a positive net present value (NPV). However, the cost overruns need to be tackled in the future. Besides cost overruns, EBN faces more concerns, the most important one in terms of NPV caculation being the deviation of the actual versus the estimated reserves. Figure 7 shows that, for almost every project, the amount of gas in the well is apparently overestimated. There is, however, a significant improvement after 2009.

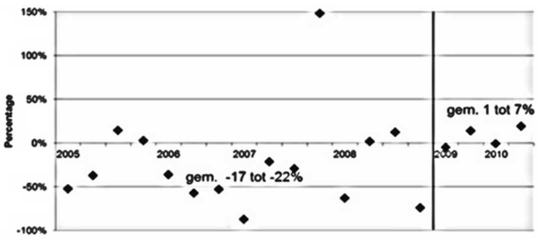

Figure 7: Deviations of the reserve estimates (EBN).

The main reason for these overruns cannot be easily identified. According to EBN's business controller department, the main problem is not in the technical side of the projects. However, during an introductory presentation, the department made clear that the cost overruns, from the technical side, could be divided into two types. The first type is related to mistakes regarding the drilling itself; for example, drilling in the wrong place or something, like the drill breaking during the drilling. The second problem arose when there was not as much gas as previously thought, so the technical analyses of the gas estimation were too high. Still, most of the cost overruns are not technical, but come from the initial design of the process and management of the project.

Additionally, the asset management department mentioned some complications on the technical side of the projects. The department mentioned that a mix of technical and non-technical problems results in schedule and cost overruns and delays. It was also made clear that EBN focusses on big projects because the volume is more important than, for example, the costs of a project. This is because EBN has to fulfill a long term volume plan between 2015 and 2030. Additionally, not every project needs the same amount of input and time; the projects with largest volume potential need more. This indicates that EBN sometimes approves a project that is expected to have cost overruns in order to reach the volume goal. EBN then tries to improve the planning and schedule in consultation with the operator. This is defined in EBN's long term plan. However, not every operator has the same magnitude of failures; some work better, others worse.

The problem that EBN faces is the major CAPEX overrun in the majority of the projects that have an investment larger than €50 million. Although for recently completed projects this issue is less severe than before, nevertheless, it needs to be addressed urgently as this issue has been compounded by the recent fall of oil and gas prices. Obviously, not every project has a cost overrun, but as mentioned earlier, these are exceptions and not the norm. Due to EBN being involved in many projects at the same time, huge overspending in CAPEX in a few projects can lead to other projects not being financed adequately.

1.5 Main focus of the Thesis

The factors that contribute to the aforementioned problems gave an overview of the most important problems. Due to the non-operating nature of EBN, its focus and influence on projects is limited to a degree of giving advice. This paragraph discusses the main focus of EBN. This will help justify the research method in the next chapter.

van der Weijde (2008) stresses that major problems arise due to insufficient Front-End-Loading development (FEL). FEL is the process by which a company develops a detailed definition of the scope of a capital project that meets corporate business objectives (Weijde, 2008). The term FEL, which is used for conceptual development of projects in processing industries such as upstream, petrochemical, refining and pharmaceutical, was first coined by the DuPont company in 1987 and has been used throughout the chemical, refining, and oil and gas industries ever since. In Figure 8, a scheme is drawn to show how a typically staged gated management process is defined. The first three phases are the so-called FEL phases that van der Weijde emphasizes (see Figure 8). This definition of FEL is used in this thesis.

van der Weijde (2008) presented evidence that indicates that historically, E&P project performance (i.e., opportunity realization performance) has often caused significant erosion of the opportunity value that had been identified when the final investment decision (FID) was taken. Despite successes in some areas, this erosion is still continuing at a far too high rate for many opportunities. Post investment reviews, which were conducted by Shell in 2006, have shown that the failure to obtain the predicted opportunity value has been caused by actions and decisions in the front-end of the opportunity realization lifecycle, well before the final investment decision (Weijde, 2008).

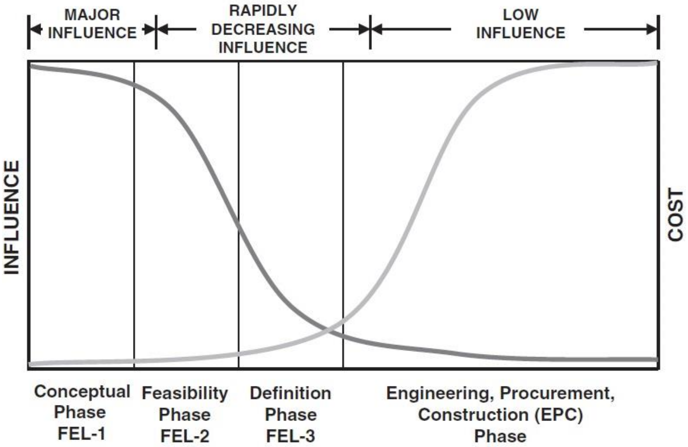

Figure 8: project life cycle cost-influence curve (Couper, Hertz, & Smith, 2008).

In the past, failure to meet objectives has been attributed to poor execution, but when analysed properly, the problems in the execute phase typically arise because of poor preparation in the first three phases of the project (the FEL phases). The reasons for this vary widely and include insufficient time or funds, vague objectives, improper recognition or management of risks, or failure to bring the right competencies to the front-end thinking and planning.

Figure 9 helps show why the FEL has such an influence on the cost of the project. The FEL phase has the greatest influence at the beginning of the project, whereas the expenditure for this phase is relatively small. Consequently, any delayed or unclear decisions that are forwarded to the next phases will cost much more money. This can be seen from Figure 9, as the cost curve increases during the project life. This is widely accepted as a rule of thumb in the industry, which states that a cost of correcting a mistake increases non-linearly as the project progresses (Turner, 2008).

It is also important to notice that one of the FEL influences on project performance characteristics is the schedule and cost goals. In each phase of FEL, this should be set by an integrated business and technical project team, composed of owner and contractor representatives. Regarding capital cost estimate, each operating company may request a slightly different accuracy, which is often project-specific. As demonstrated in Figure 9, the benefit of sufficient FEL performance on project cost is evident. FEL also has a significant effect on the project schedule performance (see Figure 10).

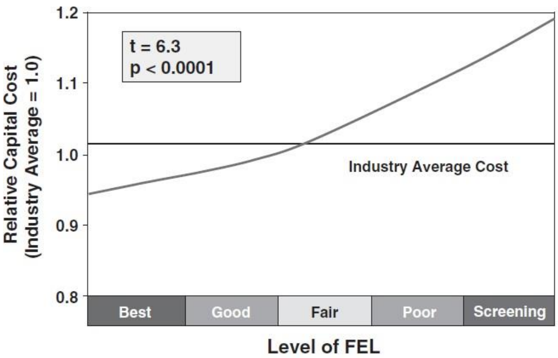

Figure 9: FEL drives better cost performance (Couper et al., 2008).

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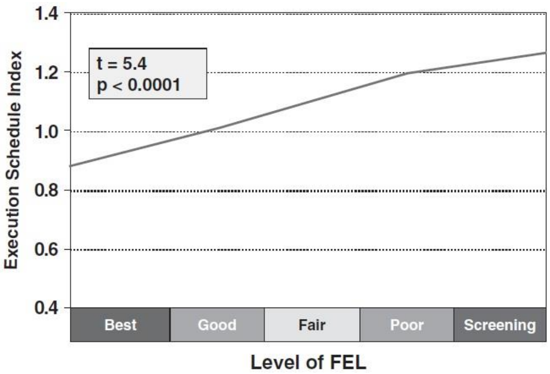

Figure 10: Sufficient FEL speeds execution time (Couper et al., 2008).

The importance of FEL is not new to the companies in the E&P sector of oil and gas. On paper, most operators show diagrams and schematics on how and where they lay their focus in their project preparation and how FEL plays a central role in this. For most of the researched projects, however, it has been difficult to find evidence that the operator achieved sufficient level of preparedness or at least applied the practices as described formally in their project system. This is not always evident from the results of the projects, because many projects have schedule delays and cost overruns that backtrack to the FEL. This may have to do with the recent shift in focus on the FEL, and it needs time to manifest all of the changes that the companies claim to have made or the managers subconsciously still focus on other aspects more than they claim to. Either way, it is important to know what the focus of the operator company is and whether this is similar to that of EBN.

2 Research Design

This chapter discusses the research goals, followed by the research questions and the research approach. The main research question is answered through the sub questions that are presented in this chapter. Additionally, the research method is introduced. The chapter ends by explaining the relevance of this research.

2.1 Research Goal

Paragraph 1.3 defined the problems encountered by the industry and by EBN. This helps to formulate the following research goal for this thesis:

1. Recognizing best Critical Success Factors (CSFs) with which to evaluate (front-end) new projects for an NOP and operator.

2.2 Research Question & the Research Approach

An important aim of this thesis is to identify CSFs that add the most value for an NOP. These CSFs are derived from literature review and previous research on oil and gas projects. Therefore, the research question is:

"How can a non-operating partner influence a project towards successful performance?"

To answer this research question, the following sub questions need to be answered:

1) What are the roles and influence of EBN and of a typical operator in a joint venture?
2) What is project success for a non-operating partner?
3) What are the important CSFs for a non-operating partner to steer a project?
4) In which phase do the identified CSFs have the biggest impact?

2.2.1 The Research Approach

In the last few decades, many different measures were researched and implemented in the oil and gas industry to improve project performance. For instance, Shell created its Opportunity and Project Management Guide. TOTAL, another large operator, developed an integrated workflow with partners and authorities. The different operator approaches to improve project success look remarkably similar, as will be discussed separately. Several studies, for example, van der Weijde on the FEL (2008), Arkesteijn Present Perspective on project success (2009) and the master thesis of van Loenhout on project success criteria (2013) also show where the desired focus should be.

EBN developed its proactive NOV management to steer project performance, which differs inherently from the typical operator project management guides, as EBN is not an operator executing projects. The core activity of EBN NOV management focusses on proactive monitoring and influencing of operators. To do this, EBN developed a framework that consists of the NOV management cycle with associated tools. As mentioned in Chapter 1, the data from recent EBN projects show improvements. However, EBN is striving for further improvements. As mentioned previously, many studies have been conducted on project performance, but these studies rarely take the NOV into account.

Which critical success factors can be applied or should be focussed on by the NOP or which combinations of success factors truly have an effect on the end result of the project is unclear. In this research, an attempt is made to gain more insight into this by analysing available project reports and the available literature. With that analysis, an array of critical success factors can be identified and marked. Then, the Q-sort analysis is conducted; the reason for choosing a Q-sort lies in the nature of the assignment and that of the Q-methodology. Q-methodology is a qualitative research approach and this fits well here due to the lack of quantitative data. Further explanation of why this method is chosen will be given later in the thesis. The Q-sort is conducted with selected professionals that work in the oil and gas industry, within EBN, and with the operators that have executed the analysed projects. By ranking the CSFs given by the experts, an overview is created that identifies which CSFs each group focusses on. This way EBN will gain more insight into the perspectives of the operators. Additionally, from the interviews that will be done during the Q-sort, new CSFs can be identified. These CSFs might not be present in the literature or in the project analysis, because there will be a direct interaction with the professionals that work in the industry. The research approach is shown in Figure 11.

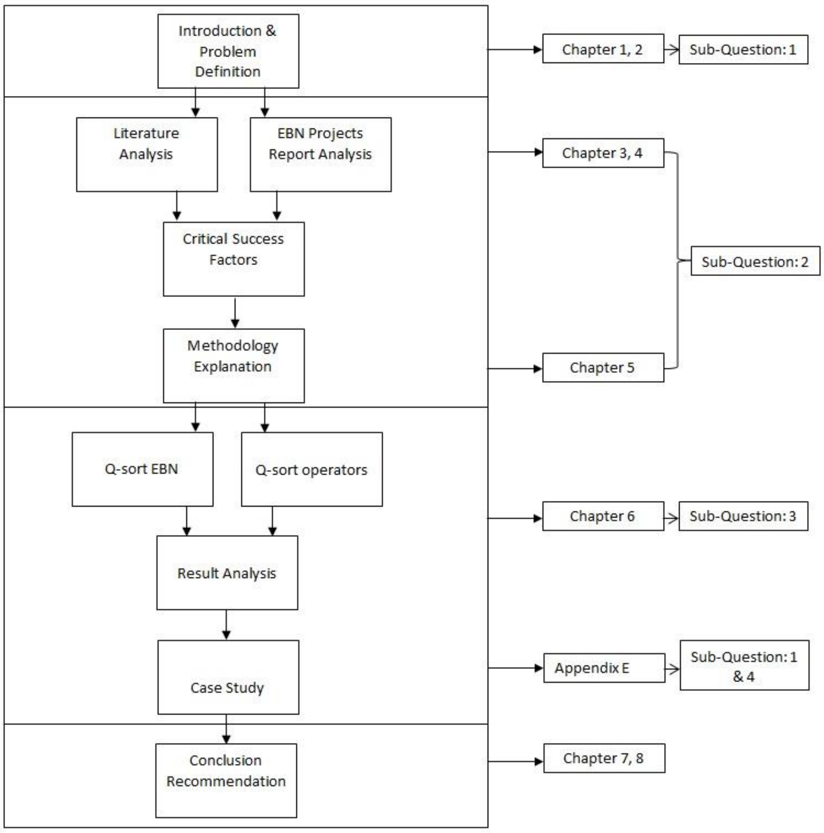

Figure 11: Research Approach.

2.3 Research method

After formulating the research question and the analysis of the literature and projects, the next step is to explain the methodology. When performing a study, the researcher typically tries to find something new. Something “new to everyone” is known as primary research. But when it is “new to you”, it is known as secondary research (Rugg & Petre, 2007).

This thesis combines both primary and secondary research. Theories on how to end a project successfully for the operators already exist, but there are none for non-operating partners. Therefore, the purpose is to identify whether the existing theories can be applied to the non-operating partner or whether new theories need to be developed or whether existing ones can be adapted.

Scientific research can be divided into two types: qualitative and quantitative. The appropriate method depends on the nature of the research question. According to van Maanen (1983), qualitative research techniques can be used as an array of interpretative techniques to describe, decode and otherwise come to terms with the meaning, but not the frequency, of certain more or less naturally occurring phenomena in the social world. On the other hand, quantitative research, according to Neil (2007), tries to classify features, count them and construct statistical models in an attempt to explain what is observed.

By using qualitative research, an in-depth understanding of the problem can be achieved. This can be done by conducting interviews using the Q-sort approach. A quantitative analysis will not be performed in this thesis due to the limited number of recent projects that EBN has information for (25 projects). For quantitative analysis, a larger number of projects is needed, somewhere between 100-200 (Hair et al., 2006), to see a pattern and obtain reliable results. The Q-sort should not only be taken from EBN staff but preferably also from the project staff of the operators; this way it will be clear what the operators focus on during a project. The focus of the operators can give insight into what the non-operating partner can anticipate.

2.4 Relevance

The current management literature gives little to no clear framework on how a non-operating partner can support a project to a good end result, which CSFs should be applied to improve project performance and where and when they should be applied. The literature gives an overview of process control and procedures for an operator, but how should an NOP use these? And on which proven CSFs that can influence a project outcome can the project managers and executers focus on? This research has a high relevance for every NOP, both in the Netherlands and abroad. The relevance can be divided into two main streams: the social relevance that affects the industry that is involved in the projects and the scientific relevance that will address the lack of scientific literature on the point of view of the NOP.

The social relevance depends on the insights that will be gained in this research for an NOP. The focus on the CSFs that can be used by an NOP will be the most important contribution of this thesis. Furthermore, specific recommendations are made for the host company that facilitated this research.

The literature is analysed and the practices of the industry are explored. This thesis can serve as a starting point for further research on this subject for project management. This research may contribute to a further improvement of project management processes in the oil and gas industry by providing valuable insights. Many operators too often experience large cost overruns. In the case of the Netherlands, nearly half of the invested money is delivered by EBN, which makes it government money. It is therefore in the interest of the whole country to improve EBN’s performance. The company that provides data for this thesis will have more insights in the project data and results of the analyses.

3 Theoretical background

Before the execution of the Q-methodology, one step needs to be undertaken. This step comprises of mentioning the theory around project management in order to understand what a project is and how success of a project is defined for a non-operating partner. Also, analysis on the existing literature about CSFs is needed. With the addition and explanation of project criteria. Information on criteria is needed due ambiguity and confusion around CSFs critical success criteria. The critical success factors found in the literature analysis will be presented in a table at the end of this chapter.

3.1 What is a project?

In previous sections, different aspects of the main problem were clarified.
However, a clear definition of a project is not yet given. PRINCE2, a well-known, structured project management method, gives a short but good definition that explains the key points:

"A project is a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case." (Murray, Bennett, & Benley, 2009)

A more elaborated definition of what a project defines is given by Turner (2008) in his second edition of project-based management handbook:

"*A project is an endeavor in which human, financial and material resources are organized in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives*" (Turner, 2008).

The main similarities about these definitions is that a project is typically defined as temporary endeavor, unique in character, collaborative, limited in time and resources and is aimed at delivering a service or a product. However, to fully understand what a project is, knowledge about the phases of a project is important as well. Turner (2008) distinguishes the following stages:

- Proposal & initiation (concept and feasibility)
- Design & appraisal
- Execution & control
- Finalization & close out (Turner, 2008)

Similar distinction of project phases are also given by Murray (2009) and Cleland and King (1983). Also, Porter, James and DuPont (2002) give an example of project phases for a typical capital project. These researchers mentioned the following phases:

- Conceptual phase
- Feasibility Phase
- Definition
- Engineering procurement and Construction Phase (EPC)
- Operate Phase

Evidently, there are similarities between the descriptions, especially in the first three phases, only with slightly different names.

3.1.1 What is project success?

By explaining the main definitions of a project, a definition of project success is important as well. Project success is an important project management issue; it is one of the most frequently discussed topics in project management literature (Crawford, 2002).
There is a lot of literature written on how to complete a project successfully. Different stakeholders have their own different opinions on what the project success can be. This was also mentioned by Baker et al. (1988) who described project success as "perceived project success" emphasizing the subjective side of this topic (Baker, Murphy, & Fisher, 1988).
A high diversity in how to achieve a project success and on which criteria a project should be judged and which factors should be used to achieve that success can be found in literature. Still, there is a general uniform agreement on what a project success is. Literature review revealed an agreement between Baker, Murphy and Fisher (1988). They all claimed that project success is a matter of perception and that a project will most likely to be perceived be an "overall success" if the project meets the following points:

- It satisfies the technical performance.
- High satisfaction concerning the project outcome.

On the other hand, the general points of budget and schedule performance alone are not considered a measure of project success. For instance, some big projects might be considered a failure regarding budget and schedule. The most famous example of this would be the Sydney Opera House. This project was originally estimated to cost $7 million and the completion date was planned on 26 of January 1963. But, it was delivered 10 years later in 1973 and had a cost of $102 million (Jonas, 2006). Taking into account budget schedule, this might be considered a failure. However, the Sydney Opera House is not considered as a failure at all. This building became the landmark of Australian city Sydney and annually it draws millions of tourists, generating income for the Sydney residents (Carbone, 2011).
Cleland (1994) suggested that *"Project success is meaningful only if considered from two advantage points: the degree to which the project's technical performance objective was attained on time and within budget and the contribution that the project made to the strategic mission of the enterprise."*

Success assessment of a project can also differ between the stakeholders of that particular project; this depends on the specific point of view. The point can differ between the persons involved in the project; stakeholders might see the project as highly successful, yet the customers of that project might think of it poorly (Pinto & Slevin, 1987). For EBN, project technical success means the Final Development Project (FDP) objectives

3.1.2 Project Success Criteria for a NOP

Now the general view on the definition of success is defined. Focus can be set on what a project success is for a non-operating partner. On the first glance, looking at the different literature that discusses project success, it seems that there is not one consistent view of it. However, knowing the role of EBN, a formulation of project success is nothing more than a combination of the different views that the literature presents. It is important to notice that for a non-operating partner it is important that the project has satisfying technical performance and a high satisfaction concerning the project outcome, as mentioned by Bakker et al (2010). However, the difference is that the cost and schedule overrun cannot be ignored, or left aside as something of minor importance. Due to big amount of different projects that needs to be financed at the same time, a NOP needs to make suitable prediction of what a project may cost and how long it will take. This is needed to predict a suitable financial planning for the firm. For instance, if one project has major cost overruns, it can take away the resources and finance that was reserved for other projects that might also have an equal importance for the company. This brings us to the definition that is given by Cleland (1994) as complementary to the definition of Bakker et al. In his definition of project success, two points are given. The first one is about the degree to which the project's technical performance objective was attained on time and within budget, so the cost and schedule are taken in, followed by the contribution that the project made to the strategic mission of the enterprise. The work of Cleland (1994) is filled by Dvir et al. (1998) extra factor that looks at the preparation for the future, as mentioned in their paper (1998). This dimension addresses the preparation of the organizational and technological infrastructure for the future. Due to the non-operating nature, one could think that once the project is delivered, the future operability is no concern for the NOP. And that the operator has to make sure that everything works right. However, a NOP still needs to be sure that the facilities are working right, so that the income can be generated and their investment was not in vain. Keeping this in mind, the success of project as defined for a NOP, in this case for EBN, is as follows:

- High satisfaction concerning the project outcome by involved stakeholder.
- Obtaining the degree of the project's technical performance objective was attained on time and within budget
- The contribution that the project made to the strategic mission of the enterprise
- Clear preparation plan for the future use of the build infrastructure or product.

In conclusion, a successful project needs to satisfy technical performance within budget and time. It also needs to have a satisfied project mission. For EBN, this would indicate to achieve the planned gas volume, followed by a realistic future plan of the use of the made infrastructure or product.

Naturally, the project outcome should satisfy the main stakeholders involved in the project. However, a distinction needs to be made between a business success and a project success. For EBN the focus lies primarily on the business success, thereby indicating that the evaluation of NPV is also important. Ending a project with a negative NPV is not desirable, even if the end project is a great success.

3.2 CSFs in Literature

Although this thesis mainly focuses on success factors, it is also important to understand that there are also success criteria. The criteria are the indicators that have resulted from the project, or to reformulate that, criteria are the rulers where you compare the results on, for example costs, time but also personal development or client satisfaction. These criteria can be seen as goals that need to be achieved, the relevance of those goals can be primary, secondary or even tertiary.

The factors are about how the criteria are met. Factors contribute to the eventual success but their absence does not necessarily lead to project failure. Examples of factors are communication, trust or cost management. Some factors are directly related to the criteria.

Some researchers observe critical success factors as independent variables and project success criteria as dependant variables (Zwikale & Globerson, 2006). The critical success factors can improve the project outcome, which in turn can be assessed by a set of measurements as indicated in the project success criteria. Rockart (1979) defines critical success factors as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization". In the definition of the authors CSFs are indicated as a useful approach for identifying information requirements for the management. In other words, the CSFs can be controlled and affected by the management's action and involvement before achieving a desirable outcome. This means that CSF can be seen as a useful framework of project management to assist project managers in achieving success, but it cannot predict whether the outcome will be a success. However, the chance of success will increases significantly if the found CSFs are adequately identified and controlled (Turner, 2008).

In table 2, the literature study on CSFs is summarized. The used literature is ranked in chronological order. Each new writer adds a new found CSF. Other literatures on CSFs are summarized in table 3. Both tables should be seen as one; due to the limitations of space in this document two tables were created. Although many other literature studies on CSFs were available, these were the ones selected as the most relevant for this thesis.

During the 1970s-1980s, most studies approached CSFs requirements in response to the indicators of project success at the implementation phase, which are time, quality, cost and stakeholder satisfaction (Jugdev & Müller, 2005). An example is the study conducted by Morris & Hough. This study focused mainly on the implementation phase. Eleven CSFs were identified, derived primarily from literature and case study analyses of major projects. The approach changed with a study of Pinto and Slevin (1987). This was a first attempt to develop CSFs trough an empirical study for the implementation phase, which was conducted in 1986. The result of this study resulted in a list of ten CSFs. After this study, an effort was made by Pinto and Prescott (1988) to explore the importance of these 10 CSFs over the project life and stated that the importance of the CSFs vary at different phases of the project life cycle. This was confirmed by a study of Brotherton and Shaw (1996), which explain that the characteristics of CSFs are dynamic, depending on where the organization is and where it wants to be. In a later study Prescott and Pinto categorized the ten CSFs in strategic factors (planning process) or tactical factors (operational process). The first four: project mission, top management support, project schedule and plans, client consultation, are grouped into a planning process. These are relevant for an NOP because of its limited involvement in a project.
The remaining six are categorized in to operational process. Each group has its own importance at different stages in the project life cycle depending on the project performance measurements.
Although these ten CSFs of Pinto and Slevin in project implementation process are used in many studies, those factors are not covering every aspect involved in project management.

External factors that affect the success of a project, such as the competence of the project manager, external organizational and environmental factors, and responsiveness to the perceived need of project implementation and political activities within the organization are not pointed out in the Project Implementation Process model (Finch, 2003). These external factors can contribute to the project's success or failure. However, it is logical to think that if the project manager pays greater attention to undesirable factors and adequately takes them into consideration; the probability of a successful project could be higher. Also, it must be pointed out that the effect of external factors mostly has to do with the project size. For small projects, external factors typically have a small effect. Large projects do have a great effect and great influence (Merrow,2011b) (2011b).

According to Belassi and Tukel (1996) the CSFs in the previous literature are mostly related to the project manager and the executing project organization. To address this problem, Belassi and Tukel (1996) conducted a study which addresses project characteristics, characteristics of team members and external factors into a new scheme. The project managers will be able to classify the CSFs into four groups with this new scheme consisting of project, project manager and team members, organization and external environment accordingly. This model also allows the project manager to examine the intra-relationships between factors in different groups in a systematic way.

Morris & Hough, 1987	Pinto and Slevin, 1987	Belassi & Tukel (1996)	Cooke-Davies (2002)
1. Attitudes 2. Project definition 3. External factors 4. Finance 5. Schedule 6. Implementation 7. Organization & contract 8. Strategy 9. Communication and controls 10. Human qualities 11. Resource management	1. Project mission 2. Top management support 3. Project schedule and plans 4. Client consultation 5. Personnel 6. Monitoring and feedback 7. Technical tasks 8. Client acceptance 9. Communication 10. Troubleshooting	1. Factors related to the project manager and project team members a. Manager: ability to delegate authority, ability to trade-off, ability to coordinate, perception of his role, competence, commitment b. Project team members: technical background, communication skills, trouble shooting, commitment 2. Factors related to the project: size, value, uniqueness of project activities, density, life cycle, urgency 3. Factors related to the organization: top Management support, organizational structure, functional managers' support 4. Factors related to the external environment: political environment, economic environment, client, competitors, etc.	Time performance measurement 1. Adequate company-wide education on risk management concept 2. Assign risk ownership 3. Adequate visible risk register 4. Updated risk management plan 5. Adequate documented project responsibilities 6. Keeping project within short time constrain. 7. Allowing changes to scope only through a mature scope change process 8. Maintaining the performance measurement baseline · Critical factors to an individual project success 9. Existence of effective benefit delivery and management process · Critical success factors leading to consistently successful projects 10. Portfolio and Program management 11. Project, program and portfolio performance and feedback system 12. Learning organization

Table 2: CSF in Literature from 1987-2002.

Another guiding technique to group the critical success factors was introduced by Cooke-Davies (2002). The questions that could be asked were *"what factors lead to consistently successful projects?"*, *"what factors are critical to project management success?"* and *"what factors are critical to success of an individual project"*(Cooke-Davies, 2002). Cooke-Davies (2002) also makes a distinction between project management success and project success. The distinction is made by using different set of measurements. Project management will succeed if it meets the criteria of time, cost and quality, while the project is successful if it satisfies the overall objectives of the project. The twelve critical success factors were derived from practical actions or activities in large multi-national organizations, including allowing changes to scope only through a mature scope-change-control process, maintaining the integrity of the performance measurement baseline and so forth. This model also allows the project manager to examine the intra-relationships between factors in different groups in a systematic way. It is still difficult with this model to identify the success factors relating specifically to particular industries.

The study conducted by Baccarini and Collins (2003) also sheds light on the factors that can be used by project managers to achieve project success. The nine factors were derived from previous literature and additional factors were found from the research in different industries that was conducted by the researchers themselves. The researchers expected to find specific factors for each critical success factor. However, these specific factors were not found. Table 3 lists all fifteen factors. The first six factors scored the highest and were defined by respondents as the most important in achieving success.

Zwikael and Globerson (2006) also did relevant research. As mentioned before, having an effective preparation phase can contribute to the overall success of the project. Zwikael and Globerson (2006) have examined this relation and found sixteen CSFs as can be seen in table 3. However, they do not think that all sixteen CSFs are of equal importance in the planning phase. The most important factors are: Activity definition, schedule development, organizational planning, staff acquisition, communication planning and project plan development.

Bakker et al also examined and developed 26 CSFs that could be divided in to 7 domains. According to Bakker et al (2010), the most important factor is the Safety, Health and Environment criterion. The major difference between this and the previous study is the place of trust. Further research on trust was advised by the researchers. (Bakker et al, 2010).

A known researcher who also engaged in project performance and success is Edward Merrow, the founder of Independent Project Analysis Inc. In his book "Industrial Megaprojects" Merrow addresses factors that contribute to success and factors that should be monitored because these factors might lead to an unsuccessful result. Merrow (2011b) defines success for a project if the project complies the following rules; The project has a realistic plan and schedule, which takes into account the actual resource constraints, the project objectives are clear and are shared with the team and the project team is a strong integrated and owner dominated, including the future operator and has strong control mechanisms (Merrow, 2011b). Factors like the contracting strategy do not have a great effect on the outcome of the project; factors that can contribute to project failure are remoteness and new technology. Remoteness has mostly to do with data issues.

When the project is in a remote place it is difficult to obtain reliable data, and when inaccurate data is used to develop the engineering and planning of the project, trouble may emerge in a later stadium of the project. New technologies correlate often with delays and costs at the startup phase. This has a strong impact on venture profitability (Merrow, 2011b). In his follow up study on Oil and Gas facilities in April 2012, Merrow adds three other factors that need to be taken in to account. Here Merrow mentions that Front End Loading, the effects of turnover in project Leadership and the drive for speed also play an important role in overall success of projects (Merrow, 2011b)(Merrow, 2012).

Baccarini & Collins (2003)	Zwikael & Globerson (2006)	Bakker et al., (2010)	E. Merrow (2011-2012)
1. Project Understanding 2. Competent Project Team 3. Communication 4. Realistic Time & Cost Estimates 5. Adequate Project Control 6. Client Involvement 6. Risk Management 8. Resources 9. Teamwork 10. Project Planning 11. Top management Support 12. Stakeholder Involvement 13. Project Managers Authority 14. External Factors 15. Problem Solving	1. Project plan development 2. Scope planning 3. Scope definition 4. Activity definition 5. Activity sequencing 6. Activity duration estimate 7. Schedule development 8. Resource planning 9. Cost estimating 10. Cost budgeting 11. Quality planning 12. Organizational planning 13. Staff acquisition 14. Communications planning 15. Risk management planning 16. Procurement planning	1. Communication -Information flow -Proper vision of owner 2. Project Management -Risk Management -Cost Management -Time management -Cost estimate -Time estimate -Resources -Fit for purpose -Contracting -Rework & Scope Change 3. People -Involvement -Trust -Authority or leadership -Early involvement 4. External -Stability -Authorities -Market 5. SHE -SHE support -SHE Compliance 6. Team -Team composition -Culture -Experience -Team Building Value focused 7. Technology Technical challenges	1. Project has a realistic plan and schedule 2. The project objectives are clear that are shared with the team. 3. Strong owner dominated integrated project team 4. The future operator is included 5. Strong control mechanisms. 6. Front End Loading -Identify and Asses -Select -Define 7. Continuity of project leadership 8. No Aggressive schedule planning.

Table 3: CSFs in literature from 2003-2012.

FEL was already discussed at the beginning of this thesis, so further explanation will not be given. The turnover in the leadership positions, especially in the project director position, damages the outcomes. According to Merrow this was established quantitatively for many years. Turnovers in the project manager position usually leads to a delay in execution and a cost growth. This happens due to the changes that are made by the project manager to the functions that were not considered important by the previous project manager (Merrow, 2011b).

The key difference between the factors of the other studies was that Merrow showed a measurable evidence for the effect of the factors on project outcome. The factor comprising the unobtainable speed mostly leads to a project where the quality of all work that goes in to successful projects begins to erode. The aggressive schedule is mostly achieved by shortcutting the FEL phase, what leads to many late changes in the later stage of the project. This leads to a cost and schedule overrun with higher chances of changing the project director. This can influence the planned schedule (Merrow, 2011b).

3.3 Conclusion

This literature review gives an overview of the existing CSFs in previous studies. However, for this research, not all CSFs can be taken into account, since there are too many of them. To formulate a list of CSFs that will be taken into account, an analysis is performed (see Appendix C). The selection criteria for these CSFs are based on how often a factor was mentioned in the literature. The first step in ranking the CSFs is to put them all in one table and give to them one point each time they were mentioned in the literature. In Table 4, a sample is taken from Appendix C to illustrate how the scores were given.

Factors	Literature Source								
	Morris & Hough, (1987)	**Pinto and Slevin, (1987)**	**Belassi & Tukel (1996)**	**Cooke-Davies (2002)**	**Baccarini & Collins (2003)**	**Zwikael & Globerson (2006)**	**Bakker et al., (2010)**	**E. Merrow (2011-2012)**	**Total Score**
1. FEL: Identify, Select, Define	1	0	0	0	1	1	0	1	3
2. Project definition	1	0	1	0	1	1	0	1	5
3. Attitudes	1	0	0	0	0	0	0	0	1
4. Top management support organizational structure	0	1	1	0	1	0	0	0	3
5. Functional managers' support	0	0	1	0	0	0	0	0	1
6. Adequate company-wide education on risk management concept	0	0	0	1	0	0	0	0	1

Table 4: Sample of Factor scores from Appendix C.

A factor that was mentioned just once is given red color and has a score of 1. Those factors were not taken into account in this thesis. The factors marked yellow and green are mentioned multiple times and are analysed further.

The next step is to create an oversight of the factors that were mentioned multiple times. Those factors were collected into one table based on their score. This can be seen in Table 5, which is a sample from Table C.4 (in Appendix C).

Table 5: Sample from factors rearrangements.

Scores		
1	2-4	5-8
3. Attitudes 5. Functional managers' support 6. Adequate company-wide education on risk management concept	1. FEL 4. Top management support organizational structure 13. Early involvement	2. Project definition 17. Schedule 20. Project schedule and plans 28. Staff acquisition 30. Team composition

This step makes it easier to see which factors can be removed and which factors should be focussed on. Although a significant reduction occurred in the number of CSFs, some further reduction was needed. In the next step, the CSFs that had the same definition are clustered together and reformulated.

Critical Success Factor that Overlap	Critical Success Factors Reformulated
45. Cost budgeting, 68. Cost Management, 44. Cost estimate, 46. Cost estimating, 59. Finance 103. Realistic Time & Cost Estimates	Estimate Cost Manage Cost

Table 6: Sample of reformulating the CSFs.

In the last step in this analysis, 28 critical success factors are created. These factors are shown in Table 7.

Major Critical Success Factor Domain	**Critical Success Factors**
Common investment Objectives	1. Clear defining the Project definition 2. Formulating Project Mission and strategy 3. Estimate Activity time and duration 4. Define Activity 5. Define (New) Technology 6. Develop Project Definition Quality
Targets	7. Developing Qualitative project Schedule and Plan 8. Develop a Resources planning strategy 9. Estimate Cost 10. Manage Cost
Scope	11. Monitoring scope change
Execution	12. Develop Risk Management plan 13. Manage the Contracts 14. Define problems 15. Formulating Solution for the Problems
External	16. Anticipate Political instability 17. Anticipate Market instability 18. Manage Client influence 19. Manage Authorities influence
Project Organization	20. Managing Communication between different parties 21. Development Easy information transfer system 22. Set up control mechanism 23. Set up feedback system 24. Developing competent Team 25. Developing Team with diverse Background 26. Receive Top management Support 27. Project Manager Authority to control

Table 7: CSF derived from literature.

4 EBN Project Report Analyses

For this thesis, an array of 25 projects were analysed. The aim of the analysis was to gain insight into the kind of projects that EBN has to deal with and the complications that occur during the development of a project. This chapter discusses the analysis. It also justifies the choice of the 25 projects. Furthermore, the information that is used for the study is clarified. Finally, the identified factors are explained. The table of the analysis can be seen in Appendix D.

4.1 The Choice of the Projects

Before the analysis of the individual projects, it was chosen to only look at those projects that had a CAPEX higher than €50 million. The choice for this minimum is based on the fact that EBN monitors projects of €50 million and higher more closely, so more detailed information is available for the larger projects. In addition, these kinds of projects have clearly defined different phases. Projects with investments smaller than €50 million were widely available. However, the lack of sufficient detailed information on these smaller projects made analysis significantly less valuable. With this constraint, an array of 25 projects that could be analysed was collected. This analysis can be seen in Appendix D. The main topics were the initial investment, followed by the cost overrun and the amount of investment that was done by EBN. The reason for the cost overrun was reported as well. Table 8 gives a fragment of the project analysis. The full project analysis can be seen in Table D.1 (in Appendix D).

Project Code and description	**Before/After 2009**	**Overrun/Under run of Initial investment in %.**	**Reason for the Cost overrun**
1) Onshore project	After	Overrun Overrun	-Insufficient definition of FID More work due to the changed scope after tender Underestimation of the budget due to specific work Incomplete preparation Small Operator team The reimbursable contract did not fit this project.
2) Onshore storage	Before	Still going on	Delay due to RSVP needed more time in this complex case to make a decision. However during start up no problems occurred during the project.
3) Offshore field development	Before	Overrun	Increase due to the pipe scope. Due to the DSV stakes increased
4) Offshore field development	Before	Overrun	Technical problems with underwater operating system.
5) Offshore field development	Before	Under run	Platform, pipelines and 2 of the 4 wells were cheaper.

Table 8: A fragment of the project analysis from Appendix D.

To formulate the CSFs resulting from the project analysis, the following steps are taken into account:
Step 1: Formulate the main problems.
Step 2: Match the reason for the schedule and cost overrun along the main problems.
Step 3: Formulate CSFs from the reasons.

To illustrate, a fragment of these three steps is shown in Table 9. The full table can be seen in Table D.2 (in Appendix D).

Main Problem	**Reason for Cost Overrun**	**Derived CSFs**
Bad preparation and bad assessment of scope Scope increase	More work due to the changed scope after tender Underestimation of the budget due to specific work Incomplete preparation The reimbursable contract did not fit this project Increase due to the pipe scope. Due to the DSV stakes increased increased scope	- Economic rational of scope (early) - Scale of the scope
Small inadequate team	Small Operator team	- Competent team members - Diversification in team - members (good balance between technical and non-technical members)
Changing market environment	Pipelines over the budget due the market conditions and weather, including tools and materials over the budget. Market situation changed. The travel and renovation expenses got higher. Price for equipment become higher than expected and one extra well was needed. Changing market conditions and evolving "rig rate". Also the market played a big roll, due to scarcity some materials became expensive Both the cost of pipelines and facilities were lower than expected But because of favorable prices was still profitable high offshore equipment rates lower €/$ - course Two wells realized under the budget Platform, pipelines and 2 of the 4 wells were cheaper.	- Market fluctuation

Table 9: Formulating CSFs from the project analysis.

Due to the large amount of information and tables, Table 10 summarizes the main problems, the derived CSFs and whether those factors are internal or external. This table shows that there were many different kinds of difficulties. However, many operators also had the same problems, like the unpredictable market situation, complications with drilling, bad weather conditions and new unpredictable technology that contributed to the delays and cost overrun.

Main Problems	Number of projects	Extern	Intern	Critical Success Factor That is overlooked.
Bad preparation and bad assessment of scope Scope increase	3		x	- Economic rational of scope (early) - Scale of the scope
Small inadequate team	1		x	- Competent team members - Diversification in team - members (good balance between technical and non-technical members)
Changing market environment	5	x		- Market fluctuation
Complexity of new technology	2	x		- Use of set of solution - Use of standard components.
Changing weather	4	x		- Weather fluctuation
Default performance of subcontractor		x		- Contracting
Needed extra well	1		x	- Reserve prediction by using probability
Inadequate project planning	1		x	- Focus on time - Focus on cost
Inadequate definition of FID	2		x	- Realistic prediction of investment costs, by using probability
Changing concept	1		x	- Consensus on projects.
Inadequate work load planning	4		x	- Evidence based approach
Modification by other partner	1	x		- Contracting - Standardize each procedure with different partners - Deviation from Operator Project System should not be encouraged. - Sufficient Communication leading to full transparency.
Wrong estimation of gas reserves	2		x	- Reserve prediction by using probability
Problems with drilling	4		x	- Evidence based approach
Inadequate risk estimation	1		x	- Risks identified and included in project targets. - Counter risk measurements

Table 10: Main problem of Operators.

From the complications that could be found, an array of domains was set where problems arose; these domains can be seen in Table 11. From these seven domains, eighteen factors could be identified. Each domain has its own set of critical factors. For more details, see Appendix D, where all the steps that were taken to formulate the CSFs from the projects are shown.

Critical Success Factors Domain	Critical Success Factors
Predictable project targets (Early).	1 Realistic prediction of investment costs, reserves by using probability. 2 Risks identified and included in project targets. 3 Counter risk measurements
External	4 Market 5 Weather
Competitive project scope	6 Scale of the scope 7 Economic rational of project scope (Early)
Strong team delivery.	8 Competent team members 9 Diversification in team members (good balance between technical and non-technical members) 10 Sufficient Communication leading to full transparency. 11 Consensus on projects.
Compliance with Operator Project System.	12 Evidence based approach 13 Deviation from Operator Project System should not be encouraged.
Optimize standardization	14 Use of set of solution 15 Use of standard components. 16 Standardize each procedure with different operators.
Common Objective	17 Focus on time. 18 Focus on cost.

Table 11: CSF derived from the project analysis.

4.2 Comparison with Literature

In this chapter, a comparison of the found CSFs of the project analysis with the literature is made. This determines whether the critical success factors from this study are confirmed by the literature. The comparison is performed systematically. Each factor from the project analysis is compared with the literature to find similar factors. If this factor was mentioned in the literature, it scores one point. If not, it does not score a point. So, each factor will have its own score. Factors that are mentioned repeatedly in the literature, or the factors with the biggest score, are left out (see Table 12), because those factors are already taken into account in the list that was formulated in the literature study. Factors that cannot be found easily in the literature are added to the list of CSFs that was developed in the previous chapter, this way the final list of factors in this research will be developed. No double factors are taken into account and relevant factors will not be missed.

Literature Source	Critical Success Factors from Project Reports																		
	Realistic prediction of CAPEX	Risk identified and included in project targets	Counter risk measurements	Market	Weather	Efficient scale of the scope	Economic rational of project scope	Competent team members	Diversification in team members	Sufficient Communication	Consensus on projects	Evidence based approach	No deviation from OPS	Use of a set of solution	Use of standard components	Standardize each procedure	Focus on Cost	Focus on Time	**Total Score of the literature**
1. Morris & Hough, (1987)	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	1	1	**7**
2. Pinto and Slevin, (1987)	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	**8**
3. Belassi & Tukel (1996)	1	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	1	1	**9**
Cooke-Davies (2002)	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	**4**
Baccarini & Collins (2003)	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	1	**7**
5. Zwikael & Globerson (2006)	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	1	1	**9**
6. Bakker et al., (2010)	1	1	1	1	0	1	0	1	1	1	0	0	0	1	0	0	1	1	**10**
7. E. Merrow (2011-2012)	1	0	0	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	**12**
Amount of times a factors was mentioned in Literature.	**7**	**5**	**5**	**5**	**1**	**6**	**1**	**7**	**6**	**7**	**1**	**0**	**1**	**2**	**0**	**1**	**6**	**8**	

Table 12: Project factors comparison with the literature.

Paragraph 4.1 explains the kind of project that was completed by the operators and the kind of problems that arose during its realization. Table 13 gives an overview of CSFs that will be used. This table shows that economic rationale of the scope, evidence-based approach, use of a set of solutions and use of standard components are not found in the literature. Also, factors regarding the weather, consensus on projects, and standardization of each procedure are only mentioned in one source each. These seven factors that are marked green in Table 12 and are used to complement the list of the CSFs that were derived from the literature study to develop a more comprehensive Q-set. Looking at this comparison, it can be conclude that the CSFs mentioned in the literature have an overlap with the ones derived from the project analysis. The seven CSFs that are added to the list of the factors from the literature are clustered together.

	CSFs
	1. Economic rationale of the scope
	2. Evidence-based approach
	3. No deviation from OPS
	4. The use of standard components
	5. Weather
	6. Consensus on projects
	7. Standardization of each procedure

Table 13: CSFs that will be added to the CSFs table derived from literature.

The CSF regarding safety was not added to the list because safety is used in almost everything and it is an evident factor that every operator regards as important. One additional factor, “allowing scope change through mature scope change process”, was added after discussion with one of the EBN employees. The two factors of feedback system and control mechanism were combined into one because they are closely related. To better understand how the full list of the factors was created, a diagram is made. In Figure 12, the red rectangle represents the list of CSFs derived from the project analysis and the blue rectangle represents the list of CSFs derived from the literature. Combining these two lists results in some overlap. The overlap is represented by the purple area and is going to be removed. This remaining red area is the CSFs that are listed in Table 11. Together with the list of CSFs derived from the literature, a new complete list is formed in Table 14.

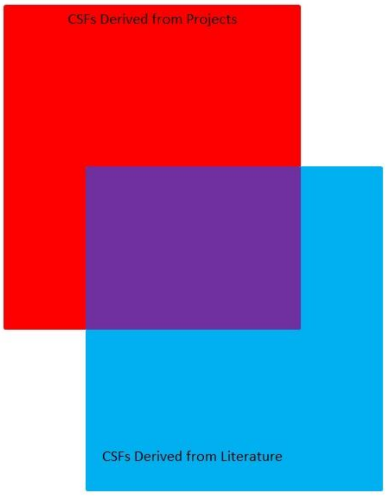

Figure 12: Representing the list of CSFs.

Major Critical Success Factor Domain	**Critical Success Factors**
Common investment Objectives	1. Clear defining the project definition 2. Formulating project mission and strategy 3. Estimate activity time and duration 4. Define activity 5. Define (new) technology 6. Develop project Definition Quality 7. Using evidence based approach
Targets	8. Developing qualitative project schedule and plan 9. Develop a resources planning strategy 10. Estimate cost 11. Manage cost
Scope	12. Monitoring scope change 13. Allowing scope change trough mature scope change process. 14. Rational of project scope
Execution	15. Develop risk management plan 16. Manage the contracts 17. Define problems 18. Ability of formulating solution for the problems 19. Standardize each procedure 20. Use of standard components 21. Strict adherence with project system
External	22. Anticipate political instability 23. Anticipate market instability 24. Manage client influence 25. Manage authorities influence 26. Anticipate weather instability
Project Organization	27. Managing communication between different parties 28. Development easy information transfer system 29. Develop control mechanism and feedback system 30. Developing competent project team 31. Developing team with diverse background 32. Receive top management support 33. Project manager authority to control 34. Achieve consensus on projects decisions

Table 14: CSFs for the Q-sort.

5 Q-Methodology

In this chapter, the Q-method will be explained, with the theoretical explanation followed by its application and how it has been applied in this study.

5.1 Q-Methodology Introduction

The Q-methodology was developed in 1930 by William Stephenson, who specialized in physics and psychology. In essence, *"Q-methodology provides a foundation for the systematic study of subjectivity"* (Brown, 1993). Subjectivity means *"a person's communication of his or her point of view"* and it always stems from a person's *"internal frame of reference"* (McKeown & Thomas, 1988). To know how the operators and the EBN employee view the projects this method can be useful to come to know the taught patron.
This methodology will help in finding the CSFs for EBN. Due to the non-operating nature of EBN, the most useful critical success factor should be identified in the concept phase. This phase coincides with phase two in the value identification and realization diagram. This is the phase where EBN and others have the most influence and can steer the project towards a good end result, as was demonstrated in Figure 4 of chapter one.

5.1.1 Theoretical explanation of Q-methodology

According to Brown (1993), Q-sort methodology is the best fit for non-quantitative analysis (Brown, 1993). Because of the focus on project managers' impressions and attitudes towards the project approach that they are working on, the Q-methodology might be useful in the case of EBN. The reason Q-methodology is used in this research can be explained by differentiating the subjectivity measures into two types: the method of impression and the method of expression (McKeown & Thomas, 1988). When a method of expression is used, the researcher is looking for the external point of view of the respondents. The weight that the respondents attach to the scale and criteria and the respondents' personal significations of the answers to the questions are of no real interest to the researcher. The researcher predetermined the scale of the research and the respondents use it, although it may have a different meaning to the interviewees than what was meant by the researcher. When using a method of impression, the individual significance and value that the respondents attach to the different factors is important; the respondents assign relative scores that are related to their internal frame of reference. The scale is therefore determined by the respondents and their reasons and motives are of great interest to the researcher (McKeown & Thomas, 1988).

Q-methodology can be seen as a method of impression and is used in this research because it provides contextual information on the project managers' choices made in the Q-sort. By asking the project managers to rank the defining success factors, the prioritization of these factors comes forth. In every project, the project manager is confronted with unexpected changes, alterations or problems. This means the manager needs to choose one of different alternatives on how to proceed with the project. Every alternative means a trade-off; one alternative may cost extra money, but ensures that the project is finished on time; another may take longer, but be safer for the workers. The trade-off means that one factor has priority over another and this is exactly what the Q-sort will bring to the surface. The ranking of the CSFs will bring about the real subjectivity (Brown, 1993).

A reason to use the Q-sort is that the project analysis showed that the managers in the industry are familiar with CSFs; they are supposed to apply these in their projects to a certain extent. However, the knowledge of which CSFs a manager should use is lacking. This became clear during the 25 project analyses. By ranking the CSFs, it can be concluded what the difference in focus is among the managers and how EBN can anticipate and reduce the difference.

The Q-sort methodology is performed as follows. The data for Q factor analysis comes from a series of “Q sorts” performed by one or more subjects. A Q-sort is a ranking of variables, typically presented as statements printed on small cards according to some “condition of instruction”. These individual rankings (or viewpoints) are then subject to factor analysis. Stephenson (1935) presented Q methodology as an inversion of conventional factor analysis in that Q correlates people instead of tests: “*whereas previously a large number of people were given a small number of tests, now we give a small number of people a large number of test-items*”. Correlation between personal profiles indicates similar viewpoints or segments of subjectivity (Brown, 1993). By correlating people, Q factor analysis gives information about similarities and differences in viewpoint on a particular subject. If each individual would have specific likes and dislikes, Stephenson (1935) argued, their profiles will not correlate; if, however, significant clusters of correlations exist, they could be factorized, described as common viewpoints (or tastes, preferences, dominant accounts, typologies, etc.), and individuals could be measured with respect to them.

5.1.2 Application of the Q-methodology

At the beginning of this chapter, the theoretical background of the Q-sort methodology was discussed. To better understand this method, a step by step explanation is given. An overview of the Q-sort methodology can be found in Figure 13.

The Q-sort begins with the first step, gathering cases and raw data. In this step it is important to know what the subject is that needs to be examined. In the second step, opinions are gathered and the acquired information is structured to formalize the statements. Those statements are ranked by the participants. To form the statements, knowledge can be used that is acquired from the literature or from the analysis of the projects. Of course, a hybrid version of this approach is also possible, by using the literature and the project analysis to form the statements. This hybrid approach is used in this thesis. After the statements for CSFs are formalized, the statements need to be finalized and made ready for the ranking. This step also involves selecting the interviewees. When set of statements or the critical success factors is ready and a list of the interviewees is made, the ranking of the factors can begin. The ranking will be done manually by the interviewee; this means an interviewee will get a deck of cards that will be placed on the Q-sort matrix. An example of the Q-sort matrix can be seen in Figure 14.

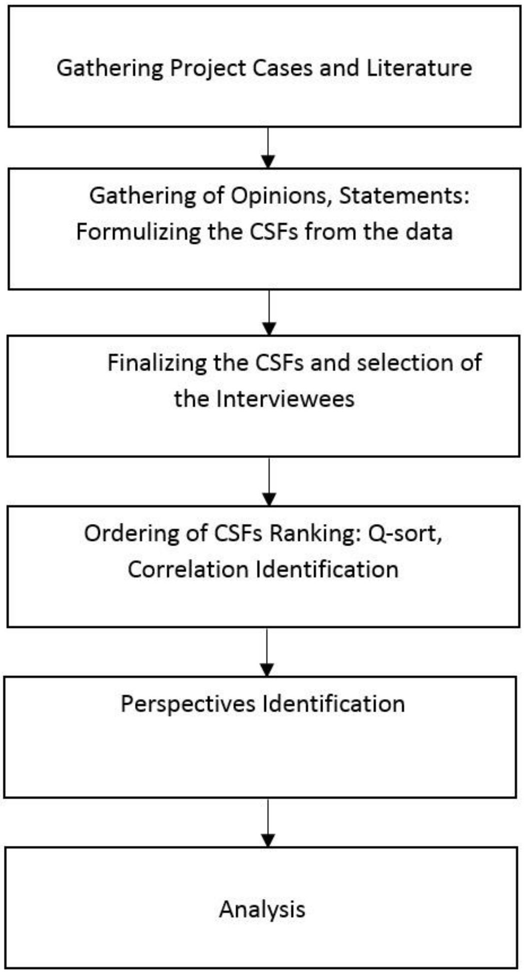

Figure 13: Q-method steps.

A number of CSFs are laid before an interviewee. These factors are the extension of each critical success factor that is identified for this research. In short, how these CSFs would be used. The interviewees' task is to arrange the cards on the scale of least effective to most effective. The factors are spread randomly on each card. Before starting, the interviewee is asked the sorting question: What factors can contribute to a successful project?

The first task is to arrange the cards into three stacks: least effective, neutral, and most effective. Effective means an application that contributes to less cost overrun and schedule delay. It will be advised to sort the factors on the basis of the interviewees' own experiences and not what other professionals say or advice. Subsequently, the interviewee is asked to sort the cards on a scale, with different predicaments. Each predicament has a maximum number of places to lay the cards on it. This way, priority is given by the interviewee; this will be useful to make a comparison between the factors.

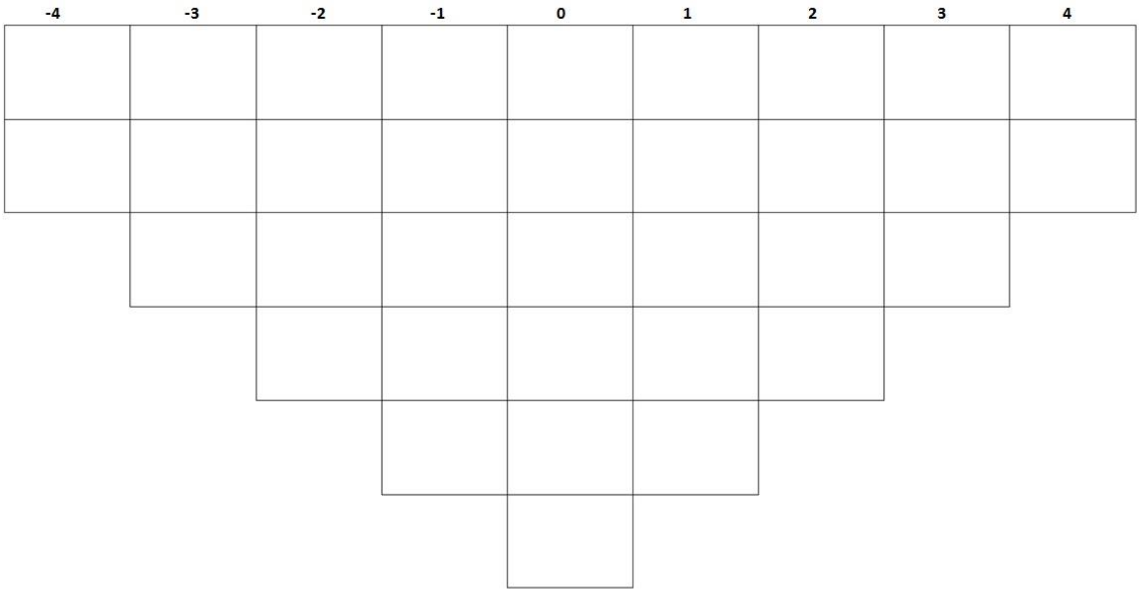

Figure 14: Example of the Q-sort matrix.

The placement grid in Figure 14 is an example of forced distribution, as the participants are forced to distribute the statements around a zero-point, with a standard deviation.

According to Brown (1980), people who are not knowledgeable about a topic will not have strong opinions. Therefore, there is a need of a grid that has more room around the middle. However, participants who are experts are more likely to have extreme opinions, like agree or disagree. For them, a flatter distribution is more desirable. Brown also gives three additional reasons for using forced distribution. The first is pragmatic. The forced distribution provides structure to an overwhelming procedure. The second is a statistical reason; by using forced distribution, a Q-sort is produced with equivalent means, making the same normalized distribution of data points in each Q-sort, which aids in the statistical comparison of Q-sorts during data analysis. The third reason that Brown gives is phenomenological. With this method, the search for meaning is done through exploring subjective accounts of phenomena from participants' perspectives (Brown, 1980). The form of the grid is bell-shaped due to the assumption that fewer statements generate strong engagement (Brown, 1980). In this thesis, however, the Q-sort matrix has more of a pyramid shape. The reason for this shape has to do with the number of CSFs and the attempt to form the matrix such that it comes close to the actual bell-shape. However, in most literature that describes the Q-sort, there is no set of rules or guidelines that determine how to draw the Q-sort matrix. Each researcher is given the freedom to draw the matrix as desired.

When the Q-grid is filled in, the next step is processing the data and bringing up the correlation between the factors. This can be done using appropriate software, which can be desktop based or web based. This will help compare the correlations between the participants. The software used in this thesis is SPSS. The higher the correlations between the participants, the more agreement there is between them.

The next step is to form the perspectives between the participants. This takes into account the correlation as seen in previous step and finds the 'principal components' that shape the perspectives. This way, the participants with a high correlation end up in the same group while others are split up.

The last step is to analyse the perspectives that were found using quantitative and qualitative techniques. The steps in the analysis include calculation of where significant differences and consensuses statements emerge. These calculations are done in the PQmethod program, a software analyser. This step is crucial to the Q-sort and needs to be done properly; otherwise incorrect conclusion can be drawn. The Q-methodology is used to bring up the differences in perspectives. The tool PQmethod is used to calculate the significance of the distinguishing or consensus statements as well as the influence of demographics on the perspectives. The mathematics behind the Q-methodology is explained in Appendix B.

5.2 Q-set up

The number of CSFs mentioned in the literature is immense and some were not discussed in this thesis. However, the ones that were discussed give a representative overview of CSFs that can be used by a project manager. In this chapter, an explanation is given on how the Q-set for the Q-sort methodology is set up. First, the literature methods that were used by the creator of the Q-sort methodology are described; next the method for completing the Q-set that is used in this thesis is explained.

5.2.1 Theoretical background of constructing the Q-set

There is a need to come up with satisfactory list that includes diverse and comprehensive CSFs that comes in different phases of the project life time. There is no agreed-upon set of rules available in the literature that can be used as a guide (Block, 1961). However, Stephenson (1953) gives three methods of Q-set construction. The first method starts with formulation of the domain of the universe of the research coverage. The next step is to find and list variables or items that are appropriate for the investigation in that domain (Block, 1961). All the items that could be found for that domain are then used for the Q-set. This simple approach can lead to casual or simplistic results. The other problem is that the items for one investigator will not be useful for another investigator. Simply put, it is irreproducible, which is a crucial point in every research.

The second method proposed by Stephenson for developing Q-sets requires operational specification of the universe of interest. All the statements that, by some operational criterion, fall within the chosen domain are collected. From that collection, random items are chosen that will comprise the Q-set. The advantage is that the statements of other researchers can be used and it is reproducible. However, the downside is the extensive labor required to collect all the statements and the fact that the random sampling can cover some aspect of that universe extensively and others just barely.

The third method is the structured Q-set. This structured method involves performing an analysis of variance design in two or three dimensions of the universe that is analysed. This way, the researcher specifies the number and items required to fill its various cells. This method gives a rationale for item selection that overcomes the initial problem of the second method, where some aspects or dimension of one universe that need to be examined are forgotten or are covered minimally.

5.2.2 Used method for the Q-set construction.

To come up with a Q-set list that could be used in this research, a road map was set up. This road map approach to formulate the Q-set comes is similar to the third method Stephenson proposed; however, there is an added step: discussing the Q-set with the academics and professionals of EBN. The structure of the road map is as follows.

Step 1: Assigning score to the CSFs.
Table C1 to C3 (in Appendix C) shows the number of times the critical success factors are mentioned in the literature. Each time a CSF is mentioned in the literature, it will receive one point. This way, CSFs that are mentioned in different sources get more than 1 point and are used in final the Q-set and the ones that are just mentioned in one source are not used in the final Q-set, as they are seen as less important.

Step 2: Reformulate the CSFs that are the same and complete the list with EBN project analysis.
Some CSFs found in the literature with a high score overlap or are the same. In this step, the factors that are the same are reformulated to form one or more CSFs. In Table 6 (Chapter 4), the CSFs derived from the EBN projects are summarized. In total, there are twenty-five projects with available access to the relevant information. The factors that were derived from the project analysis are used as an addition to the list of factors that were derived from the literature study. Only those factors from the project analysis that are not mentioned in the literature are used.

Step 3: Discuss the list of CSFs with EBN asset manager and academics of TU Delft.
The final step consists of discussing the completed CSFs with the asset managers of EBN and academics of TU Delft. Also, a test was performed on one asset manager beforehand to see whether the set of CSFs for the Q-sort is comprehensive. The end result can be seen in Table 12 and in Appendix D with the full description of each factor.

6 Analysis and Discussion

In this chapter, the result of the Q-sort test that was conducted with the factors summarized in Chapter 4 is elaborated. The Q-sort test was taken by the employees of EBN and by the operators that work with EBN. Before the results are discussed, some background information on the interviewees provides an overview of those involved in this test. Also, the interview structure and questions are given to show how the Q-sort was conducted. The results of each individual Q-sort are processed in the PQmethod software. The result of the analysis will be discussed in Paragraph 6.2, where the perspectives identified are explained. Finally, the results are discussed and a conclusion is given.

6.1 Interviewee of EBN and Operators

Six EBN employees were asked to participate in the interview and take the Q-test. Three belonged to the asset management group and three were project managers. They all worked on several large projects simultaneously. EBN works with many small and large operators. For this thesis, five major operators were chosen to execute the Q-sort. From those five operators, a total of eight people will be interviewed and conduct the Q-sort. One interviewee cancelled the appointment, so seven respondents from the operator side participated. The reasons for the choice of these people were primarily due to their having a complete overview on the projects that they were involved in. The interviewees from the operator side were primarily project managers. This information is summarised in Table 15.

	Project Manager	E./C. Manager	Asset Manager	Head of Project	EBN	Operator	Onshore	Offshore
Resp.1	X				X		X	X
Resp.2	X				X			X
Resp.3	X				X			X
Resp.4			X		X		X	X
Resp.5			X		X		X	X
Resp.6			X		X		X	X
Resp.7	X					X	X	X
Resp.8	X					X	X	X
Resp.9				X		X	X	
Resp.10		X				X		X
Resp.11				X		X		X
Resp.12	X					X		X
Resp.13		X				X		X
Total	6	2	3	2	6	7	7	12

Table 15: Interviewees background.

Interview

The Q-sort test was a part of the interview, which consisted of five phases. The questions were all open-ended. This way, the interviewees could give enough information and share the thoughts behind their decisions. The complete interview questions are given in Appendix A. The five phases of the interview are as follows:

Phase 1: Interviewee background information
In this phase, questions are asked about the project managers' education and experience and what kind of project they are involved in.

Phase 2: Preparation of the Q-sort
In this phase, the Q-sort test is explained to the interviewee. Additional questions, regarding the, project success, their own personal view on CSFs and which CSFs will be important in the future are also asked before the start of the test.

Phase 3: Q-sort execution
The sorting question that the interviewee answers when taking the Q-sort is: What factors can contribute to a successful project?

Phase 4: Question after the Q-sort
In this phase, questions are asked about the extremes and why the interviewee changed some of the sorting during the test.

Phase 5: Verification questions
In this phase, questions are asked about whether some factors are missing that are important. Additionally, questions about personal circumstances that can play a role in the execution of the project are asked, followed by questions about the trends that could shift the current focus on the project success factors.

During the Q-sort, a lot of qualitative information was gathered from the open-ended questions the interviewees answered. This information gives a good view of what EBN and the operators think of the work process and their interactions with each other.

6.1.1 Observations during the interview

Before the results of the Q-method are analysed, a brief look is taken at some of the statements and remarks that the interviewees gave. This gives insight into what the interviewees think about some subjects.

Earlier in this thesis, what a successful project is was briefly mentioned. However, that definition was derived from the literature. During the interviews, this question was raised with the interviewees. Table 16 summarizes their answers.

	Answers
Q: What is a successful project?	1. A successful project is a project where you give the right advice
	2. On time and within budget
	3. Safe, profitable on time and on budget
	4. A successful project is the one within time; budget, without HSE incidents and it has to work.
	5. A project that is on time, within budget and it is functional
	6. Successful project is a project with no LTI's, within original budget (+10%) and within planned schedule (max + 1 month). With results (production) as planned. And (preferably) acceptance by the public.
	7. A successful project is when it is delivered safe and within budget/schedule in a good atmosphere with the contractors.
	8. A project that is one time schedule and budget.
	9. Within budget and time and goes according to the FID. And does not have overruns above 10%
	10. Safe, profitable on time and budget
	11. Within time and budget
	12. A successful project is when it is delivered safe and within budget-schedule in a good atmosphere with the contractors
	13. On time, schedule and everyone is content with the outcome.

Table16: What is a successful project?

From the answers it can be seen that all the interviewees have the same notion of what a successful project is. There is mostly no difference between what the operators and non-operators think regarding this topic. The only difference is that some of the respondents mentioned safety or a project that has no incidents causing harm to the employees also as success. Also, one interviewee mentioned that projects should be according to the FID. A project that is according to the FID is one that is on schedule. So in that sense, this is not different from the previous answers. One answer from a non-operator that stood out from the rest was about giving good advice regarding the project, as a success for a project.

Experience and Educational Background.

In this section, the educational background of the employees is shown. All but one of the managers had university background. All but two had 20+ years of experience.

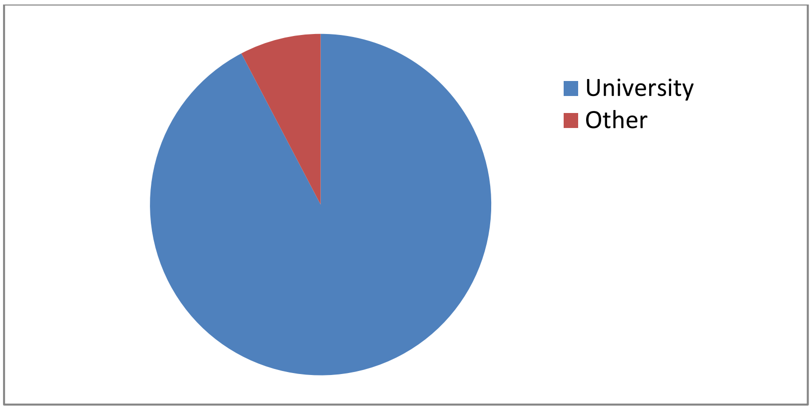

Figure 15: Educational Background.

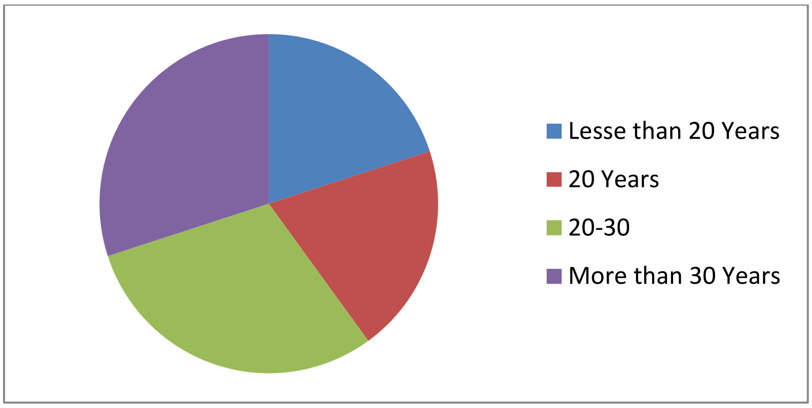

Figure 16: Experience.

This information shows that the project managers mostly have the experience and educational background that fits the work they are doing. All managers had a technical background and one had extra education in business. So none of the people involved in the projects can be judged on the basis of a mismatch between their education and experience.

What are the factors that contribute to success and the outlook at the future?

The interviewees were asked about factors that they find important and can contribute to the success of a project. Those factors are summarized in Table 22. Another question was asked about whether some factors can be important in the future and should be taken into account. Those factors are summarised in Table 17.

	Answers
Q: What are important factors for success?	1. Definitions
	2. Objectivity, aiming definition, high quality, experienced team.
	3. Objectivity in defining phase
	4. Within time, budget, without HSE incidents and it has to work
	5. Planning, budget control, communication
	6. Clear communication & documentation of the project goal, including partners during concept select phase, proper FEED, well defined project scope, project budget based on quotes, use of proper project management system (Stage Gate approach), no/minimal changes to project scope and project team during execution, integrated planning according to work breakdown system, management of change procedure, accurate cost control, secondment of staff with project team.
	7. A good front end loading/FEED is key. A good recognition of the importance of the project for the company. No blame culture. Short decision lines. Good contract arrangement with contractors (win/win). Positive attitude of all parties involved/good work atmosphere.
	8. Knowledgeable and motivated people Correct definition/scope and preparation
	9. Realistic early promises. Strong team delivery. Comply with ORS. Clear competitive and defined scope. Freeze the scope. Best Front end Loading, maximise standardisation and comply with project standards and control.
	10. Strong control. Being alert on extra work. Buy your own building material and do not let other do it. Control the leverage time and do regular inspections. Having capable people, people who are committed to the project and want to finish the work.
	11. The FEL is important, it is important to take notes of value business curve. Defining everything at the beginning of the project. Good team.
	12. Engineering and project Management organisation, Good communication and good process. Supervision.
	13. Short communication distance, disciplined engineering, Looking and striving for good quality.

Table 17: Interviewee own factors.

	Answers
Q: What are important factors in the future?	1. Scope changes trough mature scope change process and Authorities influence.
	2. Public acceptance and public relations
	3. Managing the authorities' ability will be more important in the future
	4. Surrounding/Environment license to operate plays an important role
	-
	6. Licensing, communication towards the public, and transparency towards the public.
	7. Safety, short decision lines and importance of a project.
	8. Project approval and project cost.
	9. Authorities regulations and influence on permits.
	10. Cost and defining new technologies.
	11. Less new project more brownfield project who can be complex.
	12. The prices of oil and gas.
	13. Authorities influence and public influence.

Table 18: Interviewee look on the future.

The factors that the interviewees mentioned were not that different from the factors that were present in the Q-sort. The major difference was the HSE factor (health, safety and environment). Further communication, clear definitions at the beginning of the project and good team were some of the frequently mentioned factors by the interviewees. This gives an impression that the people involved in the projects find the early phases of a project important. The factors that can be important in the future were also diverse. The authority's influence, what refers to the Dutch state and its legislations, the future cost of project and the price of the carbon fuels were other factors that were mentioned multiple times.

What is your view on EBN Involvement?

Finally, the interviewees from the operators were asked how they experienced the involvement of EBN in the projects. The majority of the respondents were positive, one could not answer that question due to not being involved in projects with EBN and two wanted more active involvement of EBN. This shows that EBN is on the right track with how it deals with operators and projects, because none of the operators felt that the involvement of EBN was negative.

6.2 Identified Perspectives

After the final interview was conducted, all of the Q-sorts were entered in the PQmethod program to identify the perspectives. Three perspectives were identified. In Table 19, the loading of each perspective is shown.

Significance of the loadings

To calculate the significance of the perspective, loading is done using the formula below. N is the number of factor statements that was used in the Q-sample, in this case N=34.

$SE=\frac{1}{\sqrt{N}}=0.17$

According to Brown (1980), factor loading, or in this case perspective loading, exceeding +/-2.58*(SE) is statistically significant at the 0.01 level. Perspectives that are significant at the 0.05 level need to exceed +/-1.96*(SE). Loading that is significant at the 0.01 level is marked with (*).
2.58*0.17=0.44 ($p<0.01$)
1.96*0.17=0.34 ($p<0.05$)

Significance of the perspectives

The PQmethod program does not define the number of perspectives that can be extracted; however, there are rules for extracting the number of perspectives and accepting them. According to Brown (1980), perspectives with an eigenvalue of 1.00 or higher should be rotated. The eigenvalue (EV) for each factor is calculated by taking the sum of the squares of the perspective loadings. For example, for factor one this is: $EV_1=(0.58)^2+ (0.589)^2+ (0.669)^2+ .....+ (0.738)^2=5.61$. In this way, only three perspectives will be left that are ready for rotation. After rotation, the perspectives can be accepted if they meet Humphrey's rule. Humphrey's rule states that if the cross product of the two highest loadings in a factor exceed 2*(SE)=0.34, then the perspective must be accepted (Brown, 1980).
In this sample three eigenvalues scored above the threshold of 1. These perspectives are rotated:
Perspective 1: 0.774*0.684=0.53 >0.34 is to be accepted.
Perspective 2: 0.8462*0.6649=0.562 >0.34 is to be accepted.
Perspective 3: 0.853*0.779=0.66 >0.34 is to be accepted.

Q-sample	Perspective 1	Perspective 2	Perspective 3
Resp.1	0.0782	0.8462*	0.1193
Resp.2	0.6510*	0.1940	0.2207
Resp.3	0.3134	0.6649*	0.2107
Resp.4	0.3076	0.2282	0.6811*
Resp.5	0.6848*	0.2037	0.0474
Resp.6	0.1771	0.6404*	0.3983
Resp.7	0.2748	0.6618*	0.1759
Resp.8	0.3036	0.0663	0.8532*
Resp.9	0.6736*	0.3448	0.2570
Resp.10	0.0914	0.2161	0.7074*
Resp.11	0.7748*	0.0217	0.2562
Resp.12	0.0480	0.4783	0.5984*
Resp.13	0.2202	0.2100	0.7796*

Table 19: Factor Loadings.

Table 19 shows that every respondent fits to a perspective. Respondent 1 to 6 are from EBN, respondents 7 to 13 are from the operators. Respondents 2, 5, 9 and 11 belong to perspective 1.

Respondent 1, 3, 6 and 7 belong to perspective 2 and respondents 4, 8, 10, 12, 13 belong to perspective 3. All perspectives are significant at $p<0.01$.

6.3 Distinguishing Statements

Before going deeper into what the perspectives mean, an intermediate step is needed. In this step, the distinguishing statements between the perspectives are clarified, which paves the way to explain the perspectives.

Table 20 gives the correlations between each pair of perspectives. This shows that the correlation between perspectives 1 and 2 (0.48) is nearly equal to that between 2 and 3 (0.50)

	Perspective 1	Perspective 2	Perspective 3
Perspective 1	1.00	0.4769	0.5471
Perspective 2	0.4769	1.00	0.5048
Perspective 3	0.5471	0.5048	1.00

Table 20: Correlation between Perspectives.

Difference between Perspective 1 and 2

The biggest difference between these two perspectives lies in the monitoring scope change. The CSF that had the least difference was defining new technology.

Factor Statement	Perspective 1	Perspective 2	Difference
31 Monitoring scope change	1.747	-0.890	2.637
3 Manage the Contracts	1.631	-0.159	1.790
28 Use of standard components	0.363	-1.386	1.749
17 Manage Cost	1.384	0.241	1.143
29 Standardize each procedure	-0.729	-1.649	0.919
16 Developing competent Project Team	1.218	0.318	0.899
13 Develop control mechanism and feedback system	0.856	0.085	0.771
27 Manage Authorities influence	0.506	-0.139	0.645
15 Developing Quality project Schedule and Plan	1.557	0.925	0.632
5 Define Activity	0.149	-0.408	0.556
32 Manage Client influence	-0.287	-0.820	0.534
18 Anticipate Weather instability	-1.165	-1.483	0.318
23 Estimate Cost	0.832	0.522	0.310
30 Project Manager Authority to control	-0.125	-0.341	0.216
20 Strict Adherence with project system	-0.523	-0.721	0.198
24 Define problems	-0.188	-0.304	0.116
25 Developing Team with diverse Background	0.068	-0.039	0.108
6 Define (New) Technology	-1.443	-1.361	-0.082
14 Estimate Activity time and duration	0.811	0.951	-0.140
1 Develop Risk Management plan	1.344	1.584	-0.241
21 Development Easy information transfer system	-0.759	-0.482	-0.277
33 Anticipate Market instability	-1.678	-1.373	-0.304
12 Using evidence based approach	-1.172	-0.713	-0.459
22 Anticipate Political instability	-2.114	-1.645	-0.469
34 Managing Communication between different parties	0.360	0.860	-0.499
10 Rational of project scope	-0.569	0.039	-0.608
2 Develop Project Definition Quality	0.425	1.092	-0.666
11 Ability of Formulating Solution for the Problems	-0.689	0.105	-0.794
9 Formulating Project Mission and strategy	0.085	1.429	-1.344
8 Achieve Consensus on projects decisions	-0.781	0.622	-1.404
26 Clear defining the Project definition	0.563	1.969	-1.406
4 Receive Top management Support	-0.304	1.167	-1.471
7 Develop a Resources planning strategy.	-0.201	1.351	-1.552
19 Allowing scope change trough mature scope change process.	-1.173	0.652	-1.825

Table 21: Difference between Perspective 1 and 2.

What can be seen from this comparison is that perspective 1 leans towards managing and monitoring the project, with low tolerance for change or adjustment of the project in the later stages. Perspective 2 leans more towards making clear definitions beforehand and sound planning in the early stages of the project.

Difference between Perspective 1 and 3

The CSF of rational of project scope was the one that had the biggest difference between these two perspectives. Estimating activity time and duration had the least difference.

Factor Statement	Perspective 1	Perspective 3	Difference
15 Developing Quality project Schedule and Plan	1.557	-0.110	1.667
31 Monitoring scope change	1.747	0.325	1.422
9 Formulating Project Mission and strategy	0.085	-1.264	1.349
13 Develop control mechanism and feedback system	0.856	-0.478	1.334
28 Use of standard components	0.363	-0.916	1.279
27 Manage Authorities influence	0.506	-0.518	1.024
29 Standardize each procedure	-0.729	-1.602	0.873
1 Develop Risk Management plan	1.344	0.541	0.803
3 Manage the Contracts	1.631	0.883	0.749
21 Development Easy information transfer system	-0.759	-1.366	0.607
2 Develop Project Definition Quality	0.425	-0.015	0.440
20 Strict Adherence with project system	-0.523	-0.962	0.439
7 Develop a Resources planning strategy.	-0.201	-0.602	0.400
17 Manage Cost	1.384	1.023	0.361
24 Define problems	-0.188	-0.318	0.130
32 Manage Client influence	-0.287	-0.317	0.031
22 Anticipate Political instability	-2.114	-2.134	0.020
14 Estimate Activity time and duration	0.811	0.800	0.011
25 Developing Team with diverse Background	0.068	0.112	-0.043
23 Estimate Cost	0.832	0.939	-0.107
4 Receive Top management Support	-0.304	-0.053	-0.250
33 Anticipate Market instability	-1.678	-1.384	-0.293
34 Managing Communication between different parties	0.360	0.839	-0.478
8 Achieve Consensus on projects decisions	-0.781	-0.292	-0.490
5 Define Activity	0.149	0.650	-0.501
11 Ability of Formulating Solution for the Problems	-0.689	0.097	-0.785
16 Developing competent Project Team	1.218	2.016	-0.798
12 Using evidence based approach	-1.172	-0.362	-0.810
18 Anticipate Weather instability	-1.165	-0.288	-0.877
6 Define (New) Technology	-1.443	-0.502	-0.941
30 Project Manager Authority to control	-0.125	1.003	-1.128
26 Clear defining the Project definition	0.563	2.066	-1.503
19 Allowing scope change trough mature scope change process.	-1.173	0.605	-1.778
10 Rational of project scope	-0.569	1.585	-2.154

Table 22: Difference between Perspective 1 and 3.

This comparison showed that perspective 3 leans towards the people involved in a project. Factors that are connected with planning estimation of cost and time come in lower.

Difference between Perspective 2 and 3

The biggest difference is in the CSF regarding formulating project mission and strategy. The CSF about the ability of formulating solutions for the problems had the least difference.

Factor Statement	Perspective 2	Perspective 3	Difference
9 Formulating Project Mission and strategy	1.429	-1.264	2.693
7 Develop a Resources planning strategy.	1.351	-0.602	1.953
4 Receive Top management Support	1.167	-0.053	1.221
2 Develop Project Definition Quality	1.092	-0.015	1.107
1 Develop Risk Management plan	1.584	0.541	1.043
15 Developing Quality project Schedule and Plan	0.925	-0.110	1.035
8 Achieve Consensus on projects decisions	0.622	-0.292	0.914
21 Development Easy information transfer system	-0.482	-1.366	0.884
13 Develop control mechanism and feedback system	0.085	-0.478	0.563
22 Anticipate Political instability	-1.645	-2.134	0.489
27 Manage Authorities influence	-0.139	-0.518	0.379
20 Strict Adherence with project system	-0.721	-0.962	0.241
14 Estimate Activity time and duration	0.951	0.800	0.151
19 Allowing scope change trough mature scope change process.	0.652	0.605	0.047
34 Managing Communication between different parties	0.860	0.839	0.021
24 Define problems	-0.304	-0.318	0.014
33 Anticipate Market instability	-1.373	-1.384	0.011
11 Ability of Formulating Solution for the Problems	0.105	0.097	0.008
29 Standardize each procedure	-1.649	-1.602	-0.047
26 Clear defining the Project definition	1.969	2.066	-0.097
25 Developing Team with diverse Background	-0.039	0.112	-0.151
12 Using evidence based approach	-0.713	-0.362	-0.351
23 Estimate Cost	0.522	0.939	-0.418
28 Use of standard components	-1.386	-0.916	-0.470
32 Manage Client influence	-0.820	-0.317	-0.503
17 Manage Cost	0.241	1.023	-0.782
6 Define (New) Technology	-1.361	-0.502	-0.859
3 Manage the Contracts	-0.159	0.883	-1.041
5 Define Activity	-0.408	0.650	-1.057
18 Anticipate Weather instability	-1.483	-0.288	-1.195
31 Monitoring scope change	-0.890	0.325	-1.215
30 Project Manager Authority to control	-0.341	1.003	-1.344
10 Rational of project scope	0.039	1.585	-1.546
16 Developing competent Project Team	0.318	2.016	-1.698

Table 23: Difference between Perspective 2 and 3.

6.4 Explanation of the Perspectives

This paragraph explains the three perspectives. With the help of the z-scores and arrays, the focus and meaning of each perspective is shown.

6.4.1 Perspective 1: Control the project

As previously mentioned, all the factors are significant at $p<0.01$. This perspective scored the highest with the factor statements number 31, 3, 15, 17 and 1 (see Table 24). Monitoring scope change and managing contracts have similar z-scores. This factor shows that to achieve success the focus has to be more on the execute phase of the project with good project team. Although this perspective also focusses on the developing of quality project schedule and plan, its score is lower than monitoring scope and managing contracts. The rest of the high scoring factors are mostly associated with the develop and execute phases.

The lowest scoring factors are 22, 33, 6, 19 and 12. Number 22 (anticipate market instability) and 33 (anticipate political instability) are the lowest. As the primarily focus of this factor being on monitoring change, whose effect can be manipulated or changed for the betterment of the project, it is not surprising that they score so low. Change in politics and the market can be monitored, but affecting it is difficult. This factor is shared by two people from EBN and two people from the operator side.

Factor Statement	Z-score	Array
31 Monitoring scope change	1.747	4
3 Manage the Contracts	1.631	4
15 Developing Quality project Schedule and Plan	1.557	3
17 Manage Cost	1.384	3
1 Develop Risk Management plan	1.344	3
16 Developing competent Project Team	1.218	2
13 Develop control mechanism and feedback system 13	0.856	2
23 Estimate Cost	0.832	2
14 Estimate Activity time and duration	0.811	2
26 Clear defining the Project definition 26	0.563	1
27 Manage Authorities influence	0.506	1
2 Develop Project Definition Quality	0.425	1
28 Use of standard components	0.363	1
34 Managing Communication between different parties	0.360	1
5 Define Activity	0.149	0
9 Formulating Project Mission and strategy	0.085	0
25 Developing Team with diverse Background	0.068	0
30 Project Manager Authority to control 30	-0.125	0
24 Define problems	-0.188	0
7 Develop a Resources planning strategy.	-0.201	0
32 Manage Client influence	-0.287	-1
4 Receive Top management Support	-0.304	-1
20 Strict Adherence with project system	-0.523	-1
10 Rational of project scope	-0.569	-1
11 Ability of Formulating Solution for the Problems	-0.689	-1
29 Standardize each procedure	-0.729	-2
21 Development Easy information transfer system	-0.759	-2
8 Achieve Consensus on projects decisions	-0.781	-2
18 Anticipate Weather instability	-1.165	-2
12 Using evidence based approach	-1.172	-3
19 Allowing scope change trough mature scope change process.	-1.173	-3
6 Define (New) Technology	-1.443	-3
33 Anticipate Market instability	-1.678	-4
22 Anticipate Political instability	-2.114	-4

Table 24: Perspective 1 Z-scores and arrays.

6.4.2 Perspective 2: Front end development

The second factor focusses mostly on factor statements that define the project and are used in the identification and selection phases. Factor statements number 26, 1, 9, 7 and 4 have the highest scores (see Table 25). Factor 26 (clearly defining the project definition) and number 1 (developing a risk management plan) are the two most important factor statements. The lowest score with this factor are assigned to factors 29, 22, 18, 28 and 33. Factors 29 (standardizing each procedure) and 22 (anticipation of political instability) score the lowest. Although this perspective clearly leans towards the first phase of the project, it still ranks weather instability, political instability and use of standard component scoring even lower than the market instability. On this perspective, three people from EBN and one from the operators scored high, meaning they lean towards this perspective. This perspective is the primary focus of EBN.

Factor Statement	Z-scores	Arrays
26 Clear defining the Project definition	1.969	4
1 Develop Risk Management plan	1.584	4
9 Formulating Project Mission and strategy	1.429	3
7 Develop a Resources planning strategy.	1.351	3
4 Receive Top management Support	1.167	3
2 Develop Project Definition Quality	1.092	2
14 Estimate Activity time and duration	0.951	2
15 Developing Quality project Schedule and Plan	0.925	2
34 Managing Communication between different parties	0.860	2
19 Allowing scope change trough mature scope change process.	0.652	1
8 Achieve Consensus on projects decisions	0.622	1
23 Estimate Cost	0.522	1
16 Developing competent Project Team	0.318	1
17 Manage Cost	0.241	1
11 Ability of Formulating Solution for the Problems	0.105	0
13 Develop control mechanism and feedback system	0.085	0
10 Rational of project scope	0.039	0
25 Developing Team with diverse Background	0.039	0
27 Manage Authorities influence	-0.139	0
3 Manage the Contracts	-0.159	0
24 Define problems	-0.304	-1
30 Project Manager Authority to control	-0.341	-1
5 Define Activity	-0.408	-1
21 Development Easy information transfer system	-0.482	-1
12 Using evidence based approach	-0.713	-1
20 Strict Adherence with project system	-0.721	-2
32 Manage Client influence	-0.820	-2
31 Monitoring scope change	-0.890	-2
6 Define (New) Technology	-1.361	-2
33 Anticipate Market instability	-1.373	-3
28 Use of standard components	-1.386	-3
18 Anticipate Weather instability	-1.483	-3
22 Anticipate Political instability	-1.645	-4
29 Standardize each procedure	-1.649	-4

Table 25: Perspective 2 z-scores and arrays.

6.4.3 Perspective 3: People are key

This factor focusses mainly on the project team and the people who are involved in this project and have influence on it. Factor statements 26, 16 10, 17 and 30 have the highest score. Factors 26 (clear definition of the project) and 16 (developing a competent project team) are the leading statements (see Table 26). Other factors statements that define the develop and execution phase well are 17 (manage the cost) and 10 (rationale of the project scope). The lowest factor statements are 22, 29 33, 21 and 9. Factor 22 (anticipating political instability) and 29 (standardisation of each procedure) have the lowest scores. The biggest difference of this perspective with others is Factor 18 (anticipating weather instability) having the highest place. Although this perspective ranks factor statements 3 (manage the contract) and 34 (managing communication between different parties) high in the list, it has the development of easy information transfer system as one of the lowest factor statements. For this perspective, the main respondents are from the operator side, with four respondents being from the operators and one from EBN.

Factor Statement	Z-scores	Arrays
26 Clear defining the Project definition	2.066	4
16 Developing competent Project Team	2.016	4
10 Rational of project scope	1.585	3
17 Manage Cost	1.023	3
30 Project Manager Authority to control	1.003	3
23 Estimate Cost	0.939	2
3 Manage the Contracts	0.883	2
34 Managing Communication between different parties	0.839	2
14 Estimate Activity time and duration	0.800	2
5 Define Activity	0.650	1
19 Allowing scope change trough mature scope change process.	0.605	1
1 Develop Risk Management plan	0.541	1
31 Monitoring scope change	0.325	1
25 Developing Team with diverse Background	0.112	1
11 Ability of Formulating Solution for the Problems	0.097	0
2 Develop Project Definition Quality	-0.015	0
4 Receive Top management Support	-0.053	0
15 Developing Quality project Schedule and Plan	-0.110	0
18 Anticipate Weather instability	-0.288	0
8 Achieve Consensus on projects decisions	-0.292	0
32 Manage Client influence	-0.317	-1
24 Define problems	-0.318	-1
12 Using evidence based approach	-0.362	-1
13 Develop control mechanism and feedback system	-0.478	-1
6 Define (New) Technology	-0.502	-1
27 Manage Authorities influence	-0.518	-2
7 Develop a Resources planning strategy.	-0.602	-2
28 Use of standard components	-0.916	-2
20 Strict Adherence with project system	-0.962	-2
9 Formulating Project Mission and strategy	-1.264	-3
21 Development Easy information transfer system	-1.366	-3
33 Anticipate Market instability	-1.384	-3
29 Standardize each procedure	-1.602	-4
22 Anticipate Political instability	-2.134	-4

Table 26: Perspective 3 z-scores and arrays.

6.4.4 Recapitulation

Now that all the factors statements have been analysed with the PQmethod, it is clear what factors the employee of EBN and of operators focus on. Three out of six employees of EBN focus on perspective 2 (front-end development), two on perspective 1 (control the project) and one on perspective 3 (people are key). This gives the impression that EBN tries to distribute its focus on all the phases of the project, but places more emphasis on the first two phases. The operators, on the other hand, have four out seven employees focus on perspective 3, two on perspective 1 and one on perspective 2. This shows that they are more focussed on the execution phase and developing a competent team in the first phases of the project and less on the overall development of the project. Their notion appears to be that the first phases are needed to establish a team that will be committed and motivated for all the phases of the project; however, they do not see the need to work out the project extensively and thus their focus shifts quickly from the first phases of the project to the last ones. This can be changed by letting EBN engage with operators more in the first phases of the project, so that not only the project team will be developed extensively but also the project itself.

From this analysis it can be concluded that the following 4 CSFs should be used by the NOP to end the project successfully.

- Project understanding
- Project definition quality
- Realistic project schedule and plan
- Resources planning

This factors are the ones that the operator tries to apply, however their attention to it is rather short, or sometimes even not sufficient. However this are the factors that should be applied critically and are also the factors that can be applied at the beginning of the project.

Appendix E describes the two case studies that were performed. These case studies answer the last sub question. The main conclusion that can be drawn from them is that no project can exist without any complications. The art of good planning is to realize that the CSFs that could contribute to a successful project need to be implemented at the beginning of the project. When problems arise during the first phases, a timely involvement of all the relevant parties is needed. Dragging those complications in the planning to the FID phase and starting to fix them in later phases will not result in a better project. The major influences that can be exercised by EBN are in the identification and select phases. If in those phases the CSFs can be applied properly, the project will have a more successful outcome. Although along the way some complication can arise, dealing with them in a timely way can reduce the cost and schedule overruns significantly.

7 Conclusion

The main research question of this thesis is: "How can a non-operating partner influence a project towards successful performance?"

To help answer this research question, four sub questions were formulated. The first sub question asked about the role and influence EBN and the operator have in a joint venture. From this research it became clear that EBN's biggest role lies in its advisory role and its major influence lies at the beginning of each project, mainly in the initiation and concept phases. This was also backed up by the literature examined in this thesis like Hutchinson and Wabeke, who stressed the importance of the front end loading *(Hutchinson & Wabeke, 2006).* In addition to this internal sources of EBN gave also a confirmation to this.

The second sub question was about what is seen as project success for a non-operating partner. A project is mainly seen as successful when the technical performance is achieved within budget and on time, which agrees with Baker, Murphy and Fisher (1988). Project success also needs to have a satisfied project mission. For EBN, this would mean achieving the planned hydrocarbon reserves, followed by a realistic future plan of the possible use of the infrastructure.

The third sub question investigated the CSFs that a non-operating partner needs to focus on to help improve project performance. Several CSFs came forward from the literature and project analysis. Those CSFs were used to set up the Q-set that was used in the Q-analysis. From that analysis, the CSFs can be summarised into three perspectives that describe the focus of the non-operating partner (EBN) and the operators. The perspectives are:

-Perspective 1: Control the project (focus on execution phase).
-Perspective 2: Front-end development (focus on identify and select phase).
-Perspective 3: People are key (focus on the people thought the whole project).

With these perspectives, the following CSFs come forward that EBN needs to focus on: Project understanding, project definition quality, realistic project schedule and plan and resources planning. If these CSFs are used, the chances of a successful project increase significantly. The use of these CSFs is advised for EBN due to the insufficient focus on them on the part of operators.

The last sub question asks about the phase in which the identified CSFs have the biggest impact. The answer for successful project performance lies in adequate use of CSFs and the use of these factors at the beginning of the project initiation and selection phases. In these phases, the parties can reduce the problems in the schedule and planning by using the aforementioned CSFs.

This research found that EBN tries to distribute its focus on all the phases of the project, with more emphasis on the first two phases. The operators, on the other hand, are more focussed on the execution phase and developing of good competent team in the first phases of the project and not much on the overall development of the project itself. Their notion is that the first phases are needed to establish a team that will be committed and motivated for all the phases of the project; however, they do not see the need to work out the project extensively and thus their main focus shifts quickly from the first phases of the project to the last ones. This can be changed by letting EBN engage with operators more in the first phases of the project, so that both the project team and the project itself will be developed extensively. However, there are also two operators that focus on perspective one and one on perspective two. Putting all operators into one category would be wrong and it is advised to keep in mind the diverse thinking of individual people and it should be noted that there is more overlap between EBN and the operators, than there are differences.

8 Recommendations

8.1 EBN

From the first case study it is clear that EBN was mostly involved in project when all major decisions, regarding the planning, time and budget were already made by the operator, which made it impossible for EBN to help steer the project in the right direction. Additionally, even when all the parties knew where the problems are, the improvement on those fronts did not result in a significant improvement of the project. In the second case study, some problems also arose; however, EBN was involved early in the project development and could advise and help steer the project towards the right path. This resulted in the project not having any major schedule or cost overruns, which could easily have happened if the recognition of the problems and involvement was done in the later stages of the project.

As stated before, it can be concluded that just mentioning or recognizing the CSFs is not enough. Most projects will have their own complications, whether the involved parties like it or not; however the essence off good planning is to realize that the CSFs that could contribute to a successful project need to be implemented in the early stages of the project, preferably in the identification and select phases or the so called FEL. When complications arise during the next phases, a timely involvement of all the relevant parties is needed, and the solution could have a much bigger positive influence than when it is taken in later stages. The major influence that can be exercised by EBN is in the identification phase and select phase. If in those phases the CSFs project understanding, project definition quality, realistic project schedule and plan, and resources planning can be properly integrated into the project planning, a more successful outcome can be achieved. Although along the way complications can arise by dealing with these CSFs on time, doing so can significantly reduce the cost and schedule overruns.

Due to the unique role that EBN fulfils in many different projects with many different operators, a unique perspective on how a project should be managed and steered can be gained by EBN. Even now, EBN possesses enough tools and information to give good advice on projects. The only difference between what is done now and how it should be done in the future is that this advice need be delivered not only at the beginning of the project, but also in collaboration with the operators. This is not only needed due to the fact that change at the beginning can deliver better outcome in later stages of the project, but also because if the operators work together with EBN and understand how EBN came up with this advice, they will take those consideration more seriously and will try to implement them better than they would by just getting a recommendation without knowing the reasons behind it.

In conclusion EBN should have early involvement in projects, try to recognise whether the CSFs are properly used and integrated into the planning, and give an explanation and background information for the advice to the Operator.

8.2 Further Research

The results and implications that are presented in this thesis can be used to improve the project outcome. However, the reader must keep in mind that the results in this thesis need more research. Further quantitative research should be conducted on this subject to get hard statistical data on the critical success factors focused on in this thesis. This will give support to the current evidence on this subject. Aside from this, further research should be conducted regarding knowledge sharing, processing feedback and developing tools.

Knowledge sharing

The interviews showed that the operators are willing to share knowledge and want to receive knowledge from EBN. Due to EBN's unique position, the knowledge of this company is highly valued by the operators. It is recommended to research methods on how to share EBN's knowledge with the operators, without oversharing private information of other operators. The knowledge EBN gains from different projects are stored, but it is not shared with others.

Processing feedback

Another point where some research needs to be conducted is on how to process feedback from the operators. Due to the advisory role of the NOP, a relevant feedback processing procedure is needed. As with most relationships, good communication is the key. This also applies with the relationship between the operators and the NOP. EBN cannot just give advice or dictate what it thinks is right only on their own information and research; its advice must be also based on the information that is given by the operators. That information can only be processed properly if the non-operating side has the right feedback processing procedure that would keep both parties open for dialog and discussion.

Developing tools

The interviews showed that the project managers had many years of experience and had relevant education to do the job. However, many projects did not go according to plan. This shows a lack of adequate modern tools, especially for predicting the NPV, time and duration of a project. Because the success of a project highly depends on how the first phases are followed, having the right tools to assist in the concept and select phase, where good prediction is the key are needed.

9 Reflection

Writing this thesis took more time than I expected. However, it was an experience I will never forget. I realized that I did not enjoy the process of research. I do not plan to continue a career in research, which I am sure my committee members will see as a wise decision. Although the process of starting and finishing this thesis was slow, I learned a lot from it. It gave me a unique view on the different mind-sets of the operators that are active in the Dutch E&P sector. This view will certainly benefit me in my future career and personal development.

Although it was difficult for me to start with the work, on the whole I enjoyed the research and writing and found that the work was much more manageable than I expected. This research could be divided into four parts. The first part is the planning of the thesis. Since the subject matter was already given, I could quickly start part 2, accumulating the relevant literature and information. Next, I started with part 3, which is conducting the research (including conducting the interviews) and writing the thesis. This phase had its own ups and downs due to my lack of experience in writing and lack of knowledge of scientific method. The last phase was to connect all the research points and reach a conclusion. This was a challenge on its own. The lack of structure in the previous phases and the small number of interviews I was able arrange made it difficult for me to reach an end to all this. But somehow I managed to do so, and looking back I think what I wrote could be seen as a contribution from my part to EBN.

Looking back at this experience, I can say it helped me move forward as a student. It helped me to think in a more structural way, make better presentations and plan better. Will this knowledge that I gained be of help in my professional life? I sincerely hope it will. However time will give us the answer.

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Appendix A

Interview

To find what the perspectives on what are the important CSFs are of the project managers regarding success, a mix of both open-ended also well as close-ended questions are going to be asked. This will enable to conduct the qualitative research.

The whole interview will be divided in to mainly five phases:

Phase 1: Interviewee background information.

1. What is your educational background?

2. How long is your working experience in this industry?

3. How many projects do you work on?

4. Can you describe their:
Size:
Investment:
Man-hours:
Complexity of the project regarding the organization and technology?

5. What are the team size, location and duration?

Phase 2: Before Q-sort.

At the start of the Q sort the following questions will be asked:

6. What is a successful project for you?

7. What factors can contribute to a successful project?

Phase 3: Q-sort execution.

In this phase the Q-sort is done. First the interviewee will be advised to make three decks of cards, one deck is negative the second neutral and third only positive, from that point on the interviewee will be advised to do the further sorting.

Phase 4: Questions after the Q-sort.

After the ranking of the Q-sort some additional questions may be asked:

8. Questions about the extremes: The interviewee must explain why application "X" is totally negative and application "Y" is totally on the right.

9. Why he/she changed her/his mind during the Q-sort about some applications.

Phase 5: Verification questions.

10. Would you like to mention something about the Q-sort that did not came in too question?

11. Are there any other applications that are not in the card desk, but that you think should be in there?

12. Could you please name some specific factors or circumstances that play a role in applying the applications in your own field?

13. This research is focusing on applications that are quite frequently applied today, can you explain on what applications we should focus in the future?

14. What is your view of the involvement of EBN in the projects?

Appendix B

Mathematical explanation of the Q-sort methodology.

Conducting the Q-sort.

In this thesis a PQmethod software is used to conduct all the calculations for the Q-sort, still an in depth understanding of the mathematics behind this methodology is needed to fully understand this methodology. In this appendix the mathematics that are behind this method are going to be explained with a small example.

The basis of the Q-sort methodology is the Q –sort technique. This includes the rank-ordering of a set of statements from agree to disagree. In this example a Q-sort will be conducted with 12 statements that will be placed on quasi-normal distribution ranging from +2 to most likely and -2 to most unlike. In this example two fictional characters, Mr. X. and Mr. Y who just had an operation will sort the 12 statements. In figure B.1 the two Q-sorts can be seen that was filled in by these interviewees. Of course in real Q-sort analysis more than two people will do the sorting. However to keep it simple just two are used in this example.

-2	**-1**	**0**	**1**	**2**
12	6	3	1	11
	2	8	7	
	4	5	10	
		9		

-2	**-1**	**0**	**1**	**2**
6	12	1	9	10
	2	7	8	
	5	4	11	
		3		

Figure B.1: Q-sort of Mr. X *Q-sort of Mr. Y.*

Calculation of the correlation.

When the Q-sort is filled in, the correlation between these two respondents can be calculated. In the table B.1 the information to calculate the correlation is given. S is the score each respondent has given and D is the difference between the scores of X and Y.

Statement	S_X	S^2_X	S_Y	S^2_Y	D_{XY}	D^2_{XY}
1	1	1	0	0	1	1
2	-1	1	-1	1	0	0
3	0	0	0	0	0	0
4	-1	1	0	0	-1	1
5	0	0	-1	1	-1	1
6	-1	1	-2	4	-1	1
7	1	1	0	0	1	1
8	0	0	1	1	1	1
9	0	0	1	1	1	1
10	1	1	2	4	1	1
11	2	4	1	1	1	1
12	-2	4	-1	1	-1	1
Sum	**0**	**14**	**0**	**14**	**2**	**10**

Table B.1: Information needed for the calculation of the correlation Between X and Y.
S: the score given by the respondent to the statement
D: The difference of the two score of the two respondents to that statement.

From the information in table XX the correlation between the Q-sorts can be calculated. The calculation is done by using the formula displayed in figure YY. The correlation can have a value between -1 and 1. The value of -1, shows that these two sorts are complete opposite each other and the value of 1 will tell that the two Q-sorts are exactly the same. Of course such extreme value never appear, the correlation will always lay somewhere in between.

$$r = 1 - \frac{\sum D^2}{\sum S_X^2 + \sum S_Y^2}$$

Formula XX: Correlation formula.
r: The correlation between Q sort X and Y
D: The difference between the statement scores of X and Y.
S: Score given to a statement by respondent

In this example the correlation between X and Y Q-sort will be as following. By using the formula XX the calculation will be:

$$r = 1 - \frac{10}{14 + 14}$$

r = 0.64

Now the method of how correlation between different Q-sort is calculated. It is time to broaden the example with 9 people who filled in the Q-sort, instead of just two. In this example the amount of statement used in the Q sort is 33. The calculation for each correlation is the same as was done in the above example. In table B.2 the correlation of those 9 people Q sorts is laid out. This example is Brown book from (1980), Political Subjectivity.

		Persons									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	$\sum r$
Persons	**1**	…	54	21	23	10	-23	-32	24	05	0.82
	2	54	…	-08	09	18	-03	-16	38	07	0.99
	3	21	-08	…	40	-54	09	05	-09	11	0.15
	4	23	09	40	…	-56	28	17	06	03	0.70
	5	10	18	-54	-56	…	-06	-13	02	-03	-1.02
	6	-23	-03	09	28	-06	…	62	-37	-21	0.09
	7	-32	-16	05	17	-13	62	…	-29	-03	-0.09
	8	24	38	-09	06	02	-37	-29	…	-21	-0.26
	9	05	07	11	03	-03	-21	-03	-21	…	-0.22
	$\sum r$	0.82	0.99	0.15	0.70	-1.02	0.09	-0.09	-0.26	-0.22	1.16

Table B.2: Correlation and factor matrices.
The correlation has decimals omitted to two places.

In the table it can be seen that the diagonal line is doted, there you have to take the correlation of Q-sort with itself, what will result in in correlation of 1. And of course the first column of correlation is the same as the first row correlation due to the fact that $r_{1,2} = r_{2,1}$, as the correlation of the other pairs. Now the matrix is 9x9=81 entries, however the diagonal is all 1 this can be removed and because one half is the same as the other half below the diagonal the formula to calculate the total coefficient become $\frac{1}{2}$(n)(n-1). This gives 36 coefficients that need to be calculated.

The next in the step will be to conduct the factor analysis. In this thesis the use of *centroid* method is explained as it called by Thurstone (1947), or *simple summation* method as called by Burt (1940).

The first step in factoring begins from the correlations that were calculated in the previous step. The sum of the all table is positive and sums up to r_s = 1.16. The data from this table will be used in the factor analysis.

Factor Analysis

The step of factor analysis is nothing more than a general method for classifying variables. In R method the variables are tests or traits; in this case the variable are Q sorts. In short this will show the groups of some people who have filled in the Q-sort similar to each other. If two persons are like minded on a topic, their Q-sort will be similar and they will both end up on the same factor. In conclusion they classify themselves on their own terms with emerge as factors. They are natural complexes as Buchler said, this is manifestations of actual thinking defined operationally in terms of concrete human behaviour.

It is important for the final set of characteristic of the final set of factors is that they should account for as much of the variability as possible. This depends on the magnitude of the columns totals which in turn depends on the size of the individual correlations between the respondents. Therefore prior to the factor analysis, it is important to render the entire matrix as positive as feasible, i.e. to maximize the manifold and that the columns have no negative sum. This manipulation of the numbers will be undone at the conclusion.
Positive manifold is achieved by reversing all of the signs in columns and rows associated with specific variables. This is called reflection.
We start with the reflection of the sum in column 5, where is has the biggest negative value of -1.02. By changing the signs in the column 5 will also affect other columns, so those columns must also be reflected as can be seen in table B.3. The * sign means that row is reflected.

	1	2	3	4	5	6	7	8	9	Matrix Total
(1) ∑r	0.82	0.99	0.15	0.7	-1.02	0.09	-0.09	-0.26	-0.22	1.16
(2) ∞5	0.62	0.63	1.23	1.82	1.02	0.21	0.17	-0.30	-0.16	5.24
(3) ∞8	0.14	-0.13	1.41	1.70	1.06	0.95	0.75	0.30	0.26	6.44
(4) ∞2	-0.94	0.13	1.57	1.52	1.42	1.01	1.07	1.06	0.12	6.96
(5) ∞1	0.94	1.21	1.15	1.06	1.62	1.47	1.71	1.54	0.02	10.72

Table B.3: Matrix total after reflection.

The reflected correlations are now added to the previous table to form the new table XX. The r in the diagonal are still empty and they need to be estimated before the factor analysis starts. Because it is doubtful that any person in real life filling in the Q-sort will come up with the same ranks of the statements. For this example the average r of the diagonal entry will be accepted. In column one, the sum of correlations is $\sum r_1$=0.94 and the mean $\bar{r}_1$=0.94/8=0.12. The total (t) for each column is now the old total plus the diagonal entry. For example columns 1 $t_{1,1}=\sum r_1+\bar{r}_1$=0.94+0.12=1.06. The same is done for the other columns. To extract the first factor a factor loading is needed to be calculated. This is done by using the following formula: $f1{,}1 = \frac{t1{,}1}{\sqrt{T1}}$= 1.06/3,47=0.31 and for $f_{1,2}$=1.36/3.47=0.39. This calculations need to be done till for each column the difference between $\bar{r}$ and f^2_1 is equal to 0.02 or even smaller. As can be seen the first row there is discrepancy in column 5, 6, 7 and 8. So more factor loading estimates are needed. The new columns are calculated by replacing $\bar{r}$ by the revised estimate of $f^2_{1.}$ The new column $t_2=\sum r+f^2_{1.}$ The rest of the calculation is done the same. After a lot of computation finally the loadings in row f_4 are such that f^2_3 are the same in each case. This way the interaction process is done and the figure of the last row are accepted as the loading for the first factor. This factor will be referred as factor A.

	1	2	3	4	5	6	7	8	9	
1	…	54	-21	-23	10	23	32	24	-05	
2	54	…	08	-09	18	03	16	38	-07	
3	-21	08	…	40	54	09	05	09	11	
4	-23	-09	40	…	56	28	17	-06	03	
5	10	18	54	56	…	06	13	02	03	
6	23	03	09	28	06	…	62	37	-21	
7	32	16	05	17	13	62	…	29	-03	
8	24	38	-09	-06	02	37	29	…	21	
9	-05	-07	11	03	03	-21	-03	21	…	
$\sum r$	0.94	1.21	1.15	1.06	1.62	1.47	1.71	1.54	0.02	
$\bar{r}$	0.12	0.15	0.14	0.13	0.20	0.18	0.21	0.19	0.00	
t_1	1.06	1.36	1.29	1.19	1.82	1.65	1.92	1.73	0.02	$12.04=T_1$
f_1	0.31	0.39	0.37	0.34	0.52	0.48	0.55	0.50	0.01	$3.47=\sqrt{T_1}$
f_1^2	0.1	0.15	0.14	0.12	0.27	0.23	0.30	0.25	0.00	$F_1=t_1/\sqrt{T_1}$
t_2	1.04	1.36	1.29	1.18	1.89	1.70	2.01	1.79	0.02	$12.28=T_2$
f_2	0.3	0.39	0.37	0.34	0.54	0.49	0.57	0.51	0.01	$3.50=\sqrt{T_2}$
f_2^2	0.09	0.15	0.14	0.12	0.29	0.24	0.32	0.26	0.00	$F_2=t_2/\sqrt{T_2}$
t_3	1.03	1.36	1.29	1.18	1.91	1.71	2.03	1.80	0.02	$12.33=T_3$
f_3	0.29	0.39	0.37	0.34	0.54	0.49	0.58	0.51	0.01	$3.51=\sqrt{T_3}$
f_3^2	0.08	0.15	0.14	0.12	0.29	0.24	0.34	0.26	0.00	$F_3=t_3/\sqrt{T_3}$
t_4	1.02	1.36	1.29	1.18	1.91	1.71	2.05	1.80	0.02	$12.34=T_4$
f_4	0.29	0.39	0.37	0.34	0.54	0.49	0.58	0.51	0.01	$3.51=\sqrt{T_4}$
f_4^2	0.08	0.15	0.14	0.12	0.29	0.24	0.34	0.26	0.00	$F_4=t_4/\sqrt{T_4}$

Table B.4: Calculation of the factor loadings.

The factor loadings, or saturations, for factor A (row *14)* are interpreted as follows: given the configuration of correlation coefficients in table 29, including reflections, there exists an underlying dimension (factor) such that Q sort 1 will correlate with factor A by an amount equal to its factor loading, i.e., $r_{1,A}$ = 0.29; no. 2 will correlate $r_{2,A}$ = 0.39; and so forth. The question that needs to be answered is what will be the amount of *residual correlation* remaining between Q sorts 1 and 2 after subtracting out the effect on them both of factor A? The general formula for removing the effect of a factor from a correlation matrix is $r_{1,2\cdot A} = r_{1,2} - f_{1,A} f_{2,A}$. The residual for $r_{1,2.A}$ can be calculated as follows: $r_{1,2.A}$ = 0.54 - (0.29 x 0.39) = 0.54 - 0.11= 0.43. The residual for the Q sorts 1 and 4 is done the same way:

$r_{1,3*A}=r_{1,3} - f_{1,A} f_{3,A}$

= –0.21– (0.29x0.37)= –0.21– 0.11

= –0.32

And for nos. 4 and 9,

$r_{4,9*A}$ = 0.03 – (0.34 x 0.01)

= 0.03

The same is done for the other pairs as can be seen in table B.5. The residuals provide general smaller correlation from which a second factor can be extracted. If all Q sorts were virtually identical, as a reflection of similarity in attitude among the subjects, then the extraction of a single factor would have reduced all the residuals to near zero. However in this example it can be seen that there are a many residuals in excess of +/- 0.30. This indicates that there can another factor that can be extracted or even a third.

	∞1	∞2	3	4	∞5	6	7	∞8	9	Factor A
1	…	54 11 43	-21 11 -32	-23 10 -33	10 16 -06	23 14 09	32 17 15	24 15 09	-05 00 -05	29
2		…	08 14 -06	-09 13 -22	18 21 -03	03 19 -16	16 23 -07	38 20 18	-07 00 -07	39
3			…	40 13 27	54 20 34	09 18 -09	05 21 -16	09 19 -10	11 00 11	37
4				…	56 18 38	28 17 11	17 20 -03	-06 17 -23	03 00 03	34
5					…	06 26 -20	13 31 -18	02 28 -26	03 01 02	54
6						…	62 28 34	37 25 12	-21 00 -21	49
7							…	29 30 -01	-03 01 -04	58
8								…	21 01 20	51
9									…	01

Table B.5: Calculation of First Residuals.

To extract another factor the same method is used as for factor A. The first residuals are put in the table B.6 followed by the reflection of the first residuals.

	1	2	3	4	5	6	7	8	9	A
1	…	43	32	33	-06	-09	-15	09	05	-29
2	43	…	06	22	-03	16	07	18	07	-39
3	32	06	…	27	-34	-09	-16	10	11	37
4	33	22	27	…	-38	11	-03	23	03	34
5	-06	-03	-34	-38	…	20	18	-26	-02	-54
6	-09	16	-09	11	20	…	34	-12	-21	49
7	-15	07	-16	-03	18	34	…	01	-04	58
8	09	18	10	23	-26	-12	01	…	-20	-51
9	05	07	11	03	-02	-21	-04	-20	…	01

Table B.6: First Residuals.

The residuals in table B.6 are presented with the loadings of factor A. Before factoring it is necessary to maximize positive manifold in the table of the first residuals, like it was done previously. This reflection is done in table B.7

	1	2	3	4	5	6	7	8	9	Matrix Total
(1) ∑r	0.92	1.16	0.27	0.78	-071	0.30	0.22	0.03	-0.21	2.76
(2) ∞5	1.04	1.22	0.95	1.54	0.71	-0.10	-0.14	0.55	-0.17	5.60
(3) ∞7	1.34	1.08	1.27	1.60	1.07	-0.78	0.14	0.53	-0.09	6.16
(4) ∞6	1.52	0.76	1.45	1.38	1.47	0.78	0.82	0.77	0.33	9.28

Table B.7: Reflection of First Residuals.

The same computation that was done previously is now done for the factor B. This will result that the factor will have its own loading. This method is repeated several times as long as there are residuals left that are significant. In table B.8 a few factors are defined that way.

	A	B	C	D	E	F	G
1	-29	56	28	38	14	08	10
2	-39	25	54	26	02	23	14
3	37	53	-07	-03	14	03	-04
4	34	50	23	-22	13	19	11
5	-54	-54	10	38	09	-26	15
6	49	-26	50	-21	38	-27	14
7	58	-28	32	-13	13	-04	02
8	-51	26	15	-19	-26	13	21
9	01	10	-20	22	29	13	-23

Table B.8: Factor loadings.

The number of factors now is now 7, however not all factors should be accepted. A method for determining the numbers of factors can be done with Standard Error. The standard error of zero-order loading is given by: $\mathrm{SE} = \frac{1}{\sqrt{\mathrm{N}}}$ here the N is the amount of statements which makes it 33.

$\mathrm{SE_r} = \frac{1}{\sqrt{33}} = 0.17$. For a loading to be significant at the level of 0.01 it must exceed $2.58(\mathrm{SE_r})=0.45$.

With this rule only factors A, B, C are significant since they each contain at least two loadings in excess of 0.45. You can also use the rule of 0.05 level therefore the loadings should exceed $1.96(\mathrm{SE_r})=0.35$ are significant. With this standard factor D is also acceptable.

Factor Rotation.

The next step is to rotate the factors. This rotation is also usually done by the software program and is incorporated in the technical phase. Mostly done with Varimax Quarimax or some other statistical routine rotating the original factors to a mathematically precise solution. To start with, the factor A and B are used.

	A_o	**B_o**
1	-29	56
2	-39	25
3	37	53
4	34	50
5	-54	-54
6	49	-26
7	58	-28
8	-51	26
9	1	10

Table B9: Loadings

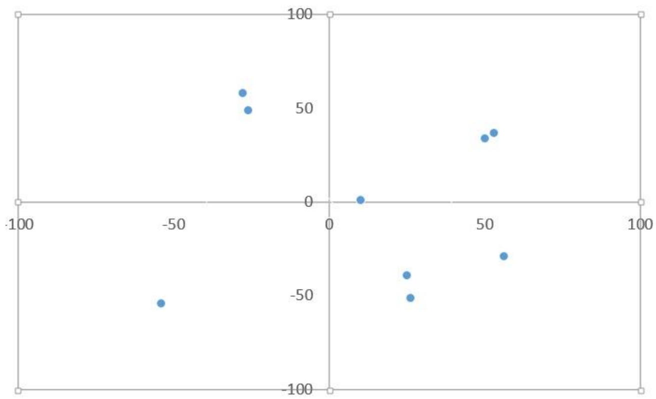

Figure B.2: Locations of variants.

In figure B.2 the original factor loadings are presented in to the diagram. The factor matrix shows A_o and B_o having very nearly in simple structure. The variants of 1, 3, 4, 6, 7 and 8 have a significant loadings on one factor only (with saturation exceeding +/-0.45 being considered significant with p<0.01). Number 5 is a mixed case and number 2 and 9 are null cases. This picture of figure B.2 can be improved by slightly rotating it counter clockwise with -31 degrees. With this rotation it is possible to take new latitude reading so as to specify variant locations in terms of the new coordinate system, A_1,B_1. The new loading can be seen in table B.10 with the rotated figure of 3 now in figure B.3. This way variables from 1 to 8 are included with also no. 5 being defined by a single factor and with saturations in all instances being higher. This way the matrix demonstrates simple structure. This method is not as random as it may seems on the first glance, by comparing the cross-product for the original factors and the rotated this can be shown.

Original: $f_{1,A}\,f_{2,A}+f_{1,B}\,f_{2,B} = (-0.29)(-0.39)+(0.56)(0.25) = 0.25$

Rotated: $f_{1,A}\,f_{2,A}+f_{1,B}\,f_{2,B} = (-0.53)(-0.46) + (0.33)(0.02) = 0.25$

This also holds for the other rotations. The points are not moved around, only the vantage point from which the relationships are observed.

	A_1	B_1
1	-53	33
2	-46	02
3	05	64
4	04	60
5	-18	-74
6	55	03
7	64	05
8	-57	-04
9	-04	09

Table B.10.

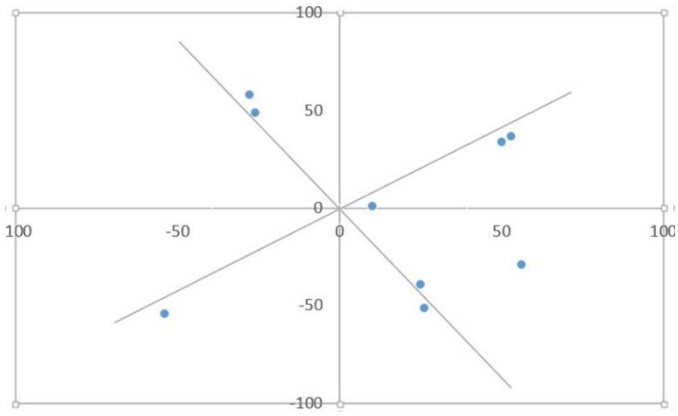

Figure B.3: rotated matrix

By doing this rotation it is possible to do another rotation with the new factor loadings of A_1 with that of the original factor C_0. What will give another factor loadings with little or no polarities. You can do this kind of rotations endlessly. However in table B.11 the factors solution is shown. With subjects 6 and 7 defining factor A, subject 3 to 5 defining B and subjects 1 and 2 defining factor C, Subject 8 is mixed, his response being partly associated with factor C and partly the reverse of A and subject 9 does not belong to any factors here.

Subjects	A_3	B_4	C_3	h^2
1 US	-21	26	60	47
2 US	-05	-01	78	61
3 US	05	64	-07	41
4 US	19	65	20	50
5 Japan	-05	-82	19	71
6 Canada	82	04	03	67
7 Britain	71	04	-13	52
8 US	-45	-02	46	41
9 France	-04	12	-09	02
Eigenvalues %Total variance	1.5 16.1	1.6 17.6	1.3 14.3	4.3 48.0

Table B.11: Rotated Centroid.

11 Appendix C

Factors	Literature Source								
	Morris & Hough, (1987)	Pinto and Slevin, (1987)	Belassi & Tukel (1996)	Cooke-Davies (2002)	Baccarini & Collins (2003)	Zwikael & Globerson (2006)	Bakker et al., (2010)	E. Merrow (2011-2012)	Total Score
1. FEL: Identify, Select, Define	1	0	0	0	1	1	0	1	3
2. Project definition	1	0	1	0	1	1	0	1	5
3. Attitudes	1	0	0	0	0	0	0	0	1
4. Top management support organizational structure	0	1	1	0	1	0	0	0	3
5. Functional managers' support	0	0	1	0	0	0	0	0	1
6. Adequate company-wide education on risk management concept	0	0	0	1	0	0	0	0	1
7. Assign risk ownership	0	0	0	1	0	0	0	0	1
8. Adequate visible risk register	0	0	0	1	0	0	0	0	1
9. Proper vision of owner	0	0	0	0	0	0	1	0	1
10. Fit for purpose	0	0	0	0	0	0	1	0	1
11. Experience	0	0	0	0	0	0	1	0	1
12. Culture	0	0	0	0	0	0	1	0	1
13. Early involvement	0	0	0	0	0	0	1	1	2
14. The project objectives are clear that are shared with the team	1	1	1	0	0	0	0	1	4
15. Strategy	1	1	0	1	0	0	0	1	4
16. Project Understanding	1	0	1	0	1	0	0	1	4
17. Schedule	1	1	1	0	0	1	0	1	5
18. Project mission	0	1	0	0	1	0	1	1	4
19. Top management support	0	1	1	1	1	0	0	0	4
20. Project schedule and plans	1	1	1	1	1	1	1	1	8
21. Client consultation	0	1	1	0	0	0	0	1	3
22. Size	0	0	1	0	0	0	0	0	1
23. Value	0	0	1	0	0	0	0	0	1
24. Uniqueness of project activities	0	0	1	0	1	0	0	0	2
25. Density	0	0	1	0	0	0	0	0	1
26. Life cycle	0	0	1	0	0	0	0	0	1
27. Urgency	0	0	1	0	0	0	0	0	1
28. Staff acquisition	1	1	1	0	1	1	1	1	7
29. Team Building	0	0	1	0	1	0	1	0	3
30. Team composition	1	1	1	0	1	0	1	1	6
31. Authority or leadership	0	0	1	0	1	0	1	1	4
32. Strong owner dominated integrated project team	0	0	0	0	0	0	0	1	1
33. The future operator is included	0	0	0	0	0	0	0	1	1
34. Communication	1	1	1	0	1	1	1	0	6
35. Control	1	0	0	0	1	0	0	1	3
36. Personnel	1	1	1	0	1	0	1	1	6
37. Monitoring and feedback	1	1	0	0	1	0	0	1	4

Table C.1 Factor Scores.

Factors	Literature								
	Morris & Hough, (1987)	Pinto and Slevin, (1987)	Belassi & Tukel (1996)	Cooke-Davies (2002)	Baccarini & Collins (2003)	Zwikael & Globerson (2006)	Bakker et al., (2010)	E. Merrow (2011-2012)	Total amount
38. Organization	1	0	0	0	0	1	0	0	2
39. Contract	1	0	0	0	0	0	1	0	2
39. Non-Aggressive schedule planning	1	1	0	0	0	1	0	1	4
40. Continuity of project leadership	0	0	0	0	0	0	0	1	1
41. Project has a realistic plan and schedule	1	1	0	0	0	1	0	1	4
42. Contracting	1	0	0	0	0	1	1	0	3
43. Time estimate	0	0	0	1	1	0	1	0	3
44. Cost estimate	1	0	0	0	1	1	1	1	5
45. Cost budgeting	1	0	0	0	0	1	0	0	2
46. Cost estimating	1	0	0	0	1	1	1	1	5
47. Resource planning	1	0	0	0	1	1	1	0	4
48. Schedule development	1	1	0	0	0	1	0	1	4
49. Communications planning	1	1	1	0	1	1	1	0	6
50. Procurement planning	0	0	0	0	0	1	0	0	1
51. Quality planning	0	0	0	0	0	1	0	1	2
52. Activity duration estimate	0	0	1	0	0	1	0	0	2
53. Activity definition	0	0	1	0	0	1	0	0	2
54. Scope definition	0	0	0	0	0	1	0	0	1
55. Scope planning	0	0	0	0	0	1	0	0	1
56. Project plan development	0	1	0	0	0	1	0	1	3
57. Project team	0	0	1	0	1	0	1	1	4
58. Manager	0	0	1	0	1	0	0	0	2
59. Finance	1	0	0	0	1	1	1	1	5
60. Implementation	1	0	0	0	0	0	0	0	1
61. Strong control mechanisms.	1	0	0	0	1	0	0	1	3
62. SHE Compliance	0	0	0	0	0	0	1	0	1
63. SHE support	0	0	0	0	0	0	1	0	1
64. Trust	0	0	0	0	0	0	1	0	1
65. Technical challenges	0	0	0	0	0	0	1	1	2
66. Resources	1	0	0	0	1	1	1	0	4
67. Time management	0	0	0	1	0	0	1	0	2
68. Cost Management	0	0	0	0	0	1	1	0	2
69. Risk Management	0	0	0	1	1	1	1	0	4
70. Risk management planning	0	0	0	1	1	1	1	0	4
71. Activity sequencing	1	0	1	0	1	1	0	1	5
72. Portfolio and Program management	0	0	0	1	0	0	0	0	1
73. Resource management	1	0	0	0	1	1	1	0	4
74. Project Cost Index (PCI)	0	0	0	0	0	0	0	1	1

Table C.2: Factor Scores.

Factors	Literature Sources								
	Morris & Hough, (1987)	Pinto and Slevin, (1987)	Belassi & Tukel (1996)	Cooke-Davies (2002)	Baccarini & Collins (2003)	Zwikael & Globerson (2006)	Bakker et al., (2010)	E. Merrow (2011-2012)	Total amount
74. Technical tasks	0	1	0	0	0	0	1	1	3
75. Market	1	0	1	0	1	0	1	0	4
76. Authorities	1	0	1	0	1	0	1	0	4
77. Stability	1	0	1	0	1	0	1	0	4
78. Rework & Scope Change	0	0	0	1	0	0	1	0	2
79. Information flow	1	1	0	0	1	1	1	0	5
80. Updated risk management plan	0	0	0	1	1	1	1	0	4
81. Learning organization	0	0	0	1	0	0	0	0	1
82. Project, program and portfolio performance and feedback system	0	1	0	1	0	0	0	0	2
83. Competitors	0	0	1	0	0	0	0	0	1
84. Client	0	1	1	0	1	0	0	0	3
85. Economic environment	1	0	1	0	1	0	1	0	4
86. Political environment	0	0	1	0	1	0	0	0	2
87. Troubleshooting	0	1	1	0	1	0	0	0	3
88. Communication	1	1	1	0	1	1	1	0	6
89. Client acceptance	0	1	0	0	0	0	0	0	1
90. Competent Project Team	0	0	1	0	1	0	0	1	3
92. Problem Solving	0	1	1	0	1	0	0	0	3
93. External Factors	1	0	1	0	1	0	1	0	4
94. Project Managers Authority	0	0	1	0	1	0	0	0	2
95. Stakeholder Involvement	0	0	0	0	1	0	0	0	1
96. Top management Support	0	1	1	0	1	0	0	0	3
97. Project Planning	0	1	0	0	0	1	0	0	2
98. Teamwork	0	0	1	0	1	0	0	1	3
99. Resources	1	0	0	0	1	1	1	0	4
100. Risk Management	0	0	0	1	1	1	1	0	4
101. Client Involvement	0	1	0	0	1	0	0	0	2
102. Adequate Project Control	1	0	0	0	1	0	0	1	3
103. Realistic Time & Cost Estimates	0	0	0	0	1	0	1	0	2
104. Existence of effective benefit delivery and management process	0	0	0	1	0	0	0	0	1
105. Critical factors to an individual project success	0	0	0	1	0	0	0	0	1
106. Maintaining the performance measurement baseline	0	0	0	1	0	0	0	0	1
107. Allowing changes to scope only through a mature scope change process	0	0	0	1	0	0	1	0	2
108. Keeping project within short time constrain.	0	0	0	1	0	0	0	0	1
109. Human qualities	1	1	1	0	1	0	0	0	4
110. External factors	1	0	1	0	1	0	1	0	4
111. VIP	0	0	0	0	0	0	0	1	1
112. Team Development Index (TDI)	0	0	1	0	0	0	1	1	3

Table C.3: Factor Scores.

Scores		
1	2-4	5-8
3. Attitudes 5. Functional managers’ support 6. Adequate company-wide education on risk management concept 7. Assign risk ownership 8. Adequate visible risk register 9. Proper vision of owner 10. Fit for purpose 11. Experience 12. Culture 22. Size 23. Value 25. Density 26. Life cycle 27. Urgency 32. Strong owner dominated integrated project team 33. The future operator is included 40. Continuity of project leadership 50. Procurement planning 54. Scope definition 55. Scope planning 60. Implementation 62. SHE Compliance 63. SHE support 64. Trust 72. Portfolio and Program Management 74. Project Cost Index (PCI) 81. Learning organization 83. Competitors 89. Client acceptance 95. Stakeholder Involvement 105. Critical factors to an individual project success 106. Maintaining the performance measurement baseline 108. Keeping project within short time constrain. 111. VIP	1. FEL 4. Top management support organizational structure 13. Early involvement 14. The project objectives are clear that are shared with the team 15. Strategy 16. Project Understanding 18. Project mission 19. Top management support 21. Client consultation 24. Uniqueness of project activities 29. Team Building 31. Authority or leadership 35. Control 37. Monitoring and feedback 38. Organization 39. Contract 39. Non-Aggressive schedule planning 41. Project has a realistic plan and schedule 42. Contracting 43. Time estimate 45. Cost budgeting 47. Resource planning 48. Schedule development 51. Quality planning 52. Activity duration estimate 53. Activity definition 56. Project plan development 57. Project team 58. Manager 61. Strong control mechanisms 65. Technical challenges 66. Resources 67. Time management 68. Cost Management 69. Risk Management 70. Risk management planning 73. Resource management 74. Technical tasks 75. Market 76. Authorities 77. Stability 78. Rework & Scope Change 80. Updated risk management plan 82. Project, program and portfolio performance and feedback system 84. Client 85. Economic environment 86. Political environment 87. Troubleshooting 90. Competent Project Team 92. Problem Solving 93. External Factors 94. Project Managers Authority 96. Top management Support 97. Project Planning 98. Teamwork 99. Resources 100. Risk Management	2. Project definition 17. Schedule 20. Project schedule and plans 28. Staff acquisition 30. Team composition 34. Communication 36. Personnel 44. Cost estimate 46. Cost estimating 49. Communications planning 59. Finance 71. Activity sequencing 79. Information flow 88. Communication

	101. Client Involvement 102. Adequate Project Control 103. Realistic Time & Cost Estimates 107. Allowing changes to scope only through a mature scope change process 109. Human qualities 110. External factors 112. Team Development Index (TDI)	

Table C.4: Factors rearrangement based on scores.

CSFs that have a score of 1 will be removed, because they are not relevant enough to take them in to the Q-set. Factors with score of 2 or higher are taken in to account and analysed further. In this analysis CSF who have an overlap with each other are reformulated.

Critical Success Factor that Overlap	Critical Success Factors Reformulated
45. Cost budgeting, 68. Cost Management, 44. Cost estimate, 46. Cost estimating, 59. Finance 103. Realistic Time & Cost Estimates	Estimate cost Manage cost
2. Project definition 16. Project Understanding 14. The project objectives are clear that are shared with the team 15. Strategy 18. Project mission	Clear defining the project Formulating project mission and strategy
1. FEL 13. Early involvement	Develop project definition quality
36. Personnel 30. Team composition 28. Staff acquisition 57. Project team 29. Team Building 58. Manager 90. Competent Project Team 98. Teamwork 112. Team Development Index (TDI) 109. Human qualities	Developing competent team Developing team with diverse background
19. Top management support 4. Top management support organizational structure 96. Top management Support	Receive top management support
17. Schedule 20. Project schedule and plans 56. Project plan development 48. Schedule development 51. Quality planning 39. Non-Aggressive schedule planning 41. Project has a realistic plan and schedule 97. Project Planning	Developing qualitative project schedule and plan
39. Contract 42. Contracting	Manage the contracts.
34. Communication 49. Communications planning 88. Communication 79. Information flow	Managing communication between different parties Development easy information transfer system.
75. Market 76. Authorities 85. Economic environment 77. Stability 86. Political environment	Anticipate market instability Anticipate political instability Manage authorities influence

93. External Factors	
31. Authority or leadership 35. Control 61. Strong control mechanisms 94. Project Managers Authority 37. Monitoring and feedback 102. Adequate Project Control	Set up control mechanism system Project manager authority to control
69. Risk Management 70. Risk management planning 80. Updated risk management plan 100. Risk Management	Develop risk management plan
21. Client consultation 84. Client 101. Client Involvement	Manage client influence
52. Activity duration estimate 43. Time estimate 67. Time management 53. Activity definition 24. Uniqueness of project activities 71. Activity sequencing 103. Realistic Time & Cost Estimates	Estimate activity time and duration Define activity
65. Technical challenges 74. Technical tasks	Understanding new technology
66. Resources 73. Resource management 47. Resource planning 99. Resources	Develop a resources planning strategy
78. Rework & Scope Change 82. Project, program and portfolio performance and feedback system 38. Organization 107. Allowing changes to scope only through a mature scope change process	Monitoring scope change Develop feedback system
87. Troubleshooting 92. Problem Solving	Define problems Formulating solution for the problems

Table C.5: Reformulating Critical Success Factor.

Major Critical Success Factor Domain	**Critical Success Factors**
Common investment Objectives	1. Clear defining the project definition 2. Formulating project mission and strategy 3. Estimate activity time and duration 4. Define activity 5. Define (new) technology 6. Develop project definition quality
Targets	7. Developing qualitative project schedule and plan 8. Develop a resources planning strategy 9. Estimate cost 10. Manage cost
Scope	11. Monitoring scope change
Execution	12. Develop risk management plan 13. Manage the contracts 14. Define problems 15. Formulating Solution for the problems
External	16. Anticipate political instability 17. Anticipate market instability 18. Manage client influence 19. Manage authorities influence
Project Organization	20. Managing communication between different parties 21. Development easy information transfer system 22. Set up control mechanism 23. Set up feedback system 24. Developing competent team 25. Developing team with diverse background 26. Receive top management support 27. Project manager authority to control

Table C.6: CSFs derived from the Literature study.

Appendix D

Project Code and description	Before/After 2009	Overrun/Under run of Initial investment in %.	Reason for the Cost overrun
1) Onshore project	After	Overrun Overrun	Insufficient definition of FID More work due to the changed scope after tender Underestimation of the budget due to specific work Incomplete preparation Small operator team The reimbursable contract did not fit this project.
2) Onshore storage	Before	Still going on	Delay due to RvS needed more time in this complex case to make a discoing. However when started, no problems occurred during the project.
3) Offshore field development	Before	Overrun	Increase due to the pipe scope. Due to the DSV stakes increased
4) Offshore field development	Before	Overrun	Technical problems with underwater operating system.
5) Offshore field development	Before	Under run	Platform, pipelines and 2 of the 4 wells were cheaper. (due to low rig rates).
6) Offshore field development	Before	Overrun	Instrument and tools price become higher than expected and one extra well was needed. Underestimated the complexity off Self Installing Platform.
7) Offshore field development	After	Overrun	Operator changed plans to use a new well instead of sidetracks.
8) Offshore Field development	After	Overrun	Changed concept of the platform.
9) Offshore field development	Before	Under run	Instead of 5 well only 3 were made, because the full capacity was already reached with those 3 wells.
10) On-shore project **10.1)** **10.2))** **10.3)**	After	 Overrun Overrun	 Because second phase was not executed, extra money was needed to close the first phase. Capacity expansion and because phase 2 was canceled.
11) Offshore project	After	Overrun	More time was needed for drilling, complementing and cleanup of the 7 wells. Insuffient planning with specified elements of this drilling rig. Also the market played a big role; due to scarcity some materials became expensive.

12) Offshore field development project	Before	Overrun	The travel and renovation expenses got higher. Market situation changed. Default of the subcontractor's performance. Developing new technology. Problems with the development of the electric control of the subsea completion. Also problems during the drilling of the well.
13) Offshore field development project	After	Overrun	Bad weather during installation. Other expenses amounted to operators modifications.
14) Onshore project	Before	Overrun	Surface modifications, brown-field work underestimated, and increased scope; subsea EPIC: more unforeseen than budgeted, delay due to weather.
15) Offshore Field Development	After	Overrun	Second branch drilling complications and drilling complication with other bores.
16) Offshore Field Development	Before	Overrun	Additional 65 days for drilling. Failure by installing sand screens and completion of the well.
17) Offshore Field Development	After	Overrun	Gas reserves estimation was misjudged. But because of favorable prices was still profitable.
18) Offshore field development	After	Overrun	Budget was made higher, because operator's budgets seemed unrealistic for EBN. Two wells realized under the budget. The expected gas volume was higher than was estimated at FID was adopted and due to high gas prices, the value of the project was tripled.
19) Offshore project	Before	Under run	While it was realized under the budget, there was still cost overrun at the overwork off one of the wells. But the cost of pipelines and facilities were lower than expected.
20) Offshore project	After	Overrun	Bad weather during mobilization. Problems with the lifting system and the tieback. Problems with machines and the cementing of the rig casing Rent price higher than that of the GSP Saturn. Construction work ran out, because simultaneous drilling was not possible.
21) Offshore project	Before	Overrun	Increase rig days. Higher fracking costs by boat availability. Re-run of well and adjustments at the host.
22) Offshore Field Development Project	Before	Overrun	Pipelines over the budget due the market conditions and weather, including tools and materials over the budget. Cost platform for removal and installation / hook up over the budget.
23) Offshore Field Development	Before	Overrun Overrun Overrun	The risk of sidetrack was too big, permission was asked for a new well, what was granted. Bad weather, high offshore equipment rates lower €/$ - course. Rig days due to the 17-1 / 2 sidetrack and the 8-1 / 2 final. Stick.
24) Offshore Field Development	Before	Overrun	Changing market conditions and evolving "rig rate".
25) Onshore project	Before	Overrun	Problematic expired sidetrack needed to be drilled.

Table D.1: Project analysis.

Main Problem	**Reason for Cost Overrun**	**Derived CSFs**
Bad preparation and bad assessment of scope Scope increase	More work due to the changed scope after tender Underestimation of the budget due to specific work Incomplete preparation The reimbursable contract did not fit this project Increase due to the pipe scope. Due to the DSV stakes increased increased scope	- Economic rational of scope (early) - Scale of the scope
Small inadequate team	Small Operator team	- Competent team members - Diversification in team - members (good balance between technical and non-technical members)
Changing market environment	Pipelines over the budget due the market conditions and weather, including tools and materials over the budget. Market situation changed. The travel and renovation expenses got higher. Equipment price become higher than expected and one extra well was needed. Changing market conditions and evolving "rig rate". Also the market played a big roll, due to scarcity some materials became expensive Both the cost of pipelines and facilities were lower than expected But because of favorable prices was still profitable high offshore equipment rates lower €/$ - course Two wells realized under the budget Platform, pipelines and 2 of the 4 wells were cheaper. (due to low rigrates).	- Market fluctuation
Complexity of new technology	Developing new technology Problems with the development of the electric control of the subsea completion Delay due to RvS needed more time in this complex case to make a discoing. However when started no problems occurred during the project Problems with the lifting system and the tieback. Problems with machines and the cementing of the rig casing	- Use of set of solution - Use of standard components.

	Underestimated the complexity off Self Installing Platform Technical problems with underwater operating system	
Changing weather	Bad weather during mobilization Bad weather during installation delay due to weather Bad weather	- Weather fluctuation
Default performance of subcontractor	Default of the subcontractor's performance. Failure by installing sand screens and completion of the well	- Contracting
Needed extra well	permission was asked for a new well, what was granted	- Reserve prediction by using probability
Inadequate project planning	Instead of 5 well only 3 were made, because the full capacity was already reached with those 3 wells. Insuffient planning with specified elements of this drilling rig Because second phase was not executed, extra money was needed to close the first phase Cost platform for removal and installation/hook up over the budget Capacity expansion and because phase 2 was canceled. Increase rig days. Higher frack costs by boat availability. Re-run of well and adjustments at the host Construction work ran out, because simultaneous drilling was not possible	- Focus on time - Focus on cost
Inadequate definition of FID	Insufficient definition of FID The expected gas volume was higher than was estimated at FID was adopted and due to high gas prices, the value of the project was tripled Rent price higher than that of the GSP Saturn subsea EPIC: more unforeseen than budgeted	- Realistic prediction of investment costs, by using probability
Changing concept	Changed concept of the platform Operator changed plans to use a new well instead of sidetracks	- Consensus on projects.
Inadequate work load planning	Additional 65 days for drilling. While it was realized under the budget, there was still cost overrun at the	- Evidence based approach

	overwork off one of the wells Rig days due to the 17-1 / 2 sidetrack and the 8-1 / 2 final. Stick Surface modifications, brown-field work underestimated	
Modification by other partner	Budget was made higher, because operator's budgets seemed unrealistic for EBN. Other expenses amounted to operators modifications.	- Contracting - Standardize each procedure with different partners - Deviation from Operator Project System should not be encouraged. - Sufficient Communication leading to full transparency.
Wrong estimation of gas reserves	Gas reserves estimation was misjudged	- Reserve prediction by using probability
Problems with drilling	More time was needed for drilling, complementing and cleanup of the 7 wells. Second branch drilling complications and drilling complication with other bores Also problems during the drilling of the well Problematic expired sidetrack needed to be drilled	- Evidence based approach
Inadequate risk estimation	The risk of sidetrack was too big, permission was asked for a new well, what was granted.	- Risks identified and included in project targets. - Counter risk measurements

Table D.2: Formulating CSFs from the project analysis

Major Critical Success Factor Domain	Critical Success Factors	Description
Common investment Objectives	1. Clear defining the project definition 2. Formulating Project Mission and strategy 3. Estimate activity time and duration 4. Define activity 5. Define (new) technology 6. Develop project definition quality 7. Using evidence based approach	Understand the project goals & objectives What does the company want to achieve with this project, its goal. Estimation when an activity need to start and how long it will last Recognizing and defining all activities that will come in the project The use of new technology must be fully understood before it is used Early involvement in projects phases Every decision backing up with sufficient evidence
Targets	8. Developing qualitative project schedule and Plan 9. Develop a resources planning strategy 10. Estimate cost 11. Manage cost	The plan is logically made with non-aggressive schedule. Planning of the recourses, where when and how to be used Realistic prediction of CAPEX and others, by using probability Adequate cost managing
Scope	12. Monitoring scope change 13. Allowing scope change trough mature scope change process. 14. Rational of project scope	Change in scope is monitored and reported Allowing changes to scope only through a mature scope change process The scale of the scope is well taught trough
Execution	15. Develop risk management plan 16. Manage the contracts 17. Define problems 18. Ability of formulating solution for the problems 19. Standardize each procedure 20. Use of standard components 21. Strict adherence with project system	Risks identified and included in project targets and counter risk measurements are taken. Contract with each party is up to date and clear Defining the problem that could arise. Come up with solution for the identified problems by a responsive team. With different operators use the same standard procedure. Standardize the used components in the project Deviation from the project system should be discouraged, however if it still happens it should be thoughtfully explained
External	22. Anticipate political instability 23. Anticipate market instability 24. Manage client influence 25. Manage authorities influence 26. Anticipate weather instability	Trying to execute a project in a political stable environment Understand the market conditions and translate that in to a clear vision for your project Clients are committed to the project goals and are involved in project management process. The influence of authorities is recognized and well managed. Including (mandate, permits…) Keep weather conditions in to your planning
Project Organization	27. Managing communication between different parties 28. Development easy information transfer system 29. Develop control mechanism and feedback system 30. Developing competent project team 31. Developing team with diverse background 32. Receive top management support 33. Project manager authority to control 34. Achieve consensus on projects decisions	Open and effective communication between different parties of the project Sharing information on the project should be easy for the parties involved by using a common information system. The project is controlled and adequate feedback is given on performance. New composed team must know each other workflow and competence before starting the project Diversification in team members (good balance between technical and non-technical members) Active support from top management for project management The project manager has control over developing plans, making changes as required, and fulfilling them Agreeing with all on project decision at the beginning of the project

Table D.3: The full list of CSFs, CSFs from literature plus CSFs from Project analysis.

Appendix E

Case study

In this chapter a case study research will be conducted by means of two separate case studies. These case studies are done to give more weight and validation to the found CSFs. First an explanation will be given on the method used for this case study, followed by the case study protocol, design and the case selection. An overview of the case analysis will be given following a discussion of each case separately. At the end a general conclusion will be drawn that will pave a way for the recommendations to EBN.

The primary reason for the choice to conduct a case study research at the end of this thesis was to formulate an academic backing of the found CSFs and answer the last sub-research question that was formulated in chapter 2. This sub-research question is stated below:

In which project phase have the identified CSF the biggest impact?

With finding the answer for this last sub-research question, the primary research question can be answered on how a non-operating partner can influence a project towards successful performance.

Method

To gather sufficient information for this case study a case study approach was followed. The reason for choosing a case study is due to the contemporary real-life situation on which the researcher does not have a strong influence (Yin, 2003). However with a case study questions as where and how can be answered, (Yin, 2003).

Case study design

Each chosen case was a completed project in the gas exploration and production that was done in the Netherlands. Each project was evaluated on the 5 common phases that a project goes through. Although there are mainly 6 phases that a project goes through, like the first 3 that belong to the FEL: identify/asses, select, define, and followed by execute and operate and as last maintenance/operation. However for this case study the last phase, maintenance, was left out of this evaluation.

The chosen two case studies belong to one Dutch operator that. The choice for this company was due its large involvement with the several projects that they do in the Netherlands and with EBN. Also the choice of the project data that was available was delivered extensively by this company. Main subject of this study is to come to know how a non-operating partner can influence the project towards successful performance; with the available information this can be better understood.
To gather information for the case study, a study using the archive was done. The most important use of documents for case studies is to corroborate and augment evidence from other sources (Yin, 2003). To investigate which factors were used in which phase of the project and how that worked out for the project, a review will be done in the production and project reports, monthly reports on the projects performance and general information that is available on the project in the archival data in EBN database. However a caution is in place with using archival data. Due to specific purpose and specific audience for the data that was produced. And this conditions must be fully appreciated in interpreting the usefulness and accuracy of the records used (Yin, 2003).

Case study protocol

For every case study a protocol is needed to increase the validity of the study. One of the weaknesses of using archival records is the bias in selectivity and reporting bias, this reflects author bias (Yin, 2003). To overcome this weaknesses a few measurement step were taken in the analysis. Those measurements are taken in the protocol for this case study. Some of the protocol main features are adopted from the book of Yin (2003).

1. Data collection procedures
In this procedure the analysing data must be collected carefully. Starting with general information about the project, like the names of the project location, duration, initial investments and people involved in. Also small explanation of what the projects are meant for and what was their initial planning. To prevent reporting bias, the information collected was not only used that of the operator but also what EBN had to report about it.

2. Outline of case study report
In this outline each case will be examined on the practice of starting up the project. How the FEL-phase was conducted and whether the non-operating partner was involved in it early or not. Also here it will be looked up on whether the CSFs from chapter 7 are used or not. And what kind of effect it had at the end of the project. With this analysis reading of the “Leer Rapport” or the learning rapport, which can be found in the data base of EBN can be of great value.

3. Case study Questions
To describe each case extensively a few question should be answered. These questions are:
a) What was the planning process, what were the original goals of the project?
b) Describing the management practice in detail.
c) In what way did the goals change in comparison to what was planned?
d) How did the change of goals and plans affect the overall project?
e) Which CSFs can be identified that were used in this project and how extensively were they used?

Following this protocol the case study were studied and analysed.

Choice of the Case Study

In this thesis 25 project were analysed to extract the CSFs. However for the case study, analysing all 25 projects is not useful nor will it not be possible due to the amount of information available. Therefore a select few projects must be chosen that have enough information. Also Yin (2003) replication logic was used, meaning each case study should be viewed as a single experiment. When the researcher identifies an important finding within a single case, the next is to replicate this with more experiments. Yin reasoned that each study replicated within a multiple-case study increases the certainty of the results. The two selected cases ranged from poor too good performance. All two of them had a Capex higher that 50 million and are completed. Also these projects are quite recent. The older of the two started only 4 years earlier than the most recent one. In table 13 the whole summary of the selected cases can be seen.

project	Starting year	EBN involvement from the start	Capex Overrun	Overall Performance	On/off shore
Case_1	X	No	Roughly 50%	Poor	Onshore
Case_2	X+4years	The beginning	----	Good	Onshore

Table 18: Summary of chosen projects.

Case 1

Case description

The main objective of this project was to redevelop a field. New technology not applied before in The Netherlands enabled the operator to further mine the field.

Outline of the case

a) What was the planning process, what were the original goals of the project?

The main planning was developed by the operator without any involvement of EBN. Some additional improvements were made later resulting in final field development project (FDP) that the operator wanted to follow. In this FDP the operator set out the managements system that they followed, with the control system and the vision that they had.
The main mission of the project, as described in the FDP, was to safeguard the integrity of projects assets. In order to produce hydrocarbons of specified quality and quantity, within the boundaries of the environment. In the original planning the starting date for the first production was planned in year Y with total investment of around half a billion. With 40% of that investment for the account off EBN.

b) Describing the management practice in detail.

The project team management system was managed through a discipline-based structure. The details of how the operation is managed in terms of structure, roles and responsibilities are documented in the tasks/competency matrix. Customer and service provider relationships are documented in respective service level agreements.

Following their objectives the facilities of this project were designed in a way to minimize operating costs and exposure to personnel and environment. The levels of manpower is strived to be as such that the full benefit is taken from automation to the extent that the operator intervention is minimal while target availability is secured.
The main key feature of the management that the operator envisioned is the minimum intervention and remote operation. To realize a good functioning project the operation Readiness and Assurance (OR&A) will be followed. OR&A refers to properly planning for all aspects of operations, from the start of the identify and asses phase through the design and engineering, resulting in an Asset and Asset team that are truly ready for profitable operation when transfer of the asset is (partly) complete.
One of the key elements of the operations readiness planning will be the adoption of the Flawless Start up Initiative (FSI) concept to ensure timely completion of the project and to maximize facility uptime post start-up. The logic behind this stems from the fact that starting up a project with errors and flaws can cost too much time and money to undue them. So it is better to prevent them in the beginning when the preventing and fixing the error can be done much faster.
FSI is a formalized program to achieve the objective of world-class commissioning, start-up and operational performance for the total project including steady state first cycle operation. The initiative involves the development and implementation of a process by which risks to this objective will be identified, assed and addressed during engineering, procurement and site implementation.
For this project the operator had formulated the 11 key success Areas or the 11 Qs. These Qs were based on the lessons learned from various project and the common failure modes, which occur during the commissioning and start-up phases.

The FSI requires the necessary up front work during FEED and subsequently in detailed engineering, procurement and construction, as well as commissioning, startup planning and risk analysis to support a short trouble free startup of the facility. The aspects are organization, structure and attention to detail throughout as well as starting the preparations for commissioning early in FEED and subsequently maturing it.
The Key elements of the process are:

- Address commissioning concerns and requirements very early in the design stage by holding a facilitated "FSI" workshop attended by key representatives from the various disciplines within the project organization
- Ensuring that the "FSI" activities and requirements are incorporated into any outsourced design activity and reflected in construction contract strategies and scope of work
- Establish a commissioning, operations, maintenance, training organization within the project reporting to the project manager
- Ensure understanding and alignment of objectives between commissioning and project engineering groups for the commissioning and start-up phase & monitor progress:
- Agree project scorecard for commissioning & start-up
- Agree key performance indicators (KPI's) for commissioning & start-up
- Develop interface agreements for all key interfaces
- Develop a detailed level 3 commissioning and start-up schedule as part of the overall project schedule
- Execute a facilitated risk identification exercise to identify key risk areas during the early design stage and assign 'risk coordinators' to follow up actions
- Maximize use of Design tools (e.g. 3D modeling techniques) to carry out commissioning, operability and maintainability reviews at agreed stages (33%, 66% & 100% design)
- Strict compliance to QA/QC throughout construction is essential with special focus on areas that can impact the commissioning schedule such as cleanliness/clean pipe policy, joint tightness, loop checking, asset integrity verification, and punch listing
- Establish an integrated commissioning and start-up (ICT) team
- Monitor compliance by holding Quarterly Health checks of progress against plan

c) In what way did the goals change in comparison to what was planned?

The main change of the project goals was the start date of the first oil production. Original plan was that the field would be fully working in 2010, but it started in April 2011. And the injection of the steam came 4 months after that.
The project was approved in 2007 because the operator insisted that the project had the appropriate definition and the right depth was reached to reach a project success. According to the operator this was evident from the reviews that they internally had executed.
However this was not the case, the team after the FID was understaffed, only one third of the initial team members were complete. The project manager was replaced and there was a big schedule overrun.
The FEED was incomplete during the FID. What also needs to be taken in notice that the contracting process did not went as planned. This resulted that all risk of the project was laid on the operator. The lack of integrated project schedule was lacking. This lack of integrated schedule could lead to 10% extra cost according to the IPA research.
What also needs to be addressed is the communication with EBN. This was prior the FID and after FID quite under the optimal.

Majority of the budget overrun can be attributed to the scope change. From the meetings that EBN organized with operator it came forward that there was no connection between the made costs of the scope change with that of what was realized. This way the cost control, that was initial meant to predict and control cost, but also to direct the project was hardly used. In this project the cost control was actually used as a registration of the cost, it had an accounting character.

d) How did the change of goals and plans affect the overall project?

The changed goals of the project had big influence on the project schedule and cost. Due to the starting point of operation shifting one year later, the project had already gained 45% extra cost above the original planed ones.
The operator insisted that the FEED of the project was complete and that the project had gained enough definition and depth to be approved. Due to the understaffing of the team the project could not be controlled optimally and also the change of the project managers contributed to instability of the project and extra cost. The first project manager quite his job because he was not in agreement with the project Assurance structure, as it was made. He had no authorization to do anything and had to ask for all investment decisions to the corporate partner. The second project manager also quite after some time, giving the reason that the operator management did not give him the necessary commitment that he needed. The third project manager, even though being quite competent, just could not bring the project to right end.
The other problem with the team was that it took a really long time to come in to being. When the original team consisted of 46 members only 17 were filled in after the FID. And even up to 2011 there was no position of the steam specialist. This was also the reason why the project could not be controlled as initially was planned.
The whole planning was not done adequately. The steering form of planning was very weak. The work determined the planning, instead of the planning demining the work.
Due to the "hands-off, eyes on" approach of the operator, the project could not be controlled.
What also needs to be taken in to consideration is the lack of commitment of the operator to solve the problems that came in to being around 2008/2009. The lack of commitment was also one of the reasons why the first two project managers quite their job.
These changes led to losing control over the project by the operator and the contractor doing all the major decisions. What led to dangerous situation, which translated in to delay and extra cost. And the inability to redirect the project in to the right direction. Taking the control back over the project was really difficult and the team could not make the project financially stable.

e) Which CSFs can be identified that were neglected in this project and when EBN involvement started?

From the FDP plan an extensive list of factors that can contribute to the success of project was mentioned.

The involvement of EBN in the project took place after FID. What is quite late. However EBN approved the project believing in what the operator informed EBN. Assuring that the FEED and the previous review phases were done extensively what resulted in positive outcome of the project. What later came forward not to be true. In figure E.1 the involvement of EBN can be seen in the overall project phases of the project.

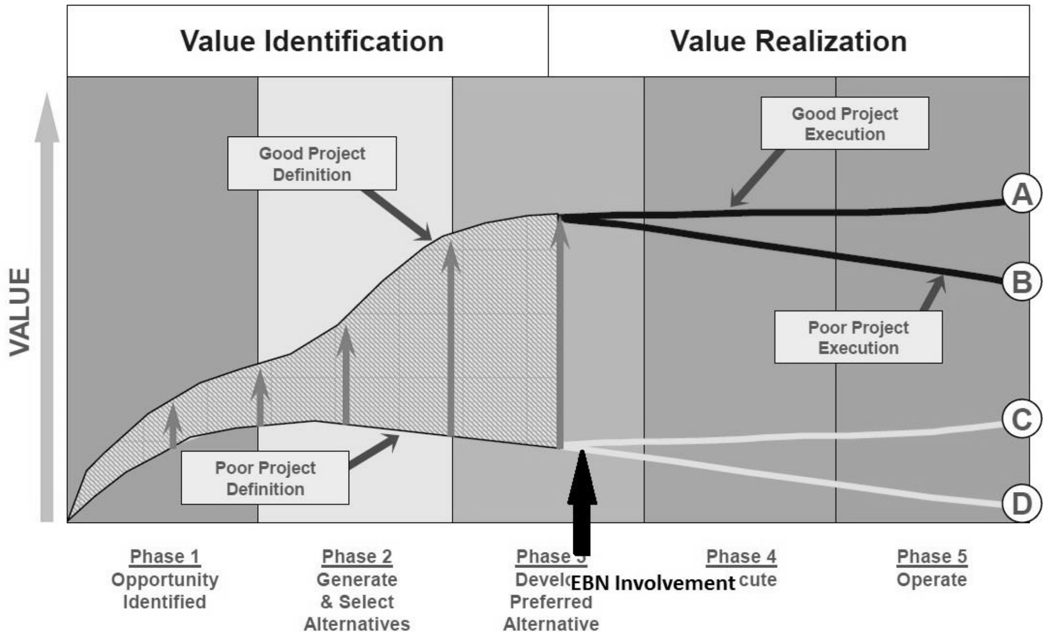

Figure E.1: Involvement of EBN in project 1.

Case conclusion

The major CSFs that were not worked out are the developing project definition quality or the FEED, managing cost, developing competent project team, managing communication between different parties and receive top management support. These CSFs were initially recognized as important; however they were not developed and used. The lack of good and functional FEED development resulted that the start of the project was not right from the beginning. This had its influence on the forming of the project team. The original project teams that were involved in the initiation and assess phase were completely replaced by new members and the forming of the new team took place after the FID and also the formation of the new teams was quite slow, what resulted that the team was too small for this project. This small team could not control the project appropriately. And also the hands-off eyes on strategy that later showed to be incompetent was used, what also contributed to the uncontrollability of the project. Due to this the project cost were not controlled and steered, but just reported passively. These problems together with lack of informing other parties, here EBN for example, made the project uncontrollable. Later on it came forward that the forming of the new project team was difficult due to the lack of support of the top management. Due to the status of this project seen as not having a priority. This all resulted as catalyst for a disastrous project. Also the fact that EBN was only involved when all major decisions were already taken, made it impossible for EBN to steer the project in to the right direction.

Case 2

Case description

This project was a capacity expansion of already existing production unit.

Outline of the case

a) What was the planning process, what were the original goals of the project?

The planning process of this project resembles that of project described in case 1 due to the involvement of the same operator. Beginning with the first phase of identifying the opportunity the operator came up with the plan of expanding the unit capacity. At the beginning the project plan was be a simple Opportunity Realization Process plan (ORP) what will later acquire a project execution plan linked to the ORP plan and this will include the detailed work activities that need to be completed in order to meet the qualifications for the next gate meeting. The project engineering planner has carried the project planning through to the selection gates, at which point the responsibility will transfer to a project execution planner. The original project Execution Plan (PEP) for the execution phase will be developed there.

The Integrated Service Contractor activities are entered in the plan through the SAP from authorized work management forms. This is done by the engineering planner of the dedicated project execution planner. The final Project Execution Plan with the Investment plan was shown to EBN. Where EBN made its own cost for the whole expansion project.

b) Describing the management practice in detail.

The project management of this project was designed according to the Opportunity Realization Process of the operator. The accountability is transferred from the opportunity manager to the project manager after the end of the select phase. The project manager has to make a business proposal package at the end of the define phase he or she is also responsible for the FID. This means that at the end of the define phase the business proposal package include the Basis for Design (BFD) and project specification (PS). The development of the BFD was led by the operator with the responsibility with the project engineer. The opportunity manager was accountable for the BFD approval the PS is developed by the Integrated Service Contractor (ISC) under the supervision of the operator. During the execute phase the project team is supported by Operator Operation Opportunity realization team. In order to gain familiarization and knowledge with the installations to be handed over, the commissioning is executed with Operator staff seconded to the ISCs commissioning team.

The operator stresses a Flawless Project Delivery by timely flawless start-up cost effective, efficient and controlled ramp-up and sustainable long term operational performance. The operator uses Flawless Project Delivery (FPD) as part of OR process to ensure the right first time and flawless start-up. The responsibilities with regard to the FPD process during the project phases are divided as follows:

1. During the FEED phase and project start-up, the Project Team will apply FPD under operator coordination, together with the assigned responsible parties (Q focal points) of operator and the ISC.
2. The ISC coordinates and implements a Flawless Project Delivery process during the execution phase.
3. The ISC delivers the Q-captains for the focus areas and ensures that the KPIs in these focus areas are met. The OR plan shall be developed by the OR team leadership.

As in previous project was mentioned there are certain quality areas (Qs) that need to be followed for a project to have a FPD. Although there 14 Qs areas, not every single project need them all implemented.
To meet the schedule a weekly overarching project meeting is scheduled to communicate interaction and to manage the interfaces between the individual projects. This meeting shall be appointed by all Project Engineers, the construction site representative and the OR team leadership and is chaired by the project engineering team leadership.
The meeting schedule with the ISC is based on the structure of dedicated counterparts. To work efficiently the project communication for the individual projects is managed by the Project engineer. The Project engineer shall strive for clear rules, plans and responsibilities within his project team. The Project engineer is single point responsible hence all Work activities, announcements and changes shall be communicated through the Project engineer. Project site rep presents the project on site and shall attend the (weekly) construction progress meetings. The PE may attend this meeting on a needed basis. PE meets on regular base with ISC project manager.
During the define phase the interfaces between the projects are/will be identified and managed through the overarching interface matrix. Mitigation is logged on an interface mitigation sheet and is communicated as an instruction to the ISC. Identification is done in a workshop, participants are: operator project engineers; Operators operations liaison; operator maintenance liaison; chair is Operator project engineering team lead.
For the execute phase a similar workshop and follow-up shall be arranged by the Operator project engineering team lead and ISC integration & risk manager. The focus shall be on system interfaces. Participants are: operator project engineers, Operator operations liaison, Operator maintenance liaison, Operator project engineering team lead, ISC project managers, ISC Commissioning lead, ISC Project construction managers and ISC Project engineers. The workshop shall be chaired by the ISC integration & risk manager. Follow-up and file by ISC integration & risk manager.

c) In what way did the goals change in comparison to what was planned?

The overall mission of the project was to expand the current capacity of the project. This goal did not change. However the amounts that were planned before did change. The new goals of the operator of this expansion program is to expand the underground storage subsurface facilities were mainly unchanged only the increase of the production capacity changed from 48 to 76 million m^3/day instead of the previously planned 96 million m^3/day. This change also brought with it that a phase 2 of this project was canceled. What resulted in an overall reduction of the total investment of the project, but this cancelation led to certain changes needed to be made in phase 1 so the closure of this phase can be done without any other complications. The cancellation of the phase of this project that resulted for the production capacity change was purely made from an economic point of view. What pointed out that if further expansion was provided the amount of negative effects of it will outweigh the positive ones.
Also the implementation of the FPD did not start early from select phase as it should be, however it did start during the execution phase.
Due this project existing out of small different projects that were connected with each other, the operator did not provide an integrated execution plan. Each project formed one piece of the total. And only if all the pieces fit together there could be successful program.

d) How did the change goals and plans affect the overall project?

Although a whole phase was canceled from this project still a big cost and schedule overrun did not take place. Only some extra investment was needed to close the first phase of the project in good state. Still those investments were not that big in comparison with the financial negative effect that

the operator would have suffered if it went through with the whole project unchanged. This all thanks to the dedication of all the parties involved to bring a good end for this project.
This project was set straight by rigorous reviews from EBN and a third party that EBN contacted to review the whole project. This expansion project consisted of several projects that together would have formed the expansion program. Each project had its project execution plan ready. During evaluation of this PEP some gaps were identified that needed to be improved, those gaps are:

PEP elements were work in progress at the time
Project execution schedule lagged Best Practice
Generic project execution plans available

Improvements were made later to the PEP, but still the rating was "preliminary" with work still in progress. So some additional improvements were needed, because in a program of projects "the weakest link" amongst the projects determines overall rating/result.
Also gaps were found in the Integrated Project Execution Plan (IEP). An integrated project execution plan is different from the general project execution plan in one vitally important aspect of providing a matrix (relating to interfaces) between the different projects and program and context. By reviewing this project the third party came to conclusion that the IEP had four main gaps, those gaps were:
Clarity of information provided (vague/not clear)
Program interface management (insufficient)
Program controls/progress tracking (insufficient)
Organization/roles and responsibilities (not clear)

With main conclusion being that the IEP needed to be reworked with focus on program level issues to provide meaningful and workable information to the organization. If that is not done the whole expansion program could end in one big disaster.

e) Which CSFs can be identified that were used in this project and when EBN involvement started?
Evaluating the whole project some major CSFs could be found that were not defined or used properly in this project. In project 1 those CSFs are summarized in a table and a grade is given to them how they were in the beginning and how did they change during the involvement of EBN in this project.
The involvement of EBN in this project was during the define phase and the beginning of the execute phase. As can be seen in the figure E.2.

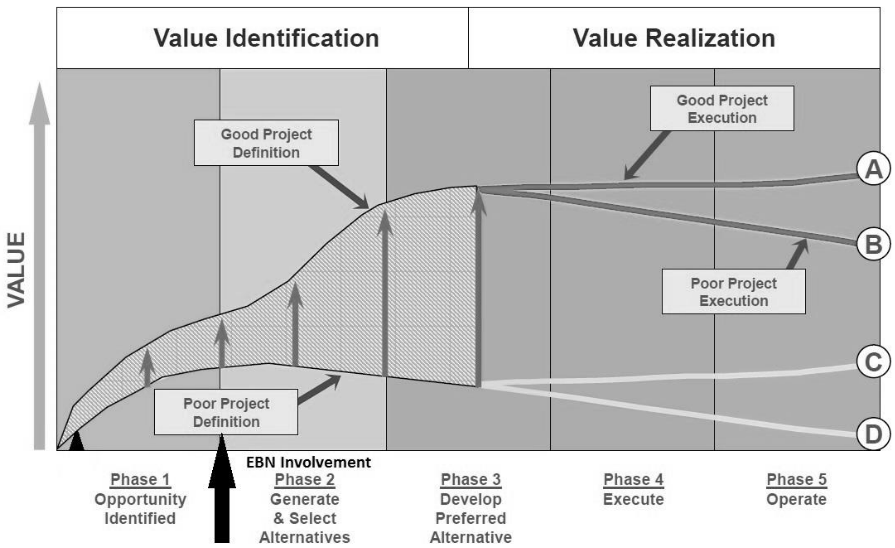

Figure E.2: EBN Involvement.

Case conclusion

Evaluating this project a lot of information could be derived. Due to the swift handling of EBN with the operator and consulting a third party, resulted that an almost failed project was saved and even ended in better conditions than what was thought at the beginning of the execution phase. The evaluation of the Integral Execution plan of this project that showed how all the several projects are managed and planned showed several gaps. This IEP of this project did not provide basis solid program planning, management and control and it appeared to be used as checkbox rather than providing real value to the organization. The overall state of the IEP was that it was confusing and vague and was handicapped by the inappropriate ancestry. However this all could be reversed by timely involvement of EBN. As could be seen in figure 15 this resulted that the changes in IEP and individual project PEP could be addressed and worked out, what resulted in a better planning. This way the project shifted from the poor definition line to a good project definition line. And overall this project is not a failure and can be seen as success.

Conclusion

By looking at these two cases a lot can be learned about the planning and management style of the Operator involved and the type of CSFs that were used. In the first case it was evident that the involvement of EBN was too late to make any changes that could end the project successfully. The CSFs of the developing project definition quality or the FEED, managing cost, developing competent project team, managing communication between different parties and receive top management support. Were initially recognized as important; however they were not developed and used as ones at the beginning of the project. These problems together with lack of informing other parties on time, made the project uncontrollable. The fact that EBN was only involved when all major decisions were already made it quite difficult for EBN to help steer the project in to the right direction. Also even when all the parties had seen where the problem lied the improvement on those fronts did not work out for the betterment of the project.

In the second case a different approach was seen. The project that copes with several difficulties could be managed due to the swift handling of EBN with the operator and consulting a third party. The evaluation of the Integral Execution plan revealed several gaps that needed to be addressed. However those gaps could be reversed by a receptive Operator team which used the external advice to the advantage of the project. As could be seen in figure 15 this resulted that the changes in IEP and individual project PEP could be addressed and worked out, what resulted in a better planning. This way the project shifted from the poor definition line to a good project definition line. Overall this project is not a failure and seen as a success.

With this in mind it can be concluded that just by mentioning or recognizing the CSFs is not enough. No project can exist without any complications; the art of good planning is to realize that the CSFs that could contribute to a successful project needs to be implemented at the beginning. And when still some problems arise during the first phases a timely involvement of all the involved parties is needed. Dragging those complications in the planning to the FID phase and starting to fix them in later phases will not result in a better project. The major influence that can be exercised by EBN is in the identification phase and select phase. If in those phases the CSFs can be applied properly the project will have potentially more successful outcome. And even tough along the way some complication can arise by dealing with them on time can reduce the cost and schedule overrun significantly.