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A Contractor's Experience of a Best Value Approach Project in Norway

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Extract: Road contracts in Norway has traditionally been utilizing familiar procurement and delivery methods such as Design-Bid-Build. With New Roads Corporation entering as a new project owner in Norway, the Best Value Approach has been chosen as a new possible approach. The Best Value Approach makes the contractors compete on delivering the best value instead of the lowest price. The best value is determined by evaluating a set of criteria, such as a contractor's past performance, the ability to identify and mitigate risks, potential added value, and the experience and qualification of assigned key personnel, in addition to price. The way a project is being awarded and the importance of each criterion has been studied. The way a project owner can influence a criteria, thus potentially affecting the outcome of the award project has been discussed. Even though the price is weighted low in the Best Value Approach, compared to traditional procurement methods, the project owner set maximum price and the wording of the other criteria could make the price criteria a key factor nonetheless. When studying the impacts of procurement methods, the results are usually presented from the project owner's perspective. This thesis focuses on the contractor's experience of the process. A series of interviews with involved personnel has been conducted, in order to find interesting focus areas according to the contractor. Three main focus areas is defined and studied; the general impression of the method, the importance of price in the procurement phase, and the time consumption in the execution phase. The project used for case study does not use the Best Value Approach in the execution phase, but the execution phase is an important part of the contractor's experience, and thus a study of the time consumption was conducted.			

Key Words:

1. Best Value Approach
2. Procurement and delivery methods
3. Contractor's experience
4. Construction Industry

A. Kjærstad
(sign.)

Preface

This master thesis written by Anders Kjærstad the autumn semester of 2017 at the Department of Civil and Environmental Engineering at the Norwegian University of Science and Technology (NTNU). The thesis is the finishing work for a Masters degree in Civil Engineering and Infrastructure Projects, with main profile in TBA4910 - Project Management. The idea and research question for the thesis was developed in cooperation with the main supervisor Ole Jonny Klakegg and contacts at BetonmastHæhre Arve Krogseth and Trond Simensrud. The thesis is directly linked to BetonmastHæhre's pilot road project E18 Rugtvedt - Dørdal, where the best value approach has been used. This is one of the first big projects in Norway where the best value approach is implemented, and it is of great interest to take a look at the contractor's experience of the method. Several people from BetonmastHæhre has been of great help with the thesis, and it could not have done without the insights provided by the involved personnel. Interviews with involved personnel at BetonmastHæhre has been conducted in order to locate interesting aspects, that could then be investigated further. Personnel in various positions at BetonmastHæhre has been included to provide information related to aspects uncovered during interviews, where the company contacts has been available for follow-up questions and discussions. The theories and methods necessary for this thesis will to a large extent be presented, although a certain degree of knowledge of projects and the construction is assumed. The thesis is mainly written for people working in the industry or with interests in the best value approach, whether in Norway or elsewhere.

Trondheim, 2017-02-11

Anders Kjærstad

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I would like to thank the following persons for their great help during the completion of this thesis. My supervisor Ole Jonny Klakegg for introducing me to the best value approach, and helping define and develop this document from an idea to a completed thesis. Thank you for being positive and supportive throughout the process, as well as providing great help when needed. I would like to express a special thank you to my contacts at BetonmastHæhre, Arve Krogseth and Trond Simensrud. Without your help during interviews, discussions and with finding other relevant people this thesis would never have been completed. I would also like to thank every involved person in both the E18 Rugtvedt - Dørdal project and the Helgeland Nord project for providing me with invaluable information and data to work with. Lastly I would like to thank everyone that helped in this process, either by proof-reading, being a writing companion or helping me take a breather when needed.

A.K.

Summary

Most road construction projects in Norway use the Design-Bid-Build delivery method. In the Design-Bid-Build method the project owner goes into contract with a project designer that designs the project, before interested contractors bid on the project, and the project is awarded based on lowest price. With New Roads entering the Norwegian construction industry as a new project owner, the Best Value Approach has been chosen as a possible new method. This method is completely new in Norway, but results from the US and the Netherlands show increased efficiency, with projects delivering on schedule and within budget with less conflicts. The Norwegian construction industry has struggled with low efficiency for a long time, and with project increasing in size and complexity, the time has come for testing a new method in Norway. The Best Value Approach makes the contractors compete on delivering the best value, instead of only the lowest price. This implies that a set of criteria, in addition to price, is part of the procurement process. The contractors are rated in past performance, ability to identify and mitigate risks, potential added value to the project, and the experience and qualifications of key personnel, as well as the tender amount. These are pre-defined and weighted, so the importance of each criteria is known.

New Roads has gone into contract with BetonmastHæhre on delivering a road project from Rugtvedt to Dørdal in Norway, using the Best Value Approach in the procurement phase. When the impact of a procurement and delivery method is studied, it is usually seen from the project owner's perspective. In this thesis the method is studied from the contractor's perspective to study their experiences of the method. Several open interviews has been conducted, in order to find focus areas that the contractor found important and different from previous projects. Three focus areas was defined, one from the procurement phase, one from the execution phase, and one area regarding the general experience of the process. The procurement phase focus area was regarding the importance of the tender amount criteria when awarding the project. The claim that the tender amount criterion was more significant than what the criterion weight would imply was studied. This was conducted by analyzing how achievable scores were in the different criteria, and how the points from the tender amount was calculated. Results show that the tender amount at least has the potential of being a key factor, and the project owner has the potential of influencing the significance of each criterion without adjusting the weights.

In addition to this, time consumption for meetings and reporting in the execution phase was studied. New Roads Corporation is a new project owner in Norway, and has a new set of routines regard the contract follow-up. Even though the execution phase is using the fairly well-known turnkey contract, and not the best value approach, the interviewees felt that time spent in meetings was significantly higher than in previous similar projects. This was studied by handing out a time tracking sheet to the project manager of the project, which handed it out to available personnel in various positions within the project. The same sheet was handed out to the

project manager of a second project, that follows the same turnkey contract, albeit with a different project owner. This was also handed out to available personnel, so that a comparison could be conducted. The results show that time spent in meetings or on reports, in the studied project is significantly higher than in the reference project, with some participants reporting spending close to 90% of a total work month in meetings or on reports. Especially internal meetings seem to be major time consuming. The possible reasons for this is discussed, with the most probable reasons being that internal meetings are necessary in order to prepare for the other meetings, and that project owner implemented focus areas becomes time consuming for the contractor.

Sammendrag

I Norge har tradisjonelt sett vegprosjekter blitt gjennomført ved bruk av utførelsesentrepriser. Denne entrepriseformen innebærer at byggherre kontraherer de ulike prosjekterende og utførende leverandører separat. Etter at vegen er prosjektert leverer interesserte entreprenører tilbud på utførelse av jobben, og prosjektet blir tildelt til entreprenøren med laveste pris. Nye Veier AS er etablert som et byggherrealternativ til Statens Vegvesen. Nye Veier har bestemt at Best Value Approach (BVA), eller prestasjonsinnkjøp, skal benyttes som et alternativ til tradisjonelle anskaffelsesmetoder. Prestasjonsinnkjøp er en helt ny metodikk i Norge, men resultater fra USA og Nederland viser at prosjekter som benytter metoder har økt effektivitet, leverer oftere innenfor tids- og kostnadsrammer, samt har lavere konfliktnivå i prosjektet. Byggeindustrien i Norge har i lang tid slitt med lav effektivitet og kostnadsoverskridelser i prosjekter som blir stadig større og mer kompliserte. Av den grunn har Nye Veier, i samarbeid med DIFI, besluttet at det skal gjennomføres noen pilotprosjekter hvor BVA blir benyttet i innkjøpsfasen. I BVA konkurrerer entreprenørene om å levere best mulig verdi i prosjektet, og ikke nødvendigvis lavest mulig pris. Dette gjennomføres ved at entreprenørene blir rangert på et sett forhåndsdefinerte og vektete kriterier. Disse kriteriene er tidligere prestasjoner, evnen til å identifisere og redusere byggherrerisikoen, potensielle tilleggsv verdier til prosjektet og erfaring og kvalifikasjoner til nøkkelpersonell, i tillegg til pris.

Nye Veier har signert kontrakt med BetonmastHæhre om gjennomføringen av E18 Rugtvedt – Dørdal, hvor innkjøpsfasen ble gjennomført som BVA. Tidligere har effekten av slike metoder stort sett blitt undersøkt fra byggherres perspektiv, så i denne oppgaven har det blitt fokusert på entreprenørens opplevelse av prosessen. Innledende semi-strukturerte intervjuer ble gjennomført, hvor entreprenøren fikk komme med innspill til fokusområder, basert på deres erfaringer og opplevelser. Ut fra innspillene til entreprenøren ble det bestemt tre interessante fokusområder. Under de innledende intervjuene kom det fram at pris føltes som et viktigere kriterie enn vektingen skulle tilsi. Denne påstanden ble undersøkt ved å studere de ulike kriteriene fra konkurransegrunnlaget. Det ble undersøkt hvor lett ulike terskelverdier kunne oppnås i de ulike kriteriene, sammenlignet med hvordan poengsum for tilbudspris ble regnet ut. Resultatene viser at pris i alle fall har potensial til å gjøre stort utslag på total poengsum, og at byggherre har muligheten til å påvirke viktigheten av de ulike kriteriene uten å nødvendigvis endre vektingen.

I tillegg til dette har møtevirksomheten i gjennomføringsfasen blitt studert. Under innledende intervjuer kom det fram at mengden møter og rapportering føltes svært tidkrevende i Rugtvedt – Dørdalprosjektet. Dette prosjektet benytter ikke BVA i gjennomføringsfasen, men en totalentreprise etter NS8407, som er en mer velkjent kontraktsform. For å undersøke om tiden som går med til møter var mer omfattende enn i andre prosjekter, ble det utarbeidet en timeliste som ble levert til prosjektleder for prosjektet. Denne ble delt ut til tilgjengelig personell

i ulike roller i prosjektet, og de involverte loggførte hvor mange timer som ble brukt i ulike typer møter. For å ha et sammenligningsgrunnlag ble samme loggføring benyttet i et annet prosjekt hvor BetonmastHæhre har en totalentreprise med en annen byggherre. Resultatene tilsier at det medgår betydelig mer arbeid til møter og rapportering i prosjektet hvor Nye Veier er byggherre. Enkelte rapporterer at opp mot 90% av en total arbeidsmåned går med til møtevirksomhet. Interne møter står for majoriteten av tidsbruken. Ulike grunner for dette blir diskutert, hvor de mest sannsynlige grunnene er at interne møter er nødvendig for å forberede seg til øvrige møter, og at ulike fokusområder Nye Veier har som byggherre til sammen blir tidkrevende for entreprenøren.

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Chapter 1

Introduction

Separating areas of responsibility has for a long time been deeply manifested in the Norwegian construction sector. The projects have consisted of separate parties, with the project owner on one side, and separate project designer and contractors on the other side. Traditionally the Norwegian Public Roads Administration (NPRA) has taken the role as the project owner or proprietor in road construction projects. [Sandvin \(2015\)](#) New Roads (Nye Veier) is a state-owned corporation established in 2015 by the government on the basis of wanting a more streamlined and efficient way to procure and build roads in Norway. With the establishing of New Roads, as an alternative to the NPRA in Norway, came a new eagerness and opportunity to start thinking new and differently. New Roads has a self stated goal of being a slim and efficient organization, that works toward securing comprehensive and cost efficient building and operating of Norwegian main roads. With the company vision being "building good roads quickly and smartly" it is apparent that the New Roads from the beginning might be open to using innovative and smart solutions to increase efficiency. [NewRoads \(2017\)](#)

In 2016 some selected projects previous in the Norwegian Public Roads Administration portfolio was transferred to New Roads. This new project portfolio consisted of undeveloped projects on the following sections

- E39 Lyngdal - Ålgård
- E18/E39 Kristiansand - Søgne - Lyngdal
- **E18 Langangen - Grimstad**
- E6 Kolomoen - Moelv
- E6 Moelv - Lillehammer - Ensby
- E6 Ulsberg - Melhus

- E6 Ranheim - Åsen

These projects are scheduled to be built within the next 20 years, and with a total cost of 130 billion NOK. [Regjeringen \(2015\)](#) The section written in bold contains the project used as a case study in this thesis.

Traditionally in Norway the delivery method of choice have been the Design Bid Build method, albeit with newer methods like Design Build and Road Development Contracts being tested in recent years. The need for new procurement and delivery methods has increased in line with increasing complexity of road projects. Studies and simulations have shown that involving the contractor at an early stage potentially has a substantial benefit on schedule performance and cost. [Song et al. \(2009\)](#) New Roads has stated that early involvement of the contractor is something they aim to ensure, thus New Roads will use newer methods like ECI and BVA. [NewRoadsCorp \(2017\)](#)

The best value approach is an approach of procuring and managing projects established and refined by Dean Kashiwagi from the Arizona State University. The method is also widely tested in Netherlands, a country with similar preconditions and challenges as in Norway. The best value approach is a revolutionary new concept in Norway. The goal of the best value approach is to change the focus from lowest price, and onto highest performance. By selecting the most suitable contractor the project owner's management and control tasks are reduced. [van de Rijt and Santema \(2012\)](#) In order to achieve the selection of the most suitable contractor a completely different approach is taken in the procurement phase of the project. Ensuring an early involvement of the contractor is essential to the method, since the contractor is having the design responsibility of the project. The BVA method is divided into three phases, the selection phase and the clarification phase during the procurement process, and the management phase during the execution and implementation of the project. Where traditional projects usually have a time consuming procurement phase with each contractor submitting a tender document containing hundreds of pages, the BVA procurement document follows a strict 6 page template, which should reduce the work load related to writing the document significantly. As of 2010 the BVA has been tested over 700 times for a total value of over 2,3b USD. Reported results from these projects have been minimizing the project owner's risk by up to 90% and achieving 98% client satisfaction, while still increasing contractor's profits by up to 100%. [van de Rijt \(2011\)](#) [Kashiwagi \(2011\)](#)

At the time of writing this thesis the BVA is still in the pilot project stage in Norway, but it is quickly gaining interest from the industry. While there are numerous publications regarding the clients or project owners, the contractor's experience haven't been analyzed to the same degree. The goal of this thesis is to view the first best value process in Norway from the contractor's perspective. Another goal to understand how the idea of best value is transferred from project owner to contractor, and from theory to practice. In order to achieve these goals interviews with

relevant personnel will be conducted in order to locate interesting aspects of the experience for further analysis.

It is important to underline that this thesis solely focuses on the contractor's experience of the method, and thus it is only viewed from one side. Where interesting aspects have surfaced as a result from conducted interviews, the analyses have been conducted as the author deems correct, based on supporting documents and relevant literature. New Roads Corporation has not been given the opportunity to explain or comment on findings, since this is outside the contractor's direct experience, and thus the area of the thesis.

1.1 Background and Motivation

The background for this thesis is New Roads choice of adding the best value approach as an alternative to traditional procurement methods in Norway. Norway has a long tradition of Design Bid Build (DBB) projects in infrastructure, and a strong separation of responsibility between the project owner and the contractor. Numerous studies show that the DBB method in some cases has lower efficiency and quality compared to other procurement and delivery methods. [Yu et al. \(2016\)](#) [Hale et al. \(2009\)](#) [Shrestha et al. \(2012\)](#) With increasing sizes and complexity of infrastructure projects in Norway, the desire to increase efficiency has increased as well as the willingness to try new and innovative solutions. The State of the Nations reports from the Association of Consulting Engineers in Norway shows an increasing backlog of required maintenance and improvement of Norwegian infrastructure. [RIF \(2015\)](#) In addition to these reasons, the results about the effectiveness of BVA in construction projects shown from the Netherlands and the US have helped paved the way for the method in Norway.

The best value approach is a new and exciting way of procuring projects, and it is interesting to see if the project studied can be the first of many projects of this type in Norway. The case study used for this thesis is the E18 Rugtvedt - Dørdal road contract signed between project owner New Roads and contractor Hæhre AS (now BetonmastHæhre AS), and is the first contract based on the best value approach in Norway. The procurement phase was carried out utilizing the BVA. The project execution phase utilizes the standard Norwegian turnkey contract (NS8407), while adding some extra management elements introduced by the project owner. The BVA method has the possibility of reducing time and money spent. Should New Roads and the Association of Consulting Engineers in Norway achieve their goal of making the BVA method one of the industry standards it could provide beneficial to be involved early in the process. [Hansteen \(2015\)](#) Early involvement could provide the possibility to give both current and future project owners feedback on how the process was experienced from the contractor's perspective. Another reason a contractor could be interested in the BVA is to build up in-house expertise on the method from early on, giving an advantage in future projects.

After the initial interest in the BVAs entrance in Norway the author of this thesis has accepted a job offer from the company used for the case study in the thesis, BetonmastHæhre, affecting the impartiality. It was therefore decided, in cooperation with the supervisor, to limit the scope of the thesis to only include the experience of the contractor. When the impact of the BVA has previously been analyzed, it has usually been from the project owner's perspective.

The goal of this thesis is to understand a best value project in Norway from a contractor's perspective, and thus pointing out both experienced benefits and areas of improvement. The thesis is written after the procurement phase is completed, and while the execution phase is ongoing. After conducting initial interviews the following focus areas have been defined.

- The procurement phase - This is the first project in Norway that utilizes BVA for procuring. How was these processes experienced, and was the phase as expected?
- The execution phase - While the execution phase does not utilize the BVA methods directly, is this phase still affected by the earlier phase?
- The future of BVA in Norway - Based on the contractor's experience, what is the next logical step?

Even though the clarification phase is one of the three main phases of the BVA, none of the initial interviews pointed out any possible focus points for this phase. Therefore the clarification phase is considered outside the thesis focus areas and the phase will only be briefly presented.

Chapter 2

Method

In this chapter the chosen research methodology will be presented. The research methodology describes the approach taken towards answering the research question. The methodology is also a help when it comes to making choices on how to uncover information.

2.1 Quantitative and qualitative research

When doing research it is common to differentiate between quantitative and qualitative research methodology. Each method can help achieving the goal of answering a research question, although in different ways. It is important to know the benefits and possible consequences from choosing one method over the other.

2.1.1 Quantitative method

The quantitative method deals in number based information, and focuses on quantifying the data gathered for analysis. It involves the evaluation of a number value or a size, and the systematization of these. The quantitative method has a high degree of verifiability and emphasizes precision. It is for instance used to collect a limited amount of information from a large number of respondents. The goal of the quantitative method to look for generalization and conformity in a set of values, or compare on set of data to another. The quantitative method is necessary to in order to document or prove a phenomenon. [Hjelle \(2013\)](#) Numbers and values is not necessarily self-explanatory, thus making the interpretation of the data a key element in quantitative research.

2.1.2 Qualitative method

Qualitative research methods builds on interpretations and experiences, rather than numbers and values. The goal is to explore phenomena, as it is experienced from the ones involved. Data that is observable but not necessarily measurable is the typical set of data one can expect working with when using qualitative methods. Using interviews is a typical qualitative approach to explore how people experience a situation or phenomenon. Collection and qualitative analysis of texts and documents is also a common qualitative approach. [Mills and Yue \(2011\)](#) Qualitative research methods are usually used as independent tools, but the methods can also be used to further elaborate on a question explored by quantitative methods. The procedures for processing, interpreting and systematization information. A benefit of a qualitative research is enabling the understanding of the dynamics related to an event or phenomenon through focusing on local perceptions and experiences of said phenomenon. [Bartunek \(2012\)](#)

2.1.3 The Method of Choice - Mixed Research Methods

In later years, using a combination of qualitative and quantitative research methodology has become prominent. This allows for using a broad qualitative approach in order to locate what focus points should be further investigated and analyzed using quantitative methods. [Bryman \(2006\)](#) This is the methodology used in the thesis, where initial interviews helped uncover interesting points that could be investigated further using quantitative tools.

2.2 Contractor involvement

The research question involves a review on how the best value approach is experienced from the contractors point of view. Therefore it is essential to reach out to an experienced contractor that both know traditional project implementations and is in the process of testing BVP. Best value procurement is a new approach in Norway, and therefore not many relevant projects are available for study. A few pilot projects have been started in Norway at the time of writing, with one being relevant for the thesis. The case study chosen is a road construction project between Rugtvedt and Dørdal which is being completed by Hæhre Entreprenør from the BetonmastHæhre group.

The author of this thesis has accepted a job offer from BetonmastHæhre, which added to the decision of writing about the experience only from the contractor's perspective. Being under employment of the contractor and giving the possibility to express experiences about the pilot project helped establishing the contact network. The initial contacts were two of the personnel deepest involved in the case study project, one of which was mostly involved in the procurement phase, and one of the project manager in the ongoing execution phase. After the initial

discussions on what and how to analyze, contact was also established with the project manager of another BetonmastHæhre project, the E6 Helgeland Nord project, to allow for comparisons where needed. This project follows the same turnkey contract model of NS8407.

2.3 Research Approach

The goal of the thesis is to map the contractor's experience with the best value approach. This goal is narrowed down into three focus areas; the procurement and execution phase as well as thoughts on the future of the method. It is easier to understand a bigger concept by breaking it down into smaller and more comprehensible parts. In order to further narrow the focus areas, a few smaller and more manageable focus points was desired. This way of approaching the focus areas was formulated to a research approach.

The research and analysis of the focus areas was done in three steps, each with a set goal and chosen research method. The approach is illustrated in Figure 2.1.



Figure 2.1: The research approach

The initial interviews was based around a set of broad and open ended questions. These questions was formulated prior to the interview, and sent to the interviewees prior to the interview. The questions sent to the interviewees is included in Appendix A. This way the interviewees could sort their thoughts and prepare for the interview. Due to the nature of the thesis revolving around their experience with the method, it was easier to structure the interview like a conversation on certain predetermined themes. It was encouraged that the interviewees talked as much as possible, such that possible focus points from their experiences could surface during

the conversation.

2.3.1 Focus Area - Procurement Phase

In each of the initial interviews one or more focus points was decided. In the interview regarding the procurement phase the following focus points was brought up, and subject to further analysis.

- Resource usage, especially in the writing process.
- Criterion used for awarding the project, and how these criterion was weighed.
- The project owner maximum price, and how this affects the process

The writing process was completed at the time of writing this thesis, thus making a retrospective analysis the only possible analysis. Due to insufficient data on the exact time and resource usage, this was deemed too imprecise. Therefore it was decided to move this focus point into a discussion regarding the general experience of the method, without further direct analysis.

The other focus points revolved around the award process, the criteria chosen, how these are evaluated and weighted, and how each criterion affects the award process. The analysis undertaken on the evaluation criteria was based on the tender documents from New Roads. These can be found publicly at the Norwegian information page on procurement, and a link to the documents is included in Appendix C on supporting documents. A description of each criterion and how it was evaluated was written, and the connection between the threshold achieved and the points obtained in each criterion was illustrated. The tender amount criterion did not follow a linear distribution and was analyzed further. This was done by varying each parameter involved in the equation and keeping the remaining parameters fixed. This showed how each parameter would impact the points a contractor would obtain. A sensitivity analysis was conducted in order to find the most significant parameter. This was done by varying each parameter with the same fixed percentage and plot the different point outcomes in a graph for each parameter. This way the slope of each graph could be investigated, and the most significant parameter could be identified.

In addition to the tender amount parameter analysis, the wording of thresholds in the remaining criteria was investigated. It was discussed whether the threshold was worded in such a way that a minimum amount of points was inevitable to obtain. If this was the case, the points lost from not having the lowest tender amount would be near unobtainable from other criteria, due to the easily obtainable minimum amount of points, one could argue most contractors would achieve.

2.3.2 Focus Area - Execution Phase

During the interview regarding the execution phase the following additional focus points was decided.

- The project management system used, and the effects from it
- The time spent in meetings and with work related to reports

These three points are closely linked and influencing one another. The point on not using BVA in the execution phase is also linked to the focus area on thoughts for the future. By choosing to use a traditional method for project management with utilizing the NS8407 turnkey contract one would assume the time and resources spent on managing the project would be similar to previous experiences. During the interviews, some of the participants had the experience that the time spent in meetings or on reporting, was significantly more time consuming than in previous projects. In order to investigate this experience it was decided that a selection of involved personnel in various positions in the project would write a log book on the hours spent in meetings. The time tracked was divided into the four following categories

- Meetings internally
- Meetings with the project owner
- Meetings with subcontractors
- Time spent on work related to reporting

A simple time tracking sheet was drafted and handed out to the project manager, which in turn handed it out to a selection of personnel. The time sheet is included in Appendix B. It was encouraged to get participants from various levels of responsibility, in order to see if this was an experience shared throughout the administration. In order to be able to get a comparison the same time tracking sheet was handed out to the project manager of another BetonmastHæhre Project, the E6 Helgeland Nord. This is a similar project, which follows the same turnkey contract model of NS8407. The sheet was handed out to two available participants, both in a role also tracked in the other project. The time was tracked for roughly two months, with one month being completely overlapping, making the basis for a comparison. One of the issues with this type of data collection is the possible pitfalls of human error. The sheet was made as simple as possible so that the time and effort required to track time was minimized. It was encouraged to make a single entry for each meeting in order to remember it, and leave the work of cleaning up the logs to the author. The results from the time sheets was convincing and thorough, and functioned as the basis for the analysis.

One of the analyses done was a direct comparison with the time usage in the reference project. The personnel in same or similar roles was compared. In addition to this an analysis comparing the time usage to the total amount of hours in a work week was conducted. This was also compared to relevant literature on time usage for leaders.

2.4 Literature review

In addition to the case study, a literature review is conducted. To be able to understand where the Norwegian implementation differs from the theorized method, one has to have a wide understanding of the BVP method itself, and how it is supposed to be implemented. A selection of the keywords used was best value approach, best value procurement, project delivery methods, infrastructure projects, construction projects and early contractor involvement. These keywords were used in various academic databases and search engines including, but not limited to, Oria, Google Scholar and Engineering Village. [Levy and Ellis](#) describes an approach to conducting an effective literature review, which the approach used in this thesis is based on. The essentials of the approach is to ensure quality sources, or inputs, before following a six-step processing phase. This sets the basis for a good quality output, the literature review. Since this thesis is not a written literature, but instead uses the literature review to ensure good quality sources only the input and some selected steps of the processing phase is used. In addition to this approach, the sources were evaluated after the Norwegian TONE-principles, or ROAA-principles in English

- **R**eliability - Who is the author? What is the education and affiliation of the author? Reliability also relates to where the article is published.
- **O**bjectivity - Relates to the presentation of the data, and consistency with other research on the matter. Is the goal of the author to convince or inform?
- **A**ccuracy - Relates to the methodology used. Is the process described in detail, and can the results be found in other sources?
- **A**ptitude - The sources relevance to the thesis. Academic level of the article.

These principles were applied during the information gathering to ensure that the data collected is of good quality. One of the ways these principles were applied was in the selection of authors. Prof Dean T. Kashiwagi is a professor at the Arizona State University, and the founder of the BVA method. Therefore it is natural to turn to his publications on the subject. Since he is one of the biggest experts on the subject he would score high on reliability and aptitude. Albeit the sources are more on the convincing side, rather than solely informative, the research methodology is well described and the case studies used are extensive. All in all Kashiwagi scores highly

on the ROAA-criteria, and is considered a good quality source. Jeroen van de Rijt and Sicco Santema are two BVA experts from the Netherlands, and recieved the same rating as Kashiwagi. The ROAA principles was applied to the other sources, and several sources was removed due to not achieving a high enough ROAA rating.

Due to the BVA method being so recently implemented in Norway, sources from Norway are limited. In order to get an impression on how the method is received and processes regarding the implementation Norwegian news articles from the industry will also be used as sources. Due to the fact that news articles in general is not the best sources, only credible news sources will be used. This mainly include the Building Industry online newspaper, bygg.no, but could also include newspapers that are known for techical news articles.

Chapter 3

Theoretical Background

In order to understand how and why new procurement methods are being implemented, one has to understand the traditional methods first. It is also important to understand what characterizes a project and how projects generally are carried out. The construction industry has several characteristics and aspects which has dictated how projects are being awarded and completed. In this chapter, literature on important aspects of construction projects will be presented. The chapter will start with an introduction and definition of projects in general. Then a description of the different procurement methods for tendering contractors and delivery methods will be presented.

3.1 Project characteristics

A project is, by definition, a one time task that utilizes resources to achieve a goal, which again should satisfy a need or purpose. The need or purpose is defined by a project owner. The project owner can be anything from a single private person to the Government. Usually the project is carried out within a set of limits or conditions regarding cost, schedule, quality and use of personnel. [Cappelen \(1994\)](#) Cost and schedule is usually defined by an upper limit, while quality needs to be above a set minimum requirement. In order to carry out and implement the project a project organization is established. The project organization is a temporary and targeted organization that works towards the set goal and is dissolved when the planned task is completed. [Samset \(2015\)](#)

A project is divided into several phases, where each phase can be done in several different ways. A simplified way to look at the project is to divide it into three different core phases; the conceptual phase, the design phase and the production phase. [Eikeland \(1998\)](#) The way these three core processes make up the project is illustrated as phases of a building process in Figure 3.1. The different contributors enter the project at different phases, and this will vary depending on the delivery and procurement method. The different methods is explained further in Section

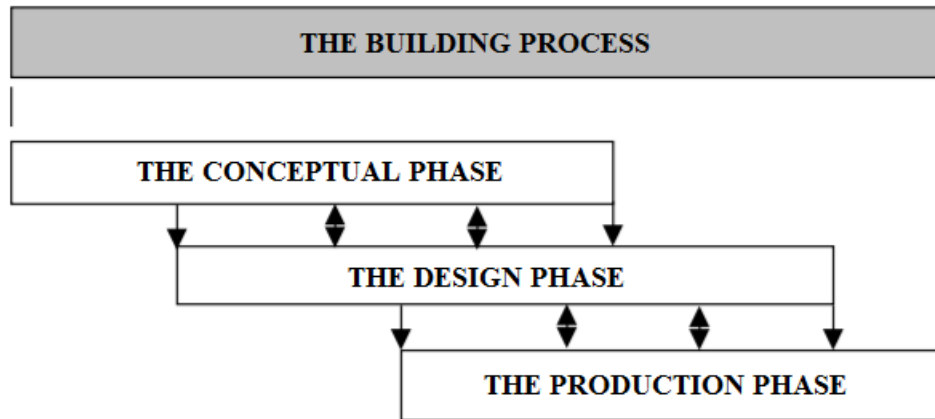


Figure 3.1: The building process [Eikeland \(1998\)](#), translated from Norwegian

3.3.

3.2 Characteristics of the Norwegian construction sector

The construction sector in Norway is a large and important sector. The sector employs over 230 000 people, which accounts for almost 10 % of the Norwegian workforce of roughly 2,5 million. [SSB \(2017c\)](#) [SSB \(2017b\)](#) The construction sector is one of the largest contributors to the Norwegian GDP, and according to the analysis company PrognoseSenteret provides as much as 16 % of Norway's total GDP. [Brekkehus \(2017\)](#) The total turnover in 2015 for the construction sector was close to 500 billion NOK. [SSB \(2017a\)](#) These numbers and the importance of the sector means that all fluctuations in the sector will have large impacts. Variations in efficiency and productivity will influence Norwegian economy in general, since a lot of money is invested in the sector each year.

The construction sector is a sector where much is based on tradition, and has a reputation for being conservative and inefficient. The sector has also been described as unwilling to change and improve as well as encourage innovation. [Borg \(2015\)](#) The projects are often subject to cost and duration overruns, as well as a large amount of conflicts. [Singh and Tiong \(2005\)](#) Combined with an ever increasing level of complexity in construction projects, these are factors leading to pressure from the media and the general public to start thinking new. [Dubois and Gadde \(2002\)](#) [Hvam \(2015\)](#) [Hansteen \(2015\)](#) One way these new ways of approaching construction projects is starting to show is the role of the contractor. Traditionally the contractor was a builder. The project owner identified the need for a project and hired architects and designers to describe and plan it. The contractors were first involved when the project design was finished, and just the actual implementation or building of the project was left to do. These days we see more

and more of early involvement of the contractors. There are several types of procurement and delivery methods that allows for the contractors to be involved already in the early phases of the project. These will be presented in the section on procurement and delivery methods. Each method has its pros and cons summarized in a table.

3.3 Traditional project procurement and delivery methods

Large public projects in Norway falls under the EU Public Procurement Law (in Norway "lov om offentlige anskaffelser"), which sets a basis of ground rules on how the procurement process has to be done. Different thresholds regarding contract sum defines what parts of the law or regulation the given project will have to follow. If a project has an assumed value of more than 1.100.000 NOK, and the procurement is done by government agencies the project has to be announced and a tendering process such as the Design-Bid-Build process has to be used. For construction procurement this threshold value is 44.000.000 NOK. In this section some of the traditional delivery methods that is legal in large projects in Norway will be presented. The delivery methods will be presented in increasing amount of risk and opportunity transferred to the contractor.

3.3.1 Divided contracts or multi-prime

The use of divided contracts implies that the project owner divides the project into the design deliverable and the different deliverables based on the different trades. This means that there will be a separate contract for each of the different contractors, e.g. one for electricity, one for plumbing etc. The different trade contractors might hire specialty subcontractors within their trade. This method is also known as multi-prime. This method requires a lot of owner involvement since there has to be a separate tendering process for all contracts. That being said, it is a certain way to ensure competition in all trades, and it is a way for smaller contractors to be able to bid on parts of the project. Out of all the common delivery methods, this method has the lowest amount of risk transferred from the owner to the contractors, due to the project owner keeping the managing responsibility. [Undervisningsbygg \(2007\)](#) [DBIA \(2015\)](#) A summary of pros and cons is shown in Table [3.1](#)

3.3.2 Design bid build

The design bid build (DBB) is the most traditional and common delivery method in Norway. In this process the project owner goes into a contract with an architect and/or engineer which designs the projects in order to meet the requirements provided by the owner. The project designer delivers a plan and specifications for the construction of the project. This design is subsequently

Table 3.1: Pros and cons of divided contracts / multi-prime

Pros	Cons
Full competition in contractors	Large administration required from owner
Allows for smaller contractors to take part	Large projects might lead to unmanageable number of contractors
Direct relation to all contractors	Requires experienced project manager
Close dialogue helps affect changes and cost development	Contractors might know the market better and therefore get better deals and prices
Reduced administrative costs for the contractors	Increased administrative cost for owner

bid upon by contractors. The contractor with the lowest bid will build the project based on the design. [Hale et al. \(2009\)](#) There are both benefits and drawbacks to this method. One of the biggest benefits is how well known this method is to the market. Being a method that has been in use for such a long time means that both contractors and project owners know what to expect, and how the procurement is done. This will in general provide that a large amount of contractors are able to bid on the project, thus making the price go down. A summary of pros and cons is shown in [3.2](#)

Table 3.2: Pros and cons of DBB

Pros	Cons
Well known method	No builder input during design phase
Well established legal anchoring	No owner influence on subcontractors
Single contract with main contractor	Price as only award criteria might reduce performance
Direct influence on contractors where necessary	

3.3.3 Design build

The design build is a delivery method where the contractor does the project design as well as building the project, based on a set of requirements from the owner. This reduces the procurement process by one step, as the need to first enter a contract with a designer before soliciting bids from contractors is removed. This means that the duration from the finished design to the entering of contract with contractor will in theory be removed as well. Not all contractors have the ability to do the project design in house, and then the subcontracting of design will have an impact on the project duration in the design build method as well. [Hale et al. \(2009\)](#) The design build method is a way to ensure Early Contractor Involvement (ECI), which is a goal for several of the newer methods. A summary of pros and cons is shown in [3.3](#)

Table 3.3: Pros and cons of Design Build

Pros	Cons
Minimizes owner time commitment	Potential lack of owner control
Reduces owner involvement in conflicts	Possible conflicts between designer and owner when designer in general answers to contractor
Builder input during design	Might increase total cost
Single contract for owner	

3.4 New methods - Early Contractor Involvement (ECI)

The need for good and effective infrastructure networks is closely linked to the economic growth and stability of a country. The goal of making roads safer, more environmentally friendly and efficient adds to the already large demand for maintenance and upgrading the road networks. In Norway the upgrade and maintenance backlog of the roads alone is estimated in the State of the Nation report to be just short of 2.000 billion NOK. [RIF \(2015\)](#) Many countries around the world, including Norway, are struggling with the lack of efficiency in the construction sector. [Kashiwagi et al. \(2005\)](#) This has caused several countries to start thinking new on how the construction projects are done, and what kind of contracts, delivery and procurement methods are used to implement projects. Most countries still use the traditional method of design bid build in their projects, but countries like England, Netherlands, the USA, and now also Norway, are starting to implement new and more innovative methods in their project implementations. [Pakkala \(2002\)](#) One key factor that is common for several of these new methods is the use of early involvement of contractor.

Involving the contractor at an earlier stage of the project life cycle has several potential benefits. The benefits can be summarized into three key elements, improved relationship between project owner and contractor, improved risk management, and utilizing contractor input during the design phase. An improved relationship implies creating a better understanding of the goals and objectives of the project and other involved parties. By identifying shared goals a co-operative environment could be established, and the shared experience could be utilized as a mean to further improve the project completion. [Rahman and Alhassan \(2012\)](#)

The main reasons for involving a contractor at an early stage is to take advantage of the contractor's expertise in the field. An experienced contractor has first-hand knowledge on the potential risks and opportunities that is common in a given type of project. Using this knowledge and understanding of the project to benefit the design ensures buildability, which is directly related to the project performance at a later stage. [Jergeas and Der Put \(2001\)](#) Involving the contractor in the design phase also gives the opportunity for innovative solutions that the project owner or designer might not necessarily consider, due to a limited level of expertise. ECI gives the opportunity for the contractor to identify risks in the project at an early stage. By identifying

these risk at this stage of the project, the contractor could take measures to mitigate and manage the risk, or change and improve the design to remove the risks entirely. [Rahman and Alhassan \(2012\)](#) This way of involving the contractor early to utilize experience and expertise is some of the reasoning behind the best value approach, which is being tested or used in numerous countries.

3.5 Best Value Approach

Increased efficiency in large construction projects can yield big savings and increased earnings. The construction industry as for a long time had performance issues, both in Europe and in the US. [Kashiwagi et al. \(2005\)](#) As a step towards increasing efficiency new procurement methods are being tested in Norway. One of the new methods that is being tested on pilot projects is the Best Value Approach (BVA). The value of something, be it a product, a process or a deliverable is often defined as the ratio of function over cost. Function can be defined in several ways, but in construction projects it is easy to define function as quality or even simpler, the requirements. Resources includes the means required to achieve said function. The resources can for example be materials, man hours, price, or time. [IVS \(2007\)](#) This is the key focus when using the best value methodology in the procurement phase, finding the contractor that can provide the best value. Projects that uses the approach have experienced transaction times cut in half, and reduced project times, such that contractors offers to reduce the total building period [van de Rijdt et al. \(2011\)](#) The Best Value Approach is a method that has been used in several years in USA and in Netherlands, albeit with different names and approach to the method. BVA in USA usually is described as the Performance Information Procurement System (PIPS), while the Dutch generally calls it Best Value Procurement. As both names indicate, it was originally meant as mostly a tool for procurement. These days, it is also used as a project management tool. In this section, both BVA as a procurement system and as a tool for project management will be presented, as well as a brief introduction to the history of the approach.

3.5.1 Brief history of the method

Professor Dean T. Kashiwagi is the originator behind the PIPS system. PIPS is a system built from two of his earlier ideas, Information Measurement Theory and the Kashiwagi Solution Mode, and several key elements have been brought from these methods into PIPS and BVA. Some of the fundamental goals of the method is to create win-win situations for the contractor and the project owner and gathering quality information about the contractors so that the best suited contractor can be chosen. By choosing the best contractor the project risk will be reduced, the quality will increase the the need for decision making will go down. [Kashiwagi \(2004\)](#) Until 2010

the best value method has been used over 700 times for a total value of 2,3b USD. According to the Kashiwagi Solution Model's web page the BVA method these numbers are more than 1800 times, for a combined value of over 6b USD worth of services over the course of 20 years. After being tested and refined for 10 years in the US, the Netherlands started the first best value project in 2005. [van de Rijt \(2011\)](#) [KSM \(2018\)](#) The BVA method has been increasingly used in the Netherlands from 2008, with a major milestone in 2010 of choosing BVA for a project of resolving 16 major road bottlenecks for a combined worth of 800b USD. This is the worlds largest BVA program, and shows the faith the government in the Netherlands have in the method. The ambition for 2012 was for the Rijkwaterstaat, their equivalent to the Norwegian Public Roads Administration, to award 90% of the contracts based on quality in addition to price. Based on the success of the method in both the US and the Netherlands, the method was introduced for a selection of pilot projects in Norway, with the first best value contract being signed in May 2017. At the time of writing this thesis, more than ten additional projects have been started in Norway, which shows an increasing interest for the method in Norway as well. [Byggeindustrien \(2017d\)](#)

The best value method is divided into three phases, with two phases in the procurement phase, and one phase in the execution phase. The Procurement method consists of two phases; the selection process and the pre-award and clarification process.

3.5.2 The Procurement Phase - Selection and Clarification

The procurement process of the BVA is the method that has been used in Norway at the time of writing. This method of procurement is radically different from the methods previously used in Norway, and the different phases will be presented in this section. [Santema et al. \(2011\)](#)

Phase 1 - The Selection Phase

The selection phase is where the contractor best suited for the job should be found. The idea of the BVA is that the project owner does not know exactly what level of performance is required, due to not knowing what is possible in the market. The contractors, being the expert, sets the performance level they can provide. By utilizing the Most Economically Advantageous Tender (MEAT) as the award criteria, other factors in addition to price can be evaluated. A common way of using MEAT is to assign a maximum monetary value to each of the non-price criteria, and reduce the tender amount according to the achievements in each criteria. This way one get a fictitious tender amount, which allows for the contractors to be compared to each other. The description of the selection phase is partially based on available literature, partially on the interviews done with the contractor of the case study, and partially based on the Norwegian Agency for Public Management and eGovernment's document showing an example tender process. This link to this document is included in Appendix C on supporting documents.

In the best value selection phase, the project awarded based on the performance in the five following predefined and weighted criteria. [Santema et al. \(2011\)](#)

- Tender Amount
- Project Capability
- Risk Assessment and Evaluation
- Added Value
- Interviews of Key Personnel

Even though the criteria chosen is similar, the names given to the criteria tend to vary. Tender amount is often called price, project capability could be called past performance or level of expertise and the key personnel interviews are sometimes called qualification interviews.

The **tender amount** is the sum of the contract works, optional work and the proposed added value. This should not exceed the project owner set maximum price. The proposed weighting of this criterion varies based on whether one consults Kashiwagi's US literature, or literature from the Netherlands. The range varies from 10% in the US to 25% in the Netherlands. [Storteboom \(2017\)](#)

One of the main ways the BVA differs from traditional procurement is the tender document the contractor submits. In traditional methods, such as the DBB, the contractor prices the extensive list of requirements the project designer has made for the project owner. This can often result in tender documents several hundred pages long. The BVA tender documents follow a set template that reduces the number of pages significantly. Three of the previously mentioned criteria, the project capability, the risk assessment and the added value, added are considered parts of the qualitative document. These documents must be no longer than two pages each, limiting the total amount to six pages.

In order for the qualitative documents to have value, and contribute towards selecting the contractor, the documents have to only include dominant information. Dominant information is by the Norwegian Agency for Public Management and eGovernment defined as information that is easily verifiable and quantifiable, and can be understood without any expert knowledge. Another definition is that the information provided has to be SMART; Specific, Measurable, Accepted, Realistic and Time-bound. This information is also known as Metrics, and it is necessary for the contractors to log past performance in various categories to be prepared for future project owner objectives. [Snippert \(2014\)](#)

In the **project capability** criterion the contractor submits a set of performance claims or goals, based on a set of objectives from the project owner. The objectives are goals the project owner wants to achieve during the execution phase. These could be related to CO_2 emissions,

injuries, waiting time due to road work etc. The contractor submits a SMART goal, justified by past performance, and is rated based on the goal submitted.

The project owner's **risks** are addressed in the risk assessment and evaluation part of the document. The goal of this document is to mitigate risks the project owner has in the project, thus contributing to the realization of the project. These risks could include various approvals, rezoning issues or concerns regarding landowners. The contractor's contribution in this criterion is either preventive measures or pricing measures should the risks occur. Preventive measures is for instance making relevant personnel, capable of increasing the chance for an approval available. [Rijkwaterstaat \(2015\)](#) It is important to note that the risks in this document does not include risks related to production. These are risks that the contractor, by being the best expert, should have control over. The document only include risks outside the contractor's control, but that can still be mitigated or managed.

The **added value** document is where the contractor suggests other solutions that can add value to the project, without significantly increasing costs. This could be a way for a contractor to stand out, and proving the capability of delivering best value. [Storteboom \(2017\)](#)

The last part of the selection phase is the **interviews** with key personnel. This is the most important way of ensuring the contractors expertise. The interviews are supposed to be with personnel that will be directly involved in the project, and it is important that the key personnel is invested in and understands the project. The commitment and ability to minimize risks should be made clear in the interview phase. [Snippert \(2014\)](#)

The exact weights of a criterion, and how the criteria is evaluated varies from project to project. The criteria of the case study in this thesis will be presented and discussed in Chapter 4. The involved contractors are rated in each criteria, and the contractor with the highest achieved score will enter the next phase.

Phase 2 - The Clarification Phase

The clarification phase is the process between choosing the best value contractor and signing the contract. This is not an arena for further negotiation, and the proposed material can not be changed. [Storteboom \(2017\)](#) The contractor takes charge in this phase by inviting to meetings to clarify anything regarding the offer. This is done by documenting the performance claims set in phase 1, in order to convince the project owner that the goals and objectives will be met. The contractor defines what is in the offer and what is left out, while still remaining in best value. The detailed schedule, risk management plan and method for risk reporting is compiled as part of the final offer. This is also when the project owner accepts the offer, should it be considered best value after everything is clarified. Should for some reason the offer not be considered best value after the clarification phase, the second best contractor from the selection phase will be invited. [Snippert \(2014\)](#) The contractor develops a set of key performance indicators (KPI) based on the

project goals, which will be a part of the weekly reports in phase 3.

3.5.3 Phase 3 - The Execution Phase

When the best suited contractor is found, all the plans and schedules are agreed upon it is time to implement the project. The project actualization is done in the execution phase, albeit the BVA execution phase is not used in every country that implements the BVA. The fundamentals of the execution phase is the same as in earlier phases, with the contractor being the expert, thus being able to provide the best value. [Parmar et al.](#) shows that the BVA in general has a better chance of minimizing the risks and decision making required in a project. This assumes that the project adheres to the best value mindset. This implies that the contractor should remain in the established role of the expert, and the project owner should not interfere. The risk in a project increases when project owner's project managers try to reactively make decisions in order to mitigate risks and satisfy the project owner. [Algahtany et al. \(2016\)](#) In order for the BVA to be used in the execution phase, the contractor still need to measure performance, mitigate risks and remain transparency and accountability. This is achieved by using weekly risk reports.

Weekly Risk Reporting

The contractor was, in the selection and clarification phases, chosen on the basis of being the best at identifying and managing risks. The weekly reports serve as a chance for the project owner to follow up on that, as well as being an update on the projects progress. The reports include a summary of what risks are affecting the project at the given time, and could potentially influence time, budget or quality. The reports also include the mitigation and risk management strategies, in order to show the project owner that the contractor still is in control. The nature of the risks shows the sources of the risks, and if the contractor is performing on the expected expert and best value level, the contractor should not be the source of the risks. [van de Rijt and Santema \(2013\)](#) In this phase the contractor has full responsibility of the project, and the risk report is what remains of the direct relationship between the contractor and the project owner. The risk reports still functions as a way of monitoring the project for the project owner, and the contractor will have to document that the quality is ensured. This is ensured by developing a set of Key Performance Indicators (KPI) at the end of the clarification phase, that has to be measured during the execution of the project. These indicators should be be directly related to the project goals and main risks of the project, as defined in the selection phase. [Horstman and Witteveen \(2013\)](#) The KPI shows the project owner the performance of the contractor regarding a selection of key elements of the project. [Snippert \(2014\)](#) If the best value execution phase is implemented as intended, the weekly reports should be the only necessary monitoring and involvement from the project owner.

Chapter 4

Findings

4.1 Summary of the Interviews - The General Experience

Several interviews with involved personnel was conducted in order to understand the contractor's experience with the BVA. In this section the discussions and thoughts that surfaced during the interviews will be presented. These interviews helped decide what aspects should be investigated further, and set a basis for the discussion chapter. The contractor's reasons and motivation for joining the pilot project was discussed. The contractor experiences with the procurement phase will also be presented in this section. At the time of writing this thesis the execution phase is still in progress, so the thoughts and experiences will be of the on-going process. Most of the points will be regarding the actual best value methodology, but some points regarding the specific project or project owner contract management will be presented, due to the connection between delivery method and project owner management. The contractor experience can be summarized into the following points

- In general, high level of satisfaction
- Greatly in favor of Most Economically Advantageous Tender (MEAT) as the award criteria
- The principle of letting the expert be the expert is promising
- Method needs time to get adjusted to, but has great potential
- Some concerns regarding the importance of price
- Time spent in meetings seems higher than in previous projects (project related, not BVA-related)

4.1.1 Motivation

The Rugtvedt - Dørdal was an interesting project for the contractor before it was made clear that the procurement phase would be using the BVA. Several factors makes the project interesting for a contractor in Norway. The initial factors concerning the interest in the project is the same as for other projects. The location of the project, the assumed contract amount, relationship with the project owner, and availability are some of the most common factors which determines a contractors interest in a project. The Rugtvedt - Dørdal project is a large road project on one of the main roads in Norway, with a contract sum of roughly 2b NOK, and with a project owner that will be awarding several road projects in the years to come. All these are factors that appeal to a large construction contractor in Norway. As New Roads Corp announced project information and that the procurement phase would use the new BVA method, the interest of several contractors peaked further. Three of the largest Norwegian contractors as well as one contractor from Spain was pre-qualified. [OurRoads \(2016\)](#)

The principle of using MEAT as award criteria, thus allowing factors like quality, performance and risk management to be considered in addition to price, is a principle Hæhre is greatly in favor for. The fact that price could be weighted from 25% and as low as 10% in these type of contracts was intriguing. The concept of the six paged tender document was another fascinating element, since the actual value created ahead of the project is low. An additional principle that the contractor is in favor of is the principle of allowing the expert to be the expert. Years of experience in the industry has equipped the best contractors with the knowledge and competence to deliver a high quality project without extensive project owner involvement.

Hæhre also aims to be an innovative contractor, and be at the forefront of new solutions when the circumstances make it possible. Earlier experience indicates that it can be profitable to be one of the early ones involved in innovative solutions and technology, and the financial risk of testing a new procurement method is low. The main reason was to secure a job, and get experience in a new method in the process.

4.1.2 Experiences and Thoughts

The recurring feedback on the process from this contractor's point of view is that the BVA methodology works very well, and is experienced as a good and predicable procurement process. The process is simple and predictable, with clear set of frameworks for completing the offer, as well as evaluating and ranking the contractors.

One of the recurring key points from the interviews is that it takes some time to get accustomed to a new method, with new procedures and processes. The process of writing the tender is particularly different from previous projects, with the amount of information that will be submitted in only six pages. The potential to save resources in this phase is nonetheless apparent,

and the writing group was reduced to a smaller group during the process. In later projects that also follows the BVA the size of the writing group has been further reduced, reducing the resources spent as well.

Another new aspect of the BVA is the importance of documented metrics and dominant information. Documenting various performance indicators and results is something the Norwegian industry have been lacking up until now, and the introduction of the BVA method has made contractors conscious on the importance of it. New Roads announced early that metrics would be an important part of the process, in order to give the contractors the opportunity to collect and document the metrics. The procedures regarding documenting various indicators has improved, in order to be prepared for future project goals and objectives.

Communication is one of the most important factors when implementing new methods that changes the relationship between project owner and contractor. In order for the method to be transparent and predictable for both parties, the communication needs to be clear and concise from the start. The interviewees stated that the initial information involving the implementation of the BVA in the project was good, for instance with the aforementioned announcement of the need for metrics. During some of the interviews it was found that the decision of choosing to not use the BVA in the execution phase might not have been made sufficiently clear from the start. Whether this was the case or not is difficult to investigate retrospectively, and thus has not been done in this thesis, but it could be a lesson to bring on to future projects. When implementing a new method that consists of several phases, it is important to be absolutely clear on what phases are in and what are left out.

In order to meet the performance goals of the selection phase the involvement of subcontractors is important for several reasons. Although the contractor is not using the BVA to select the subcontractors, the mindset has to be spread through the organization. In order to submit the best value tender, a contractor is required to submit the best value solutions for the project. Large subcontractors could be required to provide inputs and design solutions for the added value document. Subcontractors also have to understand the project goals and objectives from the selection phase, in order for the contractor to reach these goals. For a contractor to reach a set goal on for instance CO_2 emissions, concrete consumption or idle times for a project, involved subcontractors have to contribute towards the goal. This has to be agreed contractual when signing subcontractors.

The points on the importance of price and the amount of time required for meetings will be further presented in separate chapters, since these points can be investigated by collecting data and analyzing it.

4.2 Evaluation and points awarded

When the Best Value Approach is chosen as the method of procurement, the project will be awarded based on the Most Economically Advantageous Tender (MEAT) award criteria. This means that the contractors get rated in several categories or criteria. Four of the criteria is based on documents delivered by the contractor to the project owner, and one criterion, K4 on key personnel, is based on interviews of relevant personnel. Each of these criteria scores is weighted in a predefined manner to get points in that criteria, and the contractor with the highest total score is awarded the project. The way these criteria are weighted is defined by the project owner, and can change from project to project. In the pilot project studied in this research, the project owner has defined five criteria which is weighted as shown in Table 4.1. How these criteria are evaluated, scored and weighted is essential to the process of awarding the project to a contractor. How each criterion was weighted and scored, as well as the consequences of the chosen weights will be presented in this chapter. Since there are two separate scoring system working at once in this phase the following terminology will be used

- **Score:** The score achieved in a criterion. The pre-weighted scores based on the thresholds set by the project owner
- **Points:** The points that determine the awarding of the project. The amount of points after applying the criterion weights to the scores.

Table 4.1: Weighted award criteria

Award Criteria	Weight
Tender amount	25%
K1 - Performance	25%
K2 - Risk Evaluation	15%
K3 - Added Value	10%
K4 - Qualification and experience on key personnel	25%

4.2.1 Criteria evaluation

In the pilot project studied in this thesis, one or more criterion winners was found in each criterion. This was done by awarding scores based on how well each criterion was fulfilled. This was measured by the fulfillment of formulated threshold achievements for each criterion. The threshold achievements is based on to what degree the document contributes to fulfilling the target of that criterion. The winner of each criterion obtained a score of 100 on the scoring system, regardless of whether the winner reached the highest threshold or not. In order to find the

scores from the remaining contractors, their achieved score was adjusted based on the score originally achieved by the winning contractor or contractors. This was done using the following equation

$$\text{Adjusted Score} = \frac{\text{Evaluated Contractors Score}}{\text{Winning Contractors Score}} * 100 \quad (4.1)$$

Example: Contractor A has the highest achieved score in a given criteria with 80, and thus is awarded a score of 100 on the scoring system. Contractor B has achieved a score of 60 in the criterion, and thus the score is calculated as shown in equation 4.2.

$$\frac{60}{80} * 100 = 75 \quad (4.2)$$

This adjustment does not affect the distance between the contractors on the score sheet, due to the ratio of score being kept constant. This is a way to normalize the scores, so that the criterion winner is awarded the same score for winning, regardless of the score achieved in order to be best in the given category. After obtaining scores internally in each criterion, each contractor was awarded points towards the tender total based on the weighting of each criterion.

K1 - Performance

The performance criterion score is based on how well the performance document contributes to the credibility of the claim to achieve the project objectives. The possible scores and the performance required to achieve a certain score is shown in Table 4.2

Table 4.2: Performance criterion scores	
Score	Evaluation
100	The performance document contributes in a very positive way towards the realization of the project goals.
80	The performance document contributes well towards the realization of the project goals.
60	The performance document contributes sufficient towards the realization of the project goals.
Not satisfactory	The performance document is not sufficient to substantiate that the contractor is able to realize the project goals.

As shown in table 4.2 the formulation of each threshold indicates that the highest possible score could in theory be achieved by every contractor. There is also a linear relation between all

scores, except the insufficient level of performance. The wording of the thresholds implies that as long as a sufficient level of performance is achieved, a contractor will not obtain any less than a score of 60.

K2 - Risk evaluation

The risk evaluation criterion score is based on how well the contractor is able to map and minimize the project owner risk. A minimized project owner risk contributes largely to reducing the need for expensive and time consuming change orders. The risk evaluation criterion was scored as shown in 4.3.

Table 4.3: Risk evaluation scores

Score	Evaluation
100	The risk plan contributes very well to minimize the project owner risk.
80	The risk plan contributes well to minimize the project owner risk.
60	The risk plan contributes sufficient to minimize the project owner risk.
40	The risk plan contributes to a small extent to minimize the project owner risk.
20	The risk plan does not contribute to minimize the project owner risk.
0	Risk plan without content.

The risk evaluation criterion threshold has a linear relation, similar to the performance criterion. This relation ensures that as long as a risk plan that actually has content is delivered, the contractor would be awarded at least a score of 20, even if the plan does not contribute towards minimizing risk.

K3 - Added value

The added value criterion score is based on the degree of which the contractor is able to highlight possible measures that provides added value to the project goals. In order to add value to the project goal the benefit should outweigh the cost for the project owner. The added value criterion was scored as shown in Table 4.4.

As with criterion K1 and K2 a linear relation can be shown between the threshold achieved and the score obtained. As for the earlier criteria a contractor is awarded a minimum of 60 points as long as the added value contributes in at least a neutral way towards the project goals.

Table 4.4: Added value scores

Score	Evaluation
100	The added value contributes very well towards reaching the project goals, beyond the commitments based on the project requirements at a proportional cost.
80	The added value contributes well towards reaching the project goals, beyond the commitments based on the project requirements at a proportional cost.
60	The added value contributes in a neutral way towards reaching the project goals, beyond the commitments based on the project requirements at a proportional cost.
Not satisfactory	The added value shows that the project requirements will not be produced on schedule, within the budget or with the necessary quality.

K4 - Qualification and experience on key personnel

The key personnel criterion is based on interviews of the relevant personnel. The score is based on in which degree the qualifications and experience of the appointed key personnel and their roles in the organization contributes towards reaching the project goals. The key personnel criterion was scored as shown in Table 4.5.

Table 4.5: Key personnel scores

Score	Evaluation
100	The qualifications and experiences of the key personnel and their role in the organization, contributes very well towards realization of the project goals.
80	The qualifications and experiences of the key personnel and their role in the organization, contributes well towards realization of the project goals.
60	The qualifications and experiences of the key personnel and their role in the organization, contributes sufficient towards realization of the project goals.
40	The qualifications and experiences of the key personnel and their role in the organization, does not contribute well towards realization of the project goals.
20	The qualifications and experiences of the key personnel and their role in the organization, does not contribute towards realization of the project goals.

As is shown in Table 4.5, the scoring for the key personnel is also linear. The two lowest thresholds also yields a significant score even though the wording indicates that the key personnel either does not contribute well or not at all towards reaching the project goals. If the key

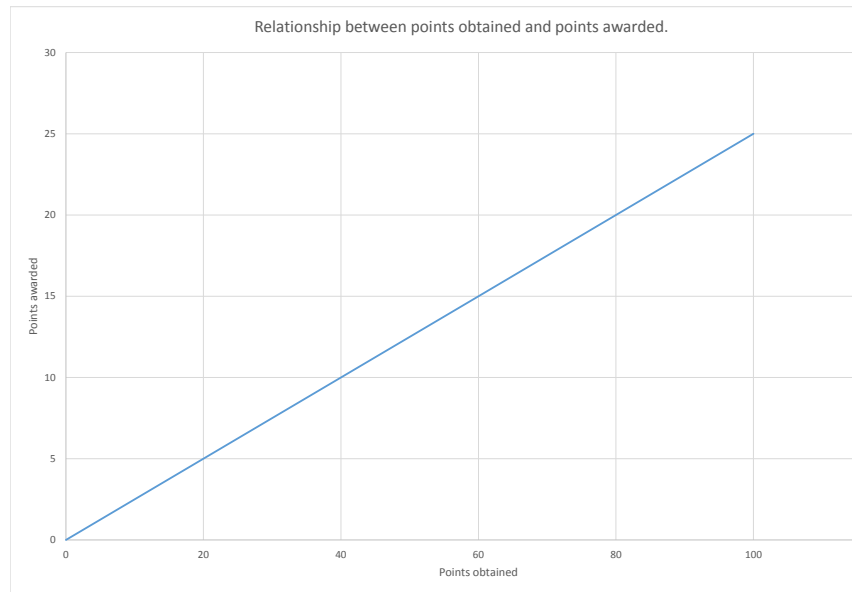


Figure 4.1: The linear relationship between points obtained and points awarded

personnel does not contribute well towards the project goals, i.e. achieving a score of 40, the contractor would still be awarded $\frac{40}{100} * 25 = 10$ points.

TA - Tender Amount

This criterion is the one that is most similar to traditional procurement methods, where the price is the most important award criteria. The tender amount consists of all the contracted work, including options on the work. The sum of the tender amount and the suggested added value from criterion K3 should not exceed the Project Owner Maximum Price (POMP). The POMP is a budgeted price ceiling set by the project owner prior to the procurement phase. The POMP will be shown to be a significant factor when deciding which contractor will be awarded the project. Contrary to the other criteria where there is a linear relationship between a set of predefined threshold achievements and the points awarded, the points awarded for the tender amount is calculated by the following formula.

$$\frac{(POMP - TA)}{(POMP - LTA)} * 100 \quad (4.3)$$

In this point calculating formula POMP is the Project Owner Maximum Price, TA is the Tender Amount for the contractor in question, and LTA is the Lowest Tender Amount submitted by

a contractor. The Tender Amount criterion is the only criterion which is directly affected by the other contractors. It is also the only criterion that does not have a linear relationship between the threshold set by the project owner and the submitted result from the contractor. Several of the interviewees suggested that this way of awarding points might make the tender amount, or price, count more than is intended when using a best value approach for procuring. This will be elaborated in Chapter 4.2.3.

4.2.2 Total Point Calculation and Awarding the Project

Choosing the contractor that provides the best value is the main focus of the Best Value Approach. This implies that price is just one of several criteria that needs to be considered before awarding a project to a contractor. The way the criteria is evaluated and scored has to be predictable and fair, in order for the best value approach to also be a predictable and fair way to award projects. The project studied in this case was, as described earlier in this chapter, awarded based on five criteria. Tender amount, performance and qualification on key personnel counted for 25% each, and risk evaluation and added value counted for respectively 15% and 10%. These percentiles make up the foundation of the project awarding process, and need to be maintained in order for the process to be transparent and predictable both for the project owner and for the contractor. In this section these percentiles, the significance of these, and various events that can have large impacts on the project awarding will be presented.

The way the scoring system is done in the tender documents of this project the different contractors accumulate points in each of the criteria. The theoretical maximum amount of points a contractor could be awarded is 100 points. This can only be achieved by submitting the lowest tender amount, as well as reaching the highest threshold of the other criterion. The total amount of points achieved is calculated as shown in equation 4.4, with CP being the criteria points achieved in a given criterion.

$$Points = \underbrace{CP * 25\%}_{\text{Tender Amount}} + \underbrace{CP * 25\%}_{\text{Performance}} + \underbrace{CP * 15\%}_{\text{Risk Evaluation}} + \underbrace{CP * 10\%}_{\text{Added Value}} + \underbrace{CP * 25\%}_{\text{Key Personnel}} \quad (4.4)$$

The accumulating of points for a contractor can be visualized as in Figure 4.2. The slope of the graph indicates the amount of points achieved in a criterion, and thus the impact of that criterion on the total score.

The wording in the tender documents indicates that the highest amount of points can be achieved by every contractor in a criterion, with the exception being tender amount. The tender amount criterion is the only criterion which is also impacted by the other tenders. It is also the only criterion where the distribution of points does not follow a linear scale. This has potential interesting effects on the outcome of choosing the best contractor.

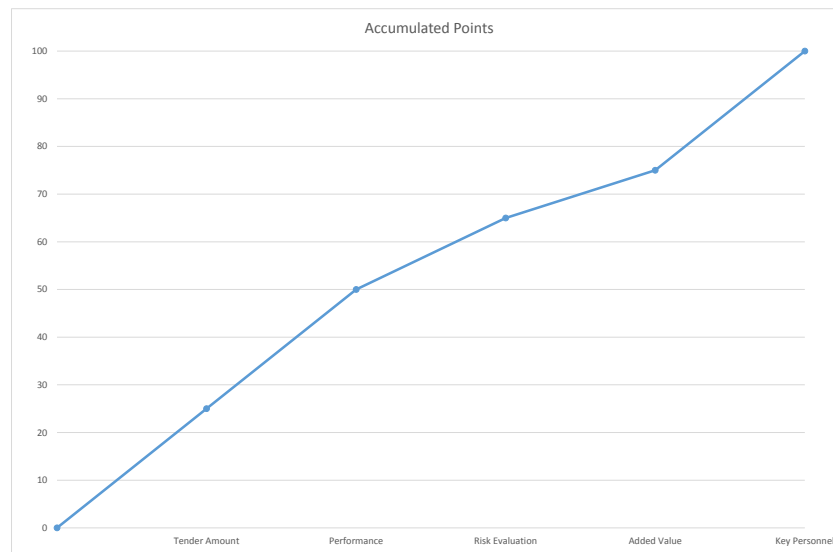


Figure 4.2: Accumulating Maximum Amount of Points

Tender Amount Parameters and Their Impact

The tender amount criterion is the only parameter that does not exclusively follow predefined thresholds. Therefore it is interesting to see how each of the involved parameters influence the total points achieved in this criterion. There are three parameters that determine the points achieved by a contractor in the TA criterion.

- Project Owner Maximum Price (POMP): A budget ceiling determined by the Project Owner prior to the selection phase.
- Lowest Tender Amount: The lowest TA delivered by a contractor. This contractor always get 25 points, regardless of the other parameters.
- Tender Amount: The TA of the contractor in question. The points achieved is calculated as shown in equation 4.3, and is dependent on both POMP and LTA.

To determine the significance and impact of each of these parameters an analysis was done on each of them. At first, a separate analysis was done on each of the parameter to observe the magnitude of a parameters impact. In order to determine which parameter has the largest impact a combined sensitivity analysis was conducted to compare the parameters in an simple and visual way.

Table 4.6: Example parameters
Example Project

Project Owner Max Price	2,435b NOK
Lowest Tender Amount	2,20b NOK
Tender Amount	2,35b NOK

The maximum price that the project owner set directly influences the amount of points the different contractors achieve, and thus has the potential to directly influence the outcome of the procurement process. In this section a selection of different scenarios will be presented to show the significance of the maximum price.

The tender documents includes an example scenario to show how the points for tender amount is calculated. The information used in the example is shown in Table 4.6. These numbers can be used to perform a sensitivity analysis on what parameter has the most impact on the point distribution. The point distribution works in the way that the contractor with the lowest tender amount always get 25 points, and the other contractors get their points based on the lowest tender amount and project owners maximum price. This means that the contractor in the example would get 9 points after the 25% weight as shown in equation 4.5.

$$\frac{(2,435 - 2,35)}{(2,435 - 2,20)} * 100 * 0,25 = 9 \quad (4.5)$$

Keeping all other parameters constant and only adjusting the POMP will show the impact of that parameter on the outcome. Testing the points outcome of equation 4.3 with different maximum prices show how significant the POMP parameter is in this example scenario. A 5% incremental increase of the maximum price shows a large spike in points achieved, especially at the first steps of increase. This can be seen in figure 4.3, with the corresponding numerical values in table 4.7. It is apparent that the first increases in maximum price greatly increases the points achieved by the contractor, with a 5% increase in POMP increases the points achieved from 9 to 14,5 points. This is roughly a 60% increase in points achieved due to that 5% increase in POMP. The diminishing returns on the points achieved is apparent both from the figure and the table, with the next increase being 19%. Nonetheless this is a significant increase in points for being a result of the same incremental increase of 5% in POMP.

The lowest tender amount is also a factor that impacts the points achieved by the contractor in question. LTA is a factor that cannot be influenced by the contractor itself. Nonetheless it is affecting the points achieved by the contractor, and thus it is interesting to see how changes in LTA actually affects the points. In order to see the magnitude of the impact a sensitivity analysis has to be conducted. The range from lowest tender amount to the tender amount in question is too small for a analysis with 5% increments. Thus an analysis using 2% increments in both

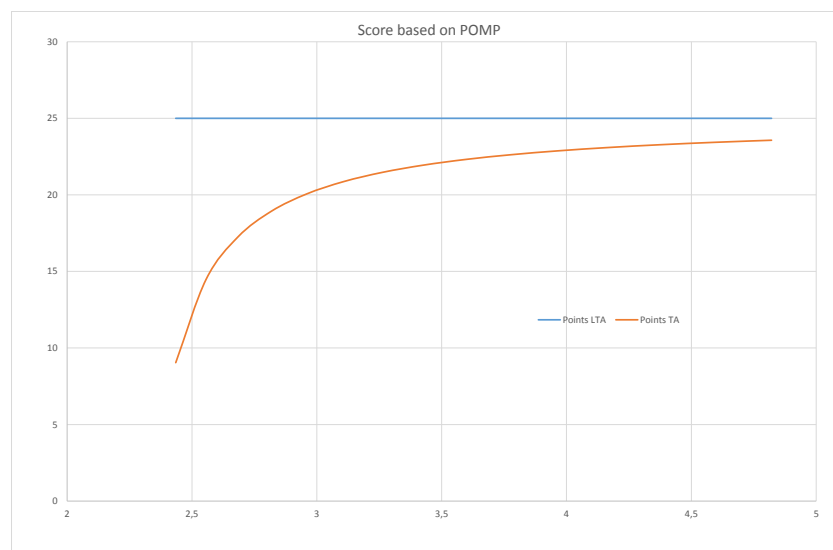


Figure 4.3: Distribution of points based on increasing maximum price

Table 4.7: Distribution of points based on increasing POMP

POMP	Score TA	Score LTA	Change
2,435	9,04255319	25	0
2,55675	14,4884373	25	60,23%
2,6845875	17,2614595	25	19,14%
2,81881688	18,9400489	25	9,72%
2,95975772	20,064216	25	5,94%
3,1077456	20,8688866	25	4,01%
3,26313288	21,4726893	25	2,89%
3,42628953	21,9419946	25	2,19%
3,59760401	22,3168365	25	1,71%
3,77748421	22,6227971	25	1,37%
3,96635842	22,8769881	25	1,12%
4,16467634	23,0912887	25	0,94%
4,37291015	23,2742038	25	0,79%
4,59155566	23,431983	25	0,68%
4,82113344	23,5693212	25	0,59%

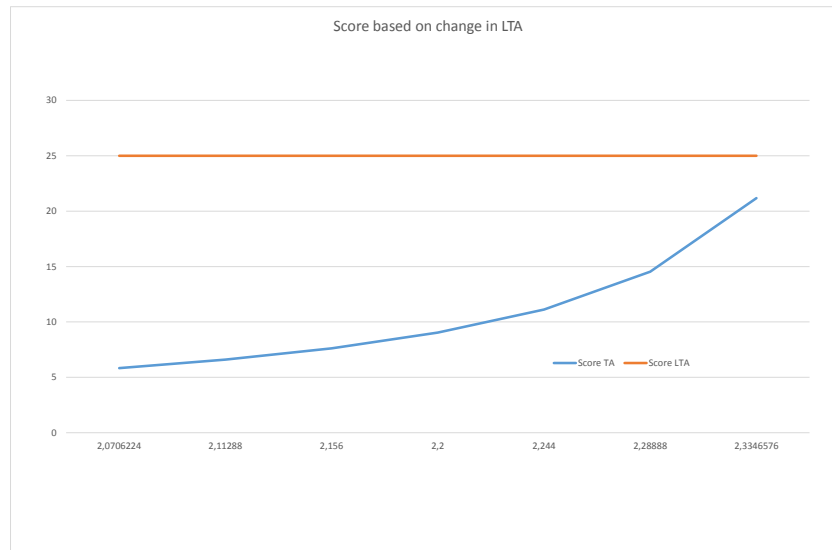


Figure 4.4: How change in LTA would affect point outcome

Table 4.8: Distribution of points based on change in Lowest Tender Amount

LTA	Score TA	Score LTA	Change
2,0706224	5,83186233	25	-11,60%
2,11288	6,5969204	25	-13,39%
2,156	7,61648746	25	-15,77%
2,2	9,04255319	25	0
2,244	11,1256545	25	23,04%
2,28888	14,5428415	25	30,71%
2,3346576	21,1774883	25	45,62%

ways was used for the original LTA of 2,2b NOK. Figure 4.4 shows the change in points based on change in LTA. Numerical values can be seen in Table 4.8. The percentage change is based on the previous incremental change, such that the most significant step can be seen. It is apparent that lowering the LTA has an impact, albeit with diminishing significance. Increasing the LTA, thereby lowering the difference between TA and LTA, has a significant and increasing impact on the points achieved. This can be seen as the same phenomenon as in the case of increasing POMP, changing the difference between TA and LTA relative to POMP.

The last parameter involved in calculating points in the tender amount criterion is the actual tender amount delivered by the contractor. This is also the only parameter that can be directly influenced by the contractor, and thus it is important to see the significance of the TA parameter

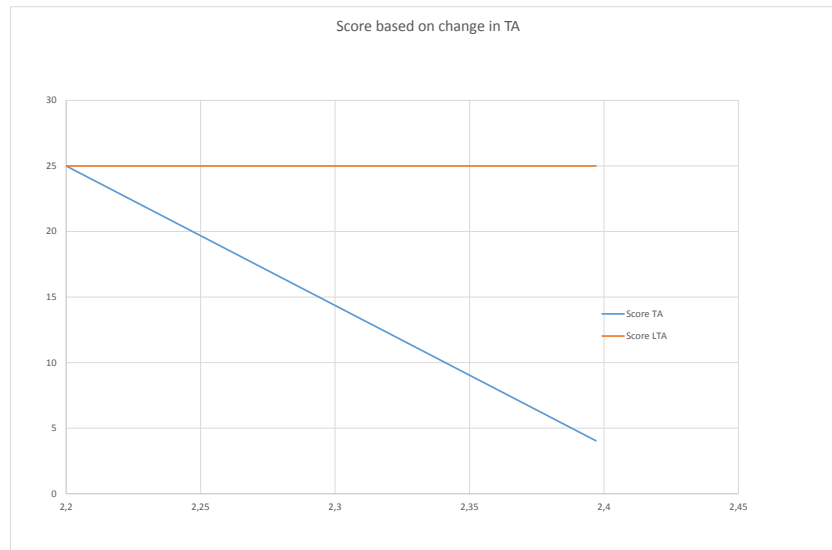


Figure 4.5: How change in TA would affect point outcome

Table 4.9: Distribution of points based on change in Tender Amount

TA	Score TA	Score LTA	Change
2,397	4,04255319	25	-55,29%
2,35	9,04255319	25	0
2,303	14,0425532	25	55,29%
2,25694	18,9425532	25	34,89%
2,2118012	23,7445532	25	25,35%

compared to the others. As for the LTA parameter the TA of 2,35b NOK was adjusted in 2% increments to observe the points achieved from various values. The distribution of points can be seen in Figure 4.5 with numerical values in Table 4.9. As for the LTA values, the percentage change is for each incremental change. The values show that the returns from lowering the tender amount is diminishing, albeit significant for each step towards the LTA. The award for reducing the original tender amount with 2% is a 55% increase in points achieved.

In order to determine which of the parameters impacts the result mostly, a comparative sensitivity analysis has to be conducted. To do this, a parameter was increased and reduced by 2% while the other two was held constant. The point outcome was calculated for each of the new set of parameters, and repeated for the two remaining parameters. These data sets can be seen in Figure 4.6 Comparing the slope of the graphs indicates which of the parameters that has the largest impact on the point outcome. The steepest slope is related to change in TA, thus making TA the most significant parameter for variance in point outcome. This implies that reducing

the tender amount is the most efficient way of increasing the number of points achieved in the tender amount criterion. The second most important parameter is the POMP, as indicated by the second steepest slope. As previously shown in figure 4.3 a small change in POMP has a large impact on point achieved by non-lowest tender amount contractors. This implies that there is a possibility for the project owner to increase the significance of the tender amount criterion. By setting a low POMP the relative difference between LTA and TA will increase. This reduces the points all non-lowest tender amount contractors achieve, thus increasing the importance of having the lowest tender amount. This will be further elaborated in the discussion chapter.

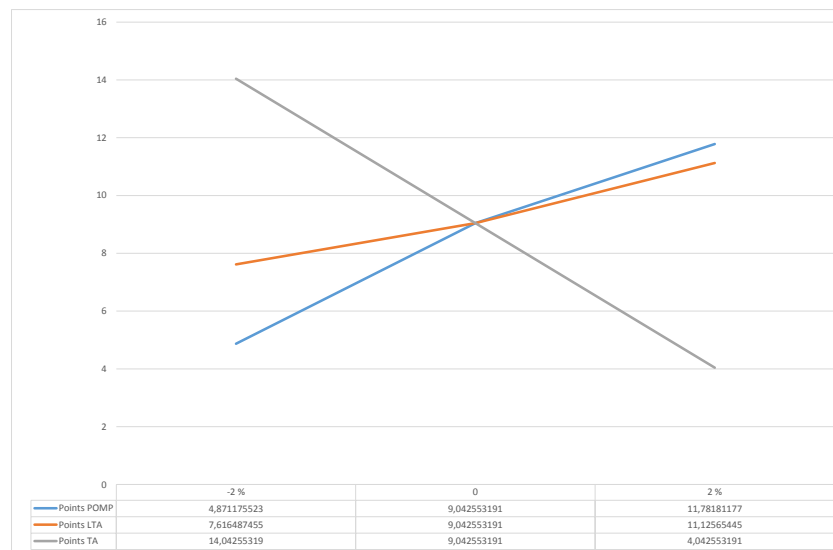


Figure 4.6: Change in points based on a fixed percentage change

4.3 Meetings and reporting

During the interview process some of the interviewees indicated that the required amount of meetings and reporting in the Rugtvedt - Dørdal project was more time consuming than in previous projects. The project owner has decided not to use the best value approach in the execution phase of this project, but still utilizing the weekly risk plans described in Section 3.5.3. This project utilizes a turnkey contract, with monitoring as per New Roads contract follow-up routines. In addition to this, the project owner has implemented several new focus areas that the contractors are responsible for. For instance New Roads have entered into an agreement with the Norwegian Tax Administration as a focus against social dumping and illicit work in the

construction industry, that requires a substantial amount of reporting from the contractor. Although this is a positive initiative for an industry that has had its troubles with illicit work and underpaid foreign labourers, it adds to the existing administrative responsibilities. One of the primary focuses of the best value approach is to reduce time consuming decision making processes. If the new way of contract follow-up requires an increased amount of administrative work, it could be worthwhile to look into options that could reduce the administrative burden. Thus it is interesting to check whether people involved in the project are actually using more time at meetings and reporting than in another similar project, and consider if the BVA could be implemented in a later project.

In order to get accurate data on time usage on meetings and reporting a survey sheet for tracking time was created. This sheet was handed out to the project manager of the case study project, as well as to the project manager of a reference project. A reference project with more traditional and well-established follow-up routines is essential to get a good comparison for the studied project. The project managers in each project involved additional participants that also tracked the hours spent. In the Rugtvedt - Dørdal project five people in various positions participated. In the project used for reference a Health, Safety and Environment Manager participated in addition to the Assistant Project Manager. The participants involved, their area of responsibility and the abbreviations used in this section is shown in Table 4.10. Due to lack of available personnel in every role a side by side comparison cannot be done for every area of responsibility, but both the HSE Manager and the assistant project manager was available in both projects, making a good comparison possible. One could also argue that a health, safety and environment manager has some similar and overlapping responsibilities with a manager of environmental, thus making that comparison valid as well. Both positions involves inspections with accompanying reports, and both positions involves meetings regarding the way the work is carried out. The project managers time spent on meetings and reports is also interesting to examine, since even though a PM is expected to be largely involved in meetings, there are also other tasks that requires a PMs time.

Table 4.10: Personnel participating in time logging

Project 1: Rugtvedt - Dørdal	Project 2: Helgeland Nord
Project Manager (PM)	Assistant Project Manager (aPM)
Assistant Project Manager (aPM)	Health, Safety & Environment Manager (HSEM)
Manager of Environmental (EnvM)	
Project Engineer (PE)	
Health, Safety & Environment Manager (HSEM)	

4.3.1 Total Time Spent on Meetings or Reports

The time tracking sheet divided time spent into 4 categories; internal meetings, meetings with the project owner, meetings with one or more sub-contractors, and time spent on work related to reports. This way it is possible to see not only how much time is spent on meetings, but also what kind of meeting is the most time consuming. In order to get a good comparison, a full month where all the participants tracked meeting time was used as a basis. The total time spent on meetings and reports for one month is shown in Figure 4.7. The distribution of the hours is shown in Table 4.11 The table also includes what percentage of a full work month that each participants spends in meetings or on reports. Only the total hours spent was tracked for the environmental manager and the project engineer, and not the distribution of hours. The distribution of hours, for the participants that tracked the different types, is shown in Figure 4.8.

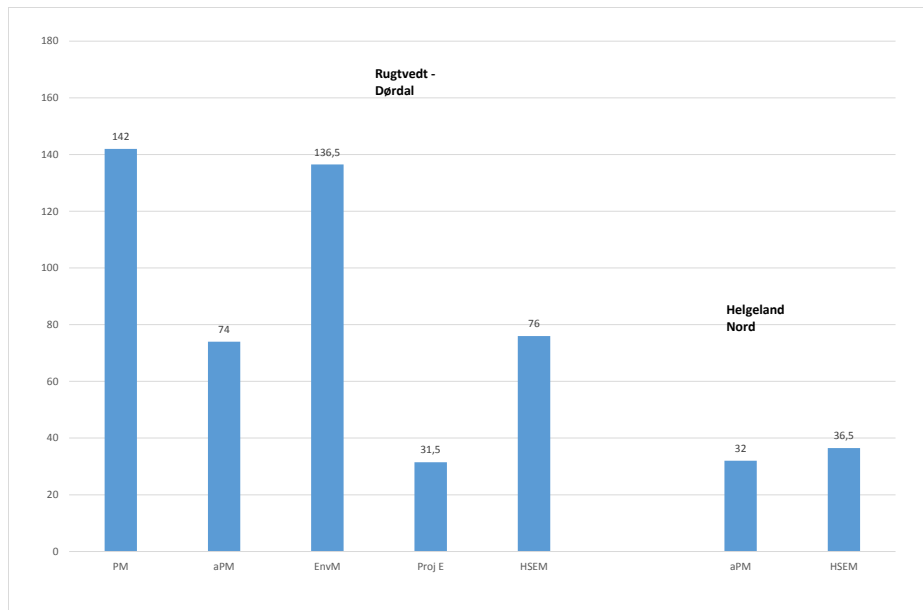


Figure 4.7: Total hours spent on meetings in one month

It is apparent that for the surveyed month the time usage in project 1 is significantly larger than for project 2. The assistant project manager in project 1 spends more than double the amount of hours on meetings and reports than the assistant project manager in project 2. The time tracking sheet does not include any description of actual responsibilities for each position, though one would assume that the same position on two different projects within the same company would have similar levels of responsibility. The same difference in hours spent can be observed for the two HSE managers. The difference in responsibility might be more significant

Table 4.11: Total distribution of hours for one month in the Rugtvedt - Dørdal project

Role	Meeting int	Meeting PO	Meeting SC	Reports	Total	% of month
Project Manager	106	24	2	10	142	87,38 %
Assistant PM	51,75	7,5	3,75	11	74	45,54 %
Env. Manager					136,5	84,00 %
Project Engineer					31,5	19,38 %
HSE-Manager	57,5	14,5	1	3	76	46,77 %

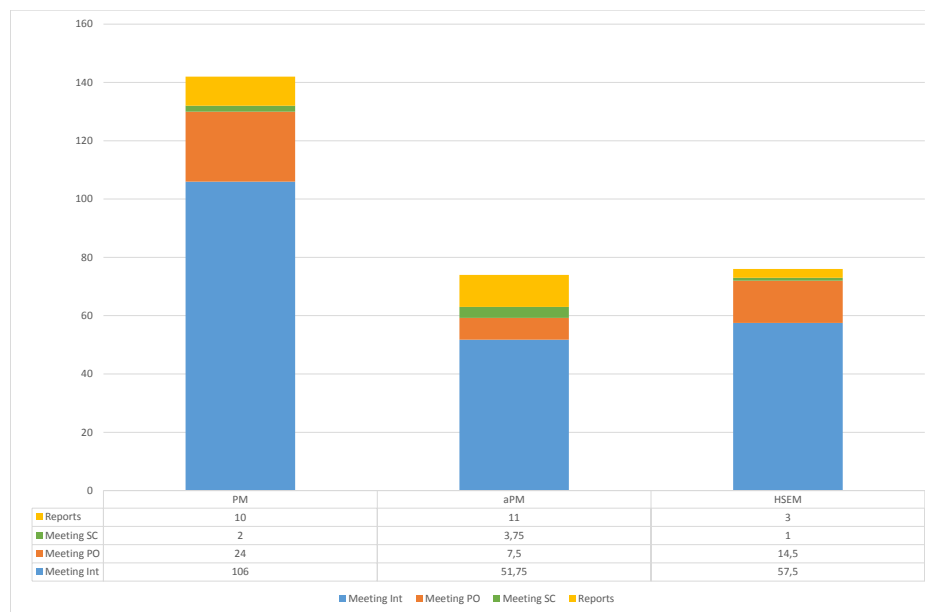


Figure 4.8: Distribution of hours for each participant

between the HSEMs and the EnvM. The difference in time spent on meetings is in any way substantial. The manager of environmental in project 1 spends close to four times more hours in meetings than the HSE manager in project 2, while spending 65% more time compared to project 1s HSE manager. The numbers and difference is shown in Table 4.12. As shown in Figure 4.8 the internal meetings in the project are by far the largest share of the total hours spent. This is the same for all involved participants. This could be for a number of reasons, with some possible explanations shown in the list below

- Exaggerated or rounded up data
- Wide definition of a meeting
- Unusual busy month
- Internal meetings are affected by the other meetings
- A large amount of internal meetings are necessary

Since all parties involved have a genuine interest in whether the meeting regime is too time consuming, and the importance of accuracy in time tracking was emphasized the first point could be excluded. The data are also quite consistent with each other which strengthens the reliability of the information. The gathered data is also consistent with the numbers gathered for the time outside the analyzed month, but due to lack of overlap for all participants that data is not included in the comparison. What defines a meeting, and what has to be tracked would effect the total time spent. If every encounter that required communication was to be defined as a meeting the numbers would be too high, and not paint a realistic picture of the time spent in meetings. In all the data collected, the lowest entry logged was 30 minutes. This implies that an encounter has to have a certain duration in order to be considered a meeting. That excludes the second point as well. Both the third and fourth point was confirmed in follow-up interviews. The month in question had a few incidents that required internal meetings, although this was nothing very time consuming. The meetings with the project owner or with a subcontractor often requires a meeting in advance, afterwards or both. This could be for instance in order to collect information that the project owner needs, or discuss something internal before addressing the subcontractor.

The sheer number of hours spent by the project manager and the manager of environment is another interesting aspect. Spending respectively 142 and 136,5 hours in meetings in 31 days is a substantial amount. The standard Norwegian work month is 162,5 hours. Økonor (2007) This implies that roughly 85% to 90% of the work month is spent either in meetings or work related to reports. A survey from England show that leaders spend on average 65% to 80% of their total time on verbal communication, with surveys from the US showing similar numbers. Martinsen

Table 4.12: Difference of time spent in comparable personnel

Position	Project 1	Project 2	Difference
Assistant Project Manager (aPM)	74	32	+125%
HSEM	82,5	36,5	+126%
EnvM	136,5	Comparing to both HSEMs	+65%/ +284%

(2009) This includes both meetings and smaller verbal encounters during the day. Spending this amount of time in meetings or on reports could result in fewer work hours remaining to do other administrative tasks, or increased amount of necessary overtime to finish all tasks. The distribution of hours spent in each category and remaining available hours for the project manager of project 1 can be seen in Figure 4.9. The figure illustrates how few hours are available for all remaining tasks after the meetings and reports has taken their share. Numeric values and percentages is shown in Table 4.13

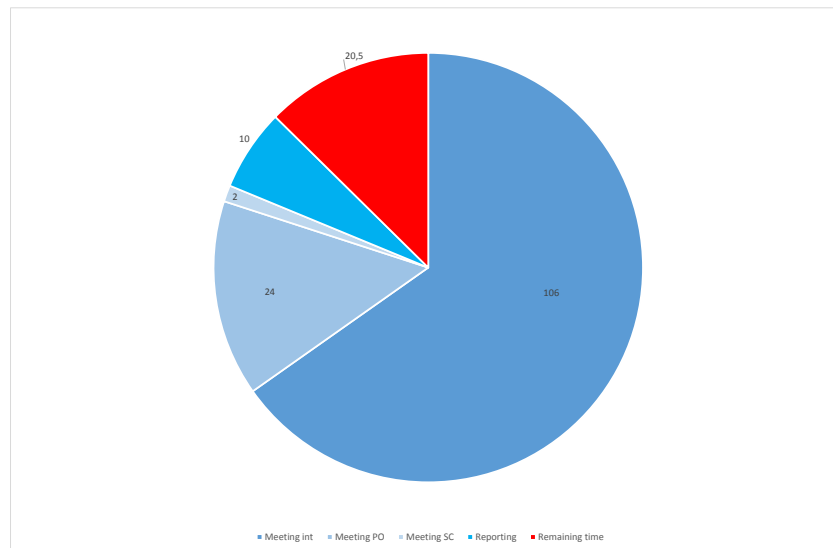


Figure 4.9: Distribution of hours for the project manager for one month

Table 4.13: Numeric values for the project managers time distribution for one month

Meeting int	Meeting PO	Meeting SC	Reporting	Remaining time
106 hours	24 hours	2 hours	10 hours	20,5 hours
65,23 %	14,77 %	1,23 %	6,15 %	12,62 %

As explained in Chapter 3 the project studied in this thesis, uses the BVA for two of the three phases. Even though the execution phase uses the well known turnkey contract, the time spent on meetings and reporting is significantly higher than in a reference project using the same contract type. The reasons for the increased time consumption are not obvious, but internal meetings represent the majority of the time spent. Possible reasons will be discussed in chapter 5.

Chapter 5

Discussion

In this chapter the results and findings will be presented. The results and their significance will be discussed. The chapter will be based on the three focus areas defined in chapter 1. A short summary will be presented, as well as limitations and thoughts on possible future work. In order to get an impression on how this method is being received in Norway, several news articles will be used and discussed. As described in Section 2.4, the articles will be chosen from online newspapers that focuses on the construction industry.

5.1 The Best Value Approach in Norway

The goal of implementing the BVA in Norway is to increase the efficiency in large projects. The first pilot projects in Norway are large road construction projects. The BVA offers a completely new way of procuring projects, which is now being tested in Norway. The BVA also includes a project management tool, which at the time of writing is yet to be implemented in Norwegian projects. The benefits from the BVA includes creating a win-win environment for the contractor and project owner, by allowing the contractor to be the expert. This reduces the workload for the project owner, by letting the contractor take charge in the project process from an early stage. This is a new way of handling projects in Norway, since the traditional method in road construction projects have typically been design-bid-build (DBB) methods. The DBB has a strong project owner involvement, with monitoring and control, in every phase of the project. There are several challenges to implementing a new method such as the BVA, for both a project owner and a contractor, and both parties has to get used to new project routines and procedures. When the results from BVA projects are analyzed, the studies usually are from the project owner perspective. This thesis views the process from the contractors perspective, and focuses on the contractors experience of the method.

The BVA in Norway is in an early phase. Only a few selected pilot project has been started, and the general knowledge of the method is still low. Nonetheless the industry is positive and

shows great interest in the method. [Byggeindustrien \(2016\)](#) It is also interesting to see that, even though the method is new to Norwegian contractors, they are still winning every tender process so far that uses BVA in the procurement phase. [Byggeindustrien \(2017c\)](#) It is nice to see that a new method does not force the Norwegian contractors out of the market due to lack of experience. The Norwegian construction industry is now either in the phase of the innovators or in the phase of the early adopters, according to Geoffrey Moore's model on a market adapting to innovations. The process of implementing and adapting to a new technology is shown in Figure 5.1 (Figure is an adaption from [Moore \(1991\)](#)). The innovators are characterized by a willingness to take a larger risk for the possibility of reward. In Norway at the time of writing this is both New Roads as the project owner, and the involved contractors such as BetonmastHæhre. Implementing a new procurement method has to have both parties willing to take the risk of trying something new. Since the choice of procurement method is up to the project owner, they have to be the driving force behind the implementation, but a number of interested contractors are also required for the method to be legal and fair. The other phase one could argue that Norway is in at the time of writing, is the early adopters phase. This phase happens after the innovators has taken the first steps towards implementing the technology, and others willing to take the risk starts seeing its potential. What has happened in Norway is that after New Roads was the first project owner to sign contracts using the BVA, a few more large public project owners has announced projects that will use the method. From starting out with only being used in road construction projects, tender processes using BVA is now being used in projects such as building kindergartens for a municipality. [Byggeindustrien \(2017a\)](#) The hardest step in implementing a new technology is what Moore calls the chasm. This is the gap between the early adopters and the early majority. The early majority is important, because even after that group has adopted and accepted the new technology, still only half of the market is involved. The early majority is what convinces the more risk averse part of the market to join in on the innovation. [Moore \(1991\)](#) In order to cross this chasm in Norway, the results and experiences from the pilot projects probably have to be shared, as well as being positive. Should the method result in better value, be it a faster, cheaper, more profitable or a project with less conflicts it could tempt more project owners to use the method for future projects.

5.2 The Procurement Phase - The Importance of Price

The procurement method of the BVA uses MEAT as the award criteria. This implies that a set of criteria are defined and weighted prior to the procurement phase. In section 4.2 the different criteria and how they are weighted and evaluated is described. The results show that the different criteria has different point scoring systems, based on either project owner set thresholds or a point calculating formula.

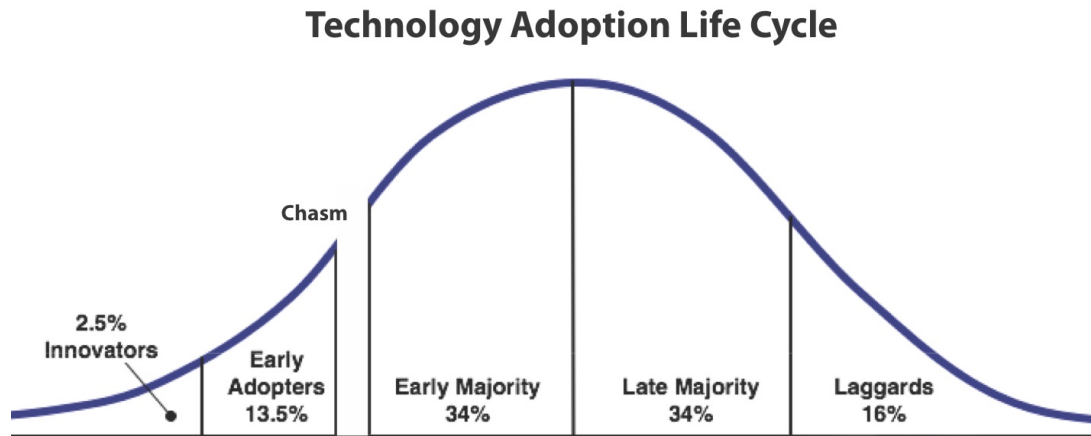


Figure 5.1: A market adopting technology

The formula for calculating points in the tender amount criterion is affected by three parameters; the tender amount from the contractor in question, the lowest tender amount submitted, and the project owner maximum price. It is interesting to see how the maximum price is affecting the points achieved by the non-lowest tender amount contractors. A low maximum price will reduce the amount of points the contractors without the lowest tender will achieve. This implies that by deliberately setting a low maximum price, a project owner has the possibility of increasing the significance of the tender amount. It is important for the project owner to set a good and fair maximum price. Setting too high maximum price would reduce the significance of the criterion to eventually not mattering. With a high enough maximum price, all contractors would get similar scores regardless of the submitted tender amount. The opposite occurs when setting too a very low maximum price. The relative difference between the tender amount in question and the lowest tender amount increases, and the point difference increases. A low maximum price could make contractors reluctant to submit tender offers, which could reduce the amount of interested contractors. A low amount of contractors could lower the chance of actually achieving best value, and could even force a project owner to cancel or postpone the tender process. This happened in one of the road segments on E39 in Norway, where Betonmas-tHæhre used low maximum price specifically as a reason to not submit an offer. [Byggeindustrien \(2017b\)](#)

Another way to influence the importance of the different criteria is the wording of the qualitative criteria. How the different thresholds are worded defines the difficulty of reaching the given criteria. How easy a certain threshold could be reached defines the significance of the criteria, because if most or all contractors could reach a certain threshold, only the higher thresholds would matter in practice. This reduces the de facto available points in a criterion. This phenomenon is illustrated by creating possible example scenarios, where the wording and how achievable the criteria thresholds are, is discussed.

5.2.1 Maintaining Best Value? Example Scenarios

Since all contractors that enters the selection phase are pre-qualified for the project, one could assume a certain degree of professionalism and experience from each contractor. This implies that when the tender documents requires that the contractor writes a risk assessment plan, the contractor would do that to the best of their ability. This would be the same for every criterion that involves prepared documents.

Scenario 1 - Minimum Threshold reached

It is interesting to investigate the amount of points a contractor would achieve by just submitting the bare minimum in each criteria. The point calculation assumes that at least one contractor reaches the highest threshold in each criteria. Should no contractor achieve the highest score, the points achieved in the example would be higher, as defined in equation 4.1.

Table 5.1: Example scenario: Lowest threshold reached in each criteria

Criteria	Threshold	Pre-weighted score	Actual Points	Points available
Performance	Contributes sufficient towards project goals	60	15	25
Risk Evaluation	Does not contribute	20	3	15
Added Value	Contributes neutrally	60	6	10
Key Personnel	Does not contribute	20	5	25
Total			29	75

In this scenario, as shown in Table 5.1 only the bare minimum is submitted in each criteria. For large pre-qualified and experienced contractors it could be argued that this is not realistic. The way the thresholds are worded, a contractor would still get approximately 40% of the total available points by just reaching the lowest threshold. This includes submitting a risk plan that does not contribute to reducing the project owner risk, and appointing key personnel whose experience does not contribute to the project. For a project of this size one would assume a higher performance from involved contractors.

Scenario 2 - Realistic contractor performance

Another interesting scenario to investigate is a realistic performance due to the size and experience of the contractors. The thresholds chosen for this example are what, in the author's opinion, should be expected from most contractors involved in this kind of project. The performance could also be argued to be on the low end, since no criteria performance stands out as a high performance. For the performance criterion this implies that the experience and past performance would contribute well towards the actualization of the project. Since all involved

contractors are pre-qualified, the contractors should have the necessary experience and project portfolio to submit this level of performance. The risk plan is assumed to contribute sufficiently towards minimizing project owner risk. This is the middle threshold, and one would expect contractors of this size to submit at least the average level of performance. The added value is assumed to contribute in a neutral way, which is the lowest satisfactory criteria. This is a new way of thinking for Norwegian contractors, and therefore it was chosen to lower the example expectations for this criterion. For the key personnel criterion a sufficient contribution is expected, as for the case with the risk plan. The threshold one step below the sufficient threshold is that the key personnel does not contribute well towards realization of the project. Repeating the same argument as before, contractors of this size and reputation should have key personnel capable of contributing at least sufficiently. The points achieved for this scenario is shown in Table 5.2.

Table 5.2: Example scenario: Realistic contractor performance

Criteria	Threshold	Pre-weighted points	Actual Points	Points available
Performance	Contributes well towards project goals	80	20	25
Risk Evaluation	Contributes sufficiently	60	9	15
Added Value	Contributes neutrally	60	6	10
Key Personnel	Contributes sufficiently	60	15	25
Total			50	75

This is the level of performance in the tender process that the author of this thesis assumes would be an expected level of performance from the contractors involved. None of the criteria really has outstanding performance, and the only performance defined as well is the criterion for past performance. If this actually is an expected result for most contractors, it would imply that there in practice is only 25 points in total to compete for in these four criteria. Should one or more of the contractors achieve better in a criterion the remaining points would be even less.

As shown in these two example scenarios, achieving respectively 40% or over 65% of the total available points is absolutely achievable for most contractors. The way that the thresholds are worded it is more difficult to move up one additional step in the threshold ladder, than achieving the average thresholds. This implies an increasing difficulty in achieving more points in a criterion. The effect of this is that when a contractor achieves an easily obtainable amount of points, the last points in each criteria is harder to get. Combining this knowledge with the results from Section 4.2.2, where the impacts on points obtained from tender amount is analyzed, the importance of the tender amount can be understood. If a project originally has a low project owner maximum price, the effects from an increase in POMP is substantial. A 5% change in maximum price could give a contractor 5 additional points in tender amount, effectively al-

lowing a one step lower performance in one of the other criteria, without changing the total points obtained. As shown in Table 4.9, changing the contractor's tender amount with 2% could change the points obtained by 55%, or effectively 5 points. This would, in the case of scenario 2, mean that a contractor with 2% higher tender amount would have to increase the performance in two criteria by one step in order to make up for the points lost on tender amount. If the same contractor was able to reduce the submitted tender amount a lower performance in two other criteria could result in the same total amount of points. It is an interesting phenomenon that lower tender amount and lower quality could yield the same amount of points, but with value defined as function over cost, it could still be considered the same value. As a summary one could say that a contractor needs to perform well in every category, but the tender amount criteria has the potential of significant impact. Assuming an average performance in the three performance criteria as well as the interview phase, the best way to increase the points obtained is to attempt to lower the submitted tender amount. In the average performance scenario, the available points in the tender amount criterion equals the total available points in the four other criteria.

5.3 The Execution Phase

Results from tracking time spent in meetings in the Rugtvedt - Dørdal project shows tendencies towards this being a project with a heavy administrative workload. This is not linked to the BVA method, since the project owner has chosen to use the turnkey contract for the execution phase. Nonetheless the contract follow-up system that the project owner has implemented seems to be significantly more time consuming than in the reference project used for comparison. Comparing the same or similar positions in the two different projects show that the participants in the Rugtvedt - Dørdal project spends more than twice the time in meetings as the participants from the reference project. While both project uses the same standard of NS8407 turnkey contract, it is apparent that there has to be factors making the administrative workload significantly heavier in the Rugtvedt - Dørdal project.

Two out of five participants spends close to 90% of the total work month in meetings or doing work related to reports. When this amount of time is spent in meetings, not much time is left for remaining tasks. Internal meetings take the majority of the time for all participants, which could have several explanations. The most probable explanation is that internal meetings are necessary for preparing for the meetings with the project owner, subcontractors or for writing reports. The amount of reporting required in the contract follow-up adds up to a substantial amount, according to interviews with involved personnel. This means that if internal meetings are necessary for these reports, the time consumption would accumulate quickly.

The purpose of the execution phase of the BVA is to reduce time consuming decision making

processes. A project owner joining the decision making process is one of the most time consuming and risk creating actions in a project, as described in section 3.5.3. Allowing the contractor to be the expert in this phase as well has the potential of reducing time consuming processes substantially. Instead of reporting project progress in the traditional and extensive manner, the contractor would utilize the weekly risk reports and KPI reporting to cover the important parts of the project. The traditional way of reporting involves tracking a variety of factors, like for instance the amounts of concrete or asphalt used, or rock blasted in a given time period. These numbers are compared to the planned amount from a work schedule and reported to the project owner. While these numbers are a good way for a contractor to track their own progress, according to the BVA project management method, the project owner does not need these numbers. Instead a contractor would utilize the weekly risk plan and KPIs as described in section 3.5.3. This has the potential of reducing the time needed for writing reports and the meetings necessary prior to the writing process. If the project owner is going into agreement with third parties that require the contractor to do additional administrative work, it would be beneficial for everyone to find solutions that reduce the original workload.

5.4 Research and Result Limitations

There will always be limitations and possibilities for error when investigating experiences or carrying out case studies. One of the most important limitations is regarding the sample size of the study. Only one BVA project has been investigated since this is the first, and at the time of writing the thesis the only, BVA project that BetonmastHæhre AS is executing. When investigating and analyzing the time spent in meetings the available personnel was limited, especially in the reference project used for comparison. This implies that a direct comparison between two of the same roles was not possible for every position. The analyzed period was limited to a month, which makes the analysis vulnerable to monthly fluctuations in administrative workload. For the analysis of the importance of the different project award criteria only the wording of the tender documents has been analyzed. Any guidelines on how the documents should be evaluated is not known, and therefore the wording of the thresholds are studied and analyzed subjectively, based on the authors interpretation.

5.5 Future Work

In this thesis a project that used the BVA in the procurement phase has been investigated. Interviews with involved personnel in the project has been conducted, which resulted in focus areas that could be investigated further. One of the focus areas was from the procurement phase and one focus area was from the execution phase.

One of the most obvious ideas for future work is to study the results of the method in this project. Did the process go as expected and hoped for both the contractor and the project owner? Did the project deliver on or ahead schedule and within budget, and did the contractor deliver on the performance criteria?

Another idea for future work is to follow a new project from the start, so that each phase could be studied more in depth. This way the resource consumption in the procurement could be investigated, and compared to the resources used in a traditional procurement method. One could also investigate the experiences of the contractor in the clarification phase. It would also be interesting to study the possibilities for implementing BVA in the execution phase as well. Understanding barriers in the industry for implementing the method could help the actual implementation, should that be a future goal.

Appendix A

Question for interviews

A.1 Execution Phase

Hæhre om styringsprosessen i dette prosjektet

- Best Value metodikken er ikke egentlig en metode bare for kontrahering. Det hører også med en metode for styring av gjennomføringen. Denne har Nye Veier valgt ikke å benytte. I stedet kjører de med et mer tradisjonelt opplegg. Hvordan oppfatter Hæhre Nye Veier sitt styringsopplegg?
- Hvor mye mer/mindre ressurser benytter Hæhre i det valgte opplegget i forhold til et vanlig prosjekt? Hvor mye av forskjellen kan relateres til måten kontrakten er anskaffet (BVP)?
- Hva mener du om det å kun benytte Best Value i anskaffelsen, men ikke i gjennomføringen?

Hæhre om BVP generelt

- Hva anser du som fordelene med BVP?
- Hva anser du som den/de største utfordringen(e) for å få etablert BVP som metode i Norge?

Eventuelt

- Er det noe vi ikke har snakket om som Hæhre opplever som viktig i denne prosessen med implementering av BVP og Nye Veiers pilotprosjekt?

A.2 Procurement Phase

Hæhre om kontraheringsprosessen i dette prosjektet

- Kan du fortelle litt om ambisjonene og målene til Hæhre bak det å bli med i denne BVP-piloteringen til Nye Veier?
- Dette er en ganske annerledes prosess enn den tradisjonelle anskaffelsesmetoden i Norge. Kan du beskrive hvordan Hæhre startet prosessen? Hvordan ble prosjektgruppen satt sammen, kursing osv.
 - Hvor mye tid gikk med til å sette seg inn i denne prosessen?
 - Var det noen spesielle utfordringer underveis?
 - Var det noen uforutsette utfordringer
 - Er det noe som kunne gjort anskaffelsesprosessen lettere?
- Hvordan er dette sammenlignet med den forberedende prosessen i en tradisjonell bu-drunde?
- Kan du fortelle om hvordan oppfølgingen til prosessen fungerte?
- I BVP som anskaffelsesmetode skal det utarbeides et sekssiders tilbudsdokument, hvordan var dette tids- og ressursmessig kontra et mer normalt tilbudsdokument?
- Noe annet du anser som relevant i anskaffelsesprosessen (Jus, kontrakt, incitament etc), og hvordan dette opplevdes fra entreprenørens side?
- Gjorde Hæhre noe annerledes enn normalt med hensyn til hvordan underentreprenører kommer til å kontraheres?

Appendix B

Time Tracking Sheet

B.1 Oversikt over tidsbruk til rapport og møter

Navn Stilling Prosjekt

For å sammenligne effektivitet på tvers av ulike prosjekter og gjennomføringsmodeller er tiden brukt til møter og rapportering svært interessant. Fyll ut skjema etter at tid har gått med til rapportering av ulike slag eller til møtevirksomhet. Fyll ut med dato, tid brukt og et kryss for hva tiden har gått med til.

Dato	Tid brukt	Møte internt	Møte byggherre	Møte underentreprenør	Rapportering

Appendix C

Supporting documents

C.1 Tender Documents

https://www.anskaffelser.no/sites/anskaffelser/files/kap_b1_konkurranseregler_nye_veier.pdf

C.2 Norwegian Public Procurement information and examples on best value procurement

https://www.anskaffelser.no/sites/anskaffelser/files/tilbuds-_og_vurderingsdokument_bvp-_rikswaterstaat.pdf

https://www.anskaffelser.no/sites/anskaffelser/files/utvelgelsesdokument_bvp-_rikswaterstaat.pdf

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