Contractor selection criteria and public infrastructure project success
An exploratory study among public infrastructure principals

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Preface

In the summer of 2006 I started my master study Supply Chain Management with the expectation to finish it within four years. The first three years went following schedule, and I rounded of all of the courses for my program. In 2009 I was planning to start with my thesis, but my former employer got in trouble due to the credit crunch in building and construction sector and had to re-organise.

I had to find a new job and I succeeded with that. At my new employer I found this subject for my thesis in spring 2010. Since then, I again changed my job, our second daughter and first son were born and we decided to renovate our house. So, a lot of things distracted me from writing my thesis.

However, now I managed to reach the finish-line and I want to thank my first supervisor Mr. Ghijsen and my co-assessor Mr. Krikke for their help, advice and patience. I would also like to thank ProRail, Rijkswaterstaat en Velt en Vecht for their corporation and enthusiasm. My special thanks goes out to Mr. Ger van der Wal, Mr. Wim Bossink and Mrs. B. Broekert.

For me the subject of contractor selection actually is not a subject I have dealt so much with during my career. Besides this thesis I worked one year at a contractor that was involved in tender procedures a lot. Maybe later on in my career I can use the specific knowledge that I have gained on this subject. If not, I’m happy anyway to know about this theme and to have to practiced scientific research.

Finally I want to thank my family for their motivating questions (did you still not finish your thesis….?!?) and especially my wife for having much patience and giving me the time to finish my study.
Summary

Subject of this study is contractor selection in public procurement. This theme has been an active area of research for the last three decades. The reason for this might be the amount of money that is going on in public procurement (two principles alone, that are studied in research, spend already yearly € 4-5 billion on infrastructures). And another reason for this interest can be that contractor selection is assumed to have a direct relation to project success.

Construction or infrastructural works have a unique and project character and demand much attention to reach an optimal result. On the public market for construction and public works principals organize tenders to select a contractor. In such procedures contractors compete to win the contract. A definition for ‘tendering’ is according the European Guidelines for public procurement: A procedure for granting orders for works, services and deliveries.

Compared to private procurement, in public procurement the legal function is much more dominant. Tendering is since 2004 on European level captured in two guidelines. The European Union expects that savings can be reached because of opening the European market for tenders. In the Netherlands, the practical regulations are registered at the level of “Algemene Maatregel van bestuur, AMvB” (Order in Council).

The most frequently used procedures are the public and the restricted procedure. In case of a public procedure, any bidder is allowed to tender for the commission. This procedure is the most straightforward and is handled in one round. The restricted procedure is characterized by two clearly separated phases: First phase is selecting the organizations that have registered. The second phase is the evaluation of the bids. This procedure is also known a tendering with pre-qualification.

The two main methods to award contracts to contractors are lowest price as single criterion and the use of Multi Criteria Selection (MCS), also mentioned as Best Value, or in Dutch EMVI criteria. The first criterion mentioned still is a common used method. This although many authors believe that this procurement method is one of the major causes of project delivery problems. These problems are: Contractors focus on cost reduction during the execution of the project (leading to poor quality) and contractors claims and additional work.

Because of the disadvantages of the award method ‘lowest price’, in studied literature a shift is noticed from this method to awarding with MCS. Advantages of the award method MCS that are found are: MCS leads to lower life cycle costs, MCS is better suited for incomplete scope-of-work and it allows better project development and cost estimation.

Contractor selection is a subject that has been researched intensively, but the most research centered on attempts to identify an universal set of criteria or in the development of formal selection methods and decision systems. In their antecedent study Watt, Kayis, and Willey (2009) find 8 principal contractor selection criteria: organization experience, workload/capacity, project management expertise, past project performance, company standing (reputation), client–supplier relations, technical expertise and method/technical solution.

The conclusion of G. Holt (2010) in his recent meta research is that the use of a cocktail of optimal selection criteria is not useful, given the transient and dynamic environments in which they are applied. The contractor selection criteria and their degrees of importance will fluctuate; both as function of objective factors such as time, quality and value targets, along with more subjective counterparts as decision makers predilection, his position and the perceived utility of those criteria. From literature it becomes not clear if this list of influence factors is complete and what the influence of these factors is.
Hence the problem statement is: Which selection criteria are applied to ensure success in public infrastructure projects

- How does a selection procedure work out in a setting around large public principals?
- Which factors influence contractor selection and what is this influence?
- How can project success be defined and how does selection of the contractor influence project success?

Goal of this research is to give clarification on which factors determine the choice for a type of procedure and the selection criteria. The study also wants to explain if there are innovative ways of tendering.

Given the explanatory nature of this research, the case study approach was chosen to enable an in-depth study on influence factors on contractor selection and innovative ways of tendering. Three contracting authorities in the public sector of infrastructure were chosen to compare the results in a cross-case analysis.

The cases study involved semi-structured interviews with key-respondents of three organizations. Additionally, the study is based on the available documentation and archival records such as policy documents and internal reports, in order to ascertain triangulation.

In the interviews with the experts of the three organizations first is verified if they use the tender procedures reported in literature. ProRail uses the restricted procedure frequently. By using pre-qualification is assured that only capable contractors can apply for the tender. Therefore it’s no problem for ProRail to award tenders commonly on lowest price. All three cases mention the use of new or innovative methods of tendering, for example Alliances (ProRail), EMVI (RWS) or sustainability (Velt en Vecht).

The experts confirm the varied picture that arose from literature on awarding on lowest price or on MCS. ProRail still uses lowest price as the main award method and tries to minimize the disadvantages of this method by use of the restricted procedure (pre-qualification). ProRail does recognize that tenders that are awarded on lowest price lead to claims and extra work of the contractor. But if the winning bid price of a contractor is too low compared the calculated price of ProRail, ProRail can either declare the procedure invalid or make additional agreements to avoid contractors claims during the execution of the project.

Velt en Vecht confirms that tenders frequently are awarded on lowest price but the policy is to increase the use of EMVI criteria. Rijkswaterstaat uses lowest price as single criterion only if the tendered product or project is very straightforward. Policy is to use EMVI-criteria, 80-90% of the infrastructural projects are awarded with this method and this share is still rising.

Conclusion from both literature and the cases is that projects that are straightforward are suitable for awarding on lowest price. If a project is complex or needs to be designed by the contractor multi-criteria selection is the desired method.

The three organizations are also using innovative tender methods. ProRail uses for large, complex projects the tendering method with alliances. With this method the risks and gains of the tender are equally shared by contractor and principal. This can be seen as a new tendering method, this method is only rarely mentioned in literature. Velt en Vecht and RWS also give examples of innovative tender procedures, in combination with sustainability criteria. Sustainability criteria are only seldom mentioned in recent literature.

An important concept in the research model of this study is project success, predominant project success factors are time, costs and quality. The three organisations mention in general also these three factors. Striking however, is that for ProRail the most important
success factor is a project without incidents. Also a stable project scope is mentioned as a project success factor by both RWS and ProRail.

There are four groups of influence factors: Environmental, organizational, social and individual influences. When comparing the answers that the three organizations gave on the questions on influence factors, the following can be noticed. The influence factors project goals and organizational goals seem to be obvious for the experts and it’s easy for them to give examples of this. Governmental policy on sustainability and innovation are mentioned more than once as an influence factor.

The factors project-complexity, -risks and –size seem to overlay. Following the experts, large projects lead to the selection of a large and financial strong contractor. Increased project-complexity/-risks require, according all three organizations, the award method multi-criteria selection or innovative procedures like competitive dialogue or alliances.

Prominent is the answer on the influence factors evaluator experience and evaluator preferences. All three experts state that these factors do not apply. The organization selects the contractor and not an individual person. But in contradiction with this, Velt en Vecht states that past experiences of project managers can lead to preferences for certain contractors that were selected before. The experts ad another influence factor on contractor selection: transaction costs determine also the choice of procedure.

A limitation of this research is that it is an exploratory study, although established literature set the research in a theoretical framework.

Qualitative research as this depends on the interpretations of the researcher. The research was aimed to be as objective as possible with a questionnaire and interviewing multiple people using the same questions. By using multiple data sources, such as the provided documents and governmental websites, internal validity was improved as well.

Concerning external validity to generalize the results it should be noted that since the three cases studied are in one sector (infrastructural works), the results should be interpreted with cautiousness. The results cannot be generalized to other sectors. Another limitation of this case study is that for each of the three cases only one expert is interviewed.

It’s also important to note that this research concerns only tender procedures in the area of principals of infrastructural works. To be able to generalize the results for the public sector, this research should be conducted in multiple areas of public procurement. Further research is needed to test the primary conclusions on the influence factors on contractor selection. To gain a complete perspective of the contractor selection process, it would be good to study the point of view of the contractors on this subject as well.
Contents

Preface ....................................................................................................................................... 2
Summary ................................................................................................................................... 3
1. Introduction ....................................................................................................................... 8

2. Literature .......................................................................................................................... 10
   2.1 The purchasing process ............................................................................................... 10
   2.2 Tender procedures ....................................................................................................... 10
       2.2.1 Contracts ......................................................................................................... 12
       2.2.2 Legislation ....................................................................................................... 12
   2.3 Selection ....................................................................................................................... 14
       2.3.1 Transaction cost theory ................................................................................... 14
       2.3.2 Difference in interests between principals and contactors ......................... 15
       2.3.3 Award methods ............................................................................................... 15
       2.3.4 Multi-criteria selection .................................................................................... 16
   2.4 Selection criteria .......................................................................................................... 17
   2.5 Influence variables on the purchase situation ......................................................... 20
   2.6 Influence variables on contractor selection ............................................................. 21
   2.7 Research model .......................................................................................................... 22
       2.7.1 Research objectives ....................................................................................... 25
       2.7.2 Relevance and importance ............................................................................ 25

3. Methodology .................................................................................................................... 26
   3.1 Research strategy ....................................................................................................... 26
   3.2 Research design ......................................................................................................... 26
   3.3 Quality of research design ....................................................................................... 26
   3.4 Units of analysis ....................................................................................................... 27
   3.5 Collecting evidence ................................................................................................... 27
   3.6 Analysing case study evidence ................................................................................ 28

4. Results .............................................................................................................................. 30
   4.1 General ....................................................................................................................... 30
   4.2 Tender procedures ..................................................................................................... 32
   4.3 Contactor selection and project success ................................................................... 33
       4.3.1 Project success ............................................................................................... 33
       4.3.2 Influence contractor selection on project success ........................................ 34
   4.4 Contractor selection criteria and award criteria ...................................................... 35
       4.4.1 Rijkswaterstaat .............................................................................................. 35
       4.4.2 Velt en Vecht ................................................................................................. 36
       4.4.3 ProRail .......................................................................................................... 36
   4.5 Influence factors on contractor selection ................................................................ 38
5. Academic and Managerial Conclusions ................................................................................. 40
  5.1 Conclusion .......................................................................................................................... 40
    5.1.1 Contractor selection .................................................................................................... 40
    5.1.2 Contractor selection criteria ....................................................................................... 41
    5.1.3 Influence factors on contractor selection .................................................................. 42
    5.1.4 Project success .......................................................................................................... 42
  5.2 Practical implications ......................................................................................................... 43
  5.3 Limitations and further research ....................................................................................... 43

References ..................................................................................................................................... 45

Appendix 1: Interview structure for all key-informants ............................................................ 49
Appendix 2: Summary of interview results ............................................................................... 50
1. Introduction

This chapter describes the context of this study and preliminary problem definition. The research model and the relevance of the research will be described in chapter two, after the literature study.

World markets are changing, new technologies are introduced and clients expectations are rising. Including due to the credit-crunch, competition on construction market is more fierce than before. Construction practices and processes are put under scrutiny of how construction industry delivers value. Government clients are important in this matter. According to the Dutch Public Procurement Expertise Centre (PIANOo), government purchasing in the Netherlands accounts for about sixty billions Euro per year. Around thousand contracting authorities put more than ten thousand tenders on the Dutch market yearly (Ministerie van E.Z, 2011).

Contractor selection is perhaps one of the most critical undertakings performed in a buying process, the effectiveness of which is directly related to project success and the achievement of specified objectives (Watt, Kayis, & Willey, 2010). Contractor selection corresponds to an interface between a variety of construction industry principals and equally varied array of construction companies. For that reason, the project success or failure depends to a large extent on this interface, because it is the magnifying glass used to look for the contractor who satisfies the project objectives in the best way (Alarcon & Mourgues, 2002).

The construction industry is competitive and every project faces adversity and uncertainty, and an incapable contractor increases the chance of delays, cost overruns, substandard work, disputes or even bankruptcy. The current procurement method used by the majority of the principals overemphasizes the acceptance of the lowest bid, and the lowest tender is usually described as being the key to a winning contract (Walraven & De Vries, 2009).

Various articles state that this procurement method, concentrating on the bid price is one of the major causes of project delivery problems (Lo & Yan, 2009), (Nagelkerke, 2009), (D. Kashiwagi & Savicky, 2003). The low-bid system encourages contractors to implement cost-cutting measures instead of quality enhancing measures and therefore makes it less likely that contracts will be awarded to the best-performing contractors who will deliver the optimum quality projects.

The alternative method for contractor selection is multi-criteria selection. Other criteria besides price are used to select the right contractor. In literature other names mentioned for multi-criteria selection (MCS) are Quality Based Selection, Best-Value or Multi-attribute Contractor Selection. Abdelrahman, Zayed, and Elyamany (2008, p. 180) state that the term Best-Value has many competing definitions in the industry. One of the suggested broad definitions of Best-Value is “A procurement process where price and other key factors are considered in the evaluation and selection process to enhance the long term performance and value of construction”. In The Netherlands the phrase ‘Economisch Meest Voordelige Inschrijving’ (EMVI) is used, this can be translated as ‘most economically advantageous tender’. In this thesis the abbreviations MCS or EMVI are used to describe the above mentioned.

The disadvantages of using the lowest-price criterion also has become clear through the Parlementaire Enquêtecommissie Bouwnijverheid (Parliamentary Inquiry Construction) (Overheid, 2011) in The Netherlands. Because of this, fraud has become known in which contractors made reciprocal appointments about the bids for tenders. The calculating costs that contractors made to bid for tenders, were experienced unreasonable by them. Pre-
consultation on the bidprice has been stimulated through the lack of compensation for calculation expenses, mentioned the PEB.

The bid prices were deliberately increased, whereby the cost estimates of the principals are taken into account. The PEB also did a recommendation when to apply the lowest-price criterion. This can be done in case of standard projects when the principal is able to specify his demands and desires in a detailed demand specification. In case of more complex and more innovative projects the PEB advises to use multi-criteria selection.

The topic of contractor selection and tender evaluation has been an active area of research for several decades (Watt et al., 2009), (Chee H. Wong, Holt, & Cooper, 2000), (G. Holt, 2010). Most research in this field centered on attempts to identify a universal set of criteria or in the development of formal selection methods and decision support systems. However, according to Watt et al. (2010) very few studies have been conducted how principals actually choose contractors or suppliers, or factors that influence choice. Literature also shows mixed findings in what contractor selection criteria should be used and what is their relative importance. This leads to the following preliminary problem definition: How does contractor selection occur in public procurement?

In chapter 2, Literature, more about the mixed findings will be explained and the context of tender procedures will be described. This chapter ends with the research model and the final problem statement. Chapter 3, Research methodology, describes the type of research and research methodology that has been chosen and the way the analysis of the research data has been conducted. The results will be reviewed in chapter 4 and this thesis ends with the conclusions and limitations in chapter 5.
2. Literature

Contractor selection continues to be an area of significant importance and interest to organizations responsible for delivering project outcomes. Occurring early in the project life cycle, it is according to Watt et al. (2010) perhaps one of the most critical undertakings performed by principals and is determining project success. The aim of this chapter is to explain (types of) tender procedures and give an overview of selection methods and criteria. After that, influence variables on the purchase situation and contractor selection are elucidated. This chapter ends with the research model of this study.

2.1 The purchasing process

The subject contractor selection is part of a purchase process. In case of supporting activities purchasing often concerns a routine process. This process can be divided in six phases (Weele, 2008), see figure 1. Each of these sub processes is of essential importance for a purchase e.g. office supplies or cleaning services. Commissions with a unique and project character (like construction or infrastructural works) demand much more attention to reach an optimal result (Weele, 2008). The purchase process starts with the recognition of a problem and ends with making available the required products to the user in the organization. Important is that the right order of the activities is followed and that one is aware of the interrelationship of the activities. For example, when the specification phase of the purchase process is not done well, it’s almost impossible that the result of the purchase process will be satisfying. The selection of the contractor occurs in the tactical purchase phase, sub-phase select (figure 1).

![Figure 1 Phases purchase process (Weele, 2008)](image)

The Dutch Public Procurement Expertise Centre PIANOo describes three levels within the purchase process. PIANOo adds besides the tactical and operational level also the strategic level. Weele (2008) mentions purchase management as the strategic level and subdivides the purchase function in a tactical and operational phase.

2.2 Tender procedures

The main aspects of the tender process are specify, select and contract, this corresponds with the tactical purchase level. On the public construction market it is common that principals organize tender procedures to select a contractor. In such a procedure contractors compete to win the tender and get the contract.
In the European Guidelines for public procurement (Epema, Michelotti, & Streefkerk, 2011) ‘tendering’ is subscribed as: a procedure for granting orders for works, services and deliveries. Tendering is a prescribed part of the purchase process of public sectors. According to Aanbesteden (2010) a tender procedure is ‘A procedure that uses a contracting entity to call competition in the market and wherewithal he tries to select a contractor with whom he wants to conclude a framework agreement or to whom he intends to award a contract’.

![Figure 2 Tender process (Essers, 2006)](image)

In figure 2 the steps within a tender procedure are outlined. In the first phase the relationships between the potential participants in the building process are displayed. In the second phase will be decided what and when will be tendered. Here the choice also will be made which award criteria will be used. In the third phase the tender will be set up. In this publication will be clarified what may be expected of the bidders and how they will be judged. The bidders will be invited to apply, the tenders will be checked for compliance to the formal requirements and the tender will be awarded according to the judgment on the selection and award criteria.

This tactical level in the procedure can be compared with the tactical purchase phase. However, the legal function in the public sector is much more dominant than in case of purchasing in the private sector (Weele, 2008). In the final phase the tender will be converted to a contract. The function of a contract is that mutual obligations and division of risks and liabilities between parties clearly will be described and captured. In this contract the financial, functional and the legal aspects of the contract will be addressed (De Koning, 2001). Hereafter the execution of the project is started and the principal monitors if the requirements of the contract are satisfied.
2.2.1 Contracts

In the Netherlands, principals can, when conducting works, choose between integrated contracts or separate contracts with the designing and executing parties. On those contracts the general terms and conditions apply. These terms and conditions assume a standard division of works, responsibilities, liabilities and risks (De Koning, 2001). In the Netherlands principals use for contracts with executive parties mostly the Uniforme Administrative Voorwaarden voor de uitvoering van werken (UAV ’89).

In case of separate contracting for each part of the assignment separate contracts will be set up. The most important feature of this type of contracting is separated contracting of design and build.

Unlike traditional contracting, in case of an integrated contract one party will be contracted to create an object. The contractor will be responsible for both the design and the execution of the work. Also maintenance of the project can be part of this contract. One example of this type of contract is the Design & Build contract (De Koning, 2001).

2.2.2 Legislation

Governments purchase goods, services and execution of works on a regular basis from market parties. European Union and Dutch government demand that tenders of public principals occur under certain conditions (De Koning, 2001). The tender legislation has several tender procedures that apply under certain circumstances. In procurement law is stated which law applies on tenders by government, public institutions and utilities (Arrowsmith, 2007).

Tendering on European level is since 2004 captured in two guidelines. The reason that the European Union is involved in the subject tendering is because of the expectation to reach savings because of opening the European Market for tenders. The public procurement market has been traditionally an area where national protectionism played a significant role (Gelderman, Ghijsen, & Schoonen, 2010). The tender legislation is captured in the European guidelines (Pachnou, 2005b). These form the legal framework for the execution of European tender procedures and the threshold amounts of commissions. The practical effect will be primarily in regulation at the level of ‘Algemene Maatregel van Bestuur, AMvB’ (Order in Council).

The two AMvB’s in the Netherlands, operational since 1 January 2005, are:

- Decree Utilities Procurement, Besluit aanbestedingen nutsssector (Bass)
- Decree Public Tenders, Besluit overheidsaanbestedingen (Bao)

According to Gelderman, Ghijsen, and Brugman (2006) compliance with the directives is rather limited. In their study they present a multidisciplinary model to explain non-compliance. The survey is conducted at purchasing professionals of the Dutch Ministry of Defence and a main conclusion is that purchaser’ increasing familiarity of the rules and organisational incentives have a positive impact on compliance with the directives.
2.2.3 Types of procedures

Weele (2008) distinguishes 6 tender procedures:
- Public procedure
- Restricted procedure
- Competitive dialogue
- Negotiated procedure with announcement
- Negotiated procedure without announcement
- Request for quotation

In case of a public procedure any applicant is allowed to tender for the commission. Before tendering takes place, a general announcement of this tender is done. The selection and bid documents are submitted simultaneously. The bidders will be judged using the selection criteria and the bid can be judged with the award criteria. The public procedure is the most straightforward procedure and is handled in one round. Advantages of this method are the relative short turnaround and less documentation because of the bundling of selection and award. Disadvantages of this method are the risk of a big amount of bids, this requires a lot of time to judge the bids and leads to a smaller chance for the bidder to get awarded.

The restricted procedure is characterized by two distinct separated phases: The first is selection of organizations that have subscribed (the candidates). The second phase is selection of the bids. In this context the procedure can also be named a procedure with pre-qualification. The advantages of this procedure are that the transaction costs are diminished by limiting the number of bidders. And the contracting authority can ensure that only qualified contractors can make a bid. Disadvantages are the relative long turnaround and the increased risk of objections by the contractors because they can be rejected twice.

The competitive dialogue is a procedure that can only be applied by the classical government in case of exceptional complex assignments. Utilities don’t use this procedure. An assignment can be considered as exceptional complex if the Contracting Authority itself is not able to set up the specifications or requirements for the project. Analogous to the restrictive procedure pre-qualification takes place, with minimal three organizations. With these selected companies the Contracting Authority starts a dialogue, it’s goal is to determine which solutions best meet the functional specifications. Based on the solutions offered, the definite requirements will be set up. The participants of the competitive dialogue next will be invited to deliver their infinite bid.

Negotiated procedures are only allowed under certain circumstances. Deviating from public or restricted procedures a Contracting Authority can negotiate with the bidder about the execution of the assignment and the costs. The negotiated procedures can be with or without announcement. A negotiated procedure without announcement can only be used in case of circumstances like: Urgency in case of disasters, the CA did not receive any suitable bidding or due to technical or exclusive skills the task can only be executed by one specific contractor (Arrowsmith, 2007).

For the procedure request for quotation no justification is required. The goal is to provide a plan or design that will be selected by a jury.

There can be concluded that the government has to deal with complex regulation while conducting her purchase- and tender policy. Good knowledge of these regulations is important before awarding the contract. Procedural mistakes can lead to an re-tender and claims from suppliers that feel shortchanged.
2.3 Selection

In this thesis until here consistently the concept contractor selection is used. This is in line with what many researchers do (Alarcon & Mourgues, 2002), (Singh & Tiong, 2006), (Lo & Yan, 2009), (Chee H. Wong et al., 2000), (Walraven & De Vries, 2009), (G. Holt, 2010). Taking this literally, contractor selection criteria are about the requirements that the contracting authority desires from the supplier. The question is who can execute the assignment. On the other hand, tender evaluation criteria cover the judgment of the bids.

Watt et al. (2009) and Jakrapong and Liston (2003) mention in their studies not only contractor selection criteria, but also tender evaluation criteria. The question is also: How does the bidder want the execute the assignment and what are the costs. According to Weele (2008) alternating selection and award criteria occurs frequently. According to Meland, Robertsen, and Hannas (2011) public clients commonly confuse qualification criteria with selection criteria.

Contractor Selection criteria can be divided in two main groups: Grounds for exclusion and suitability requirements. Examples of grounds for exclusion are fraud, corruption or state of bankruptcy. Participants to the tender that are not excluded, are judged using suitability requirements. These requirements concern financial standing and technical skills of the participants.

2.3.1 Transaction cost theory

Transaction cost theory is relevant to the analysis of construction projects (Waara & Bröchner, 2006). The basic assumption is that the parties to a contract minimize the sum of construction costs and transaction costs. The bidprice for the project represent the production costs. Less easily measured are the transaction costs for the owner. These comprise efforts to specify the project, conduct the procurement process and to resolve possible conflicts related to the contract. An owner who is optimizing, can choose between activities that affect transaction costs before the contract has been signed and activities that affect the transaction costs afterwards. More attention in an early stage may result in reduced transaction costs at a later stage and to lower production costs.

The use of transaction cost theory enables using nonprice criteria when awarding contracts. Bidders can be understood to react and adapt to the signals from the owners that apply nonprice criteria. According to (De Boer, 2001) supply chain thinking has led to reliance on multi criteria choice of suppliers and transformed earlier practices of purchasing in the manufacturing industry. The shift to increasing supplier development because of the use of multicriteria selection leads to costs for the bidders organization. E.g. costs for reviewing specifications, assessing risk and introducing new management and production routines to meet buyers requirements.

In this context bidders and buyers look further than a single contract. A more strategic interaction between owners and bidder will arise and bidders will be aware that stronger capabilities and appropriate management routines will lead to a higher probability of winning future contracts. Alignment between owner and contractors interests will be improved by using MCS. The effort to renegotiate the contract during the construction project can be reduced because increased effort at an early stage.
2.3.2 Difference in interests between principals and contactors

In the process to reach a result in a building or infrastructural project, all tasks and roles have to coincide. Integration is an important factor in project management and the importance is still increasing. When integrated contracts are used, a fixed price is agreed between principal and contractor for design and execution of the work, and eventually maintenance.

In case of a traditional contract model there is no urge to share responsibilities during the development of solutions. Architects, designers, advisors and contractors are independent from each other in a traditional model, although their decisions have a strong influence on each other. The different disciplines have different interests. Also between principal and market a difference in interest can be noticed. This can be explained through the model of Ridder de (2002).

![Value-price-costs model (De Ridder, 2002)](image)

- **Value**: the meaning of the project in trade
- **Price**: the amount that has to be paid for the project
- **Costs**: realization costs of the project

A contractor will strive for profit-optimization, a principal wants to have as much value as possible. Profit is the difference between the price that the principal pays and the costs that the contractor actually has to realize the project. Value is the difference between the principals’ value of the project and the price that the principal is paying to the contractor.

2.3.3 Award methods

Contracting Authorities substantially have two opportunities to award public contracts: Lowest price or multi-criteria selection. The current procurement method used by the majority of the principals overemphasizes the acceptance of the lowest bid, and the lowest tender price is usually described as being the key to winning a contract (Walraven & De Vries, 2009). According to (Zavadskas & Vilutienė, 2006) different countries use different procedures to select the “cheapest” contractor. For instance in Denmark a contractor is
selected by rejecting the two lowest and the two highest bids. The offer closest to the average is selected. But they also conclude that the price criterion is decisive in contractor selection.

Many authors believe that this procurement method is one of the major causes of project delivery problems (D. Kashiwagi & Savicky, 2003), (Walraven & De Vries, 2009), (Abdelrahman et al., 2008), (Hatush & Skitmore, 1997a), (Padhi & Mohapatra, 2010). When a contractor has a shortage of work it is presumable that this contractor will subscribe a low bid price to win the tender.

However, likely this contractor will try to get additional income through claims or cost savings. (Lo & Yan, 2009) name these compensations in this context ‘beyond contractual rewards’ (BCR). They propose that under the fiercely competitive market, contractors would deliberately cut their bidding prices with the consideration of BCR to win bids. (Meland et al., 2011) state that awarding to the lowest bid in complex design and construction projects deteriorates incentives for collaboration and project outcome in terms of cost and quality. Thus the lowest bid may paradoxically lead to the most expensive project from both an investment and a life cycle perspective.

Advantages of using the lowest price criterion are found by (Manoliadis, Pantouvakis, & Christodoulou, 2009): It is objective and relatively simple to use and the client will get the best price for his project. About the choice when to use which award method (Ang, Groosman, & Scholten, 2005, p. 115) state the following: ‘it is widely assumed that traditional forms of procurement and tendering, supported by prescriptive, solution-based specifications, and at the lowest price only, are suitable for routine projects but will hamper innovation in other types of project’.

2.3.4 Multi-criteria selection

Whilst some authors mention ‘lowest price’ to be the main award criterion, in literature also evidence can be found for shift from lowest price alone to multi-criteria selection. (Abdelrahman et al., 2008, p. 180) see this trend ‘...federal agencies have moved aggressively towards the use of best-value procurement..’ and also (Waara & Bröchner, 2006, p. 797) mention ‘an attempt to create a broader synthesis of how public procurement could benefit from the application of multiple criteria selection’.

The construction industry in Singapore has witnessed a spate of project delivery problems, according to the President of Singapore Institute of Architects, the system that the lowest price wins the contract is hereby the problem. The selection of contractors for construction projects should be based on a set of multiple decision criteria (Singh & Tiong, 2006). (Koenen, 2010) reports that in The Netherlands Rijkswaterstaat momentary uses MCS as award procedure in 50% of the cases and that they plan to increase this within a few years to 90%. (Gibcus, 2008) find in their study that for works the use of the award criteria ‘lowest price’ is significant higher than for services or products.

What is the reason for this increased popularity of this award method? (Christodoulou, Griffis, Barrett, & Okungbowa, 2004) suggest that MCS offers significant advantages over competitive bidding: It is better suited for incomplete scope-of-work (a problem commonly encountered in design-build projects), and it allows for better project development and cost estimation. Through the MCS process, a detailed, accurate and high quality scope of work can be developed. And MCS provides the lowest life cycle costs. (D. T. Kashiwagi & Byfield, 2002) conclude that MCS has the ability to minimize the owners’ risk (not being on time, on budget and meeting quality expectations). (Meland et al., 2011) argue the importance of using qualitative criteria, but state that suppliers that offer higher quality at higher price, get discriminated and lose the bid since the client is unable to assess the market price of quality in the selection model.
2.4 Selection criteria

The environment for making judgments about suppliers and their ability to deliver is complex, comprising high levels of ambiguity and uncertainty, competing stakeholder values and complicated relationships as a result of multiple conflicting objectives. (Watt et al., 2010). Further complications consist of identifying suitable and relevant criteria and assigning appropriate weights. Contractor selection seems to be influenced by factors like organizational objectives, role, function and experience of the evaluator, project complexity, project duration, industry and competitive intensity (Hatush & Skitmore, 1997b), (Watt et al., 2010), (Singh & Tiong, 2006). More about these influence factors will be explained in paragraph 2.6.

Although the topic of contractor selection has been an active area of research for several decades, few studies are conducted on how principals actually choose contractors or suppliers. This was for Watt et al. (2010) motivation to conduct their empirical study on the contractor selection and tender evaluation criteria and the relative importance of the criteria used. They used a Discrete Choice Experiment in which respondents simultaneously evaluate the characteristics of contractors as a function of the level or value assigned to the individual criterion. To determine which criteria should be used in this study (Watt et al., 2010) used their previous study undertaken in 2009. The basis of that research was a comprehensive literature review combined with an industry survey which identified eight principal criteria (Watt et al., 2009).

As part of this literature-research, first aim is to give an overview of the selection criteria found in studies that have been conducted on this topic previously. This can serve as base point for this study. 11 academic studies are found on the subject contractor selection criteria and award criteria conducted in the last two decades. These studies are examined to find the used criteria and in table 1 these criteria are categorized. The categories ‘Firm Characteristics’ and ‘Past performance & experience’ can be described as contractor selection criteria. The categories ‘Technical Bid’ and ‘Commercial bid’ are award criteria.

Striking in this context is the conclusion of Phillips, Martin, Dainty, and Price (2008). They mention ‘new’ selection criteria, being understanding of best value, understanding of partnering, transparency of cost data, understanding of clients objectives and innovative management. The use of these criteria shows that stakeholders are not only aware of the importance of the creation of supply chains and working in partnership but are also embracing ideas that contractors should be able to demonstrate competence in addressing green construction issues and innovative construction solutions. This is the only study in this literature review that mentions these new criteria explicitly.
<table>
<thead>
<tr>
<th>SELECTION CRITERIA</th>
<th>AUTHOR</th>
</tr>
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<tbody>
<tr>
<td>Firm characteristics</td>
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<tr>
<td>Workload / capacity</td>
<td>(Watt et al., 2009), (Turskis, 2008), (Chee H. Wong et al., 2000), (Bendaña, del Caño, &amp; Pilar de la Cruz, 2008), (Singh &amp; Tiong, 2006)</td>
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<td>Financial position</td>
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<td>Health Safety Environment (HSE)</td>
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<td>Key Personnel</td>
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<td>Location</td>
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<td>Project management expertise</td>
<td>(El-Sayegh, 2009; Turskis, 2008; Watt et al., 2009), (Chee H. Wong et al., 2000), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Understanding of clients objectives</td>
<td>(Phillips et al., 2008), (Abdelrahman et al., 2008), (Bendaña et al., 2008)</td>
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<td>Innovative management including sustainability</td>
<td>(Phillips et al., 2008), (Abdelrahman et al., 2008), (Bendaña et al., 2008)</td>
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<td>Company standing</td>
<td>(Watt et al., 2009), (El-Sayegh, 2009)</td>
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<tr>
<td>Quality control</td>
<td>(Watt et al., 2009), (Turskis, 2008), (Phillips et al., 2008), (Abdelrahman et al., 2008), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Client-supplier relationships</td>
<td>(Watt et al., 2009), (Singh &amp; Tiong, 2006)</td>
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<td>Technical expertise</td>
<td>(Watt et al., 2009), (Phillips et al., 2008), (Abdelrahman et al., 2008), (El-Sayegh, 2009), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
</tr>
<tr>
<td>Ability to deal with unanticipated problems</td>
<td>(Chee H. Wong et al., 2000)</td>
</tr>
<tr>
<td>Understanding of best value</td>
<td>(Phillips et al., 2008)</td>
</tr>
<tr>
<td>Training or skill level of the craftsmen</td>
<td>(Chee H. Wong et al., 2000), (Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Type of project control and monitoring procedures</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Quality and quantity of human resources</td>
<td>(Chee H. Wong et al., 2000), (Bendaña et al., 2008)</td>
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<tr>
<td>Cost control and reporting systems</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Suitability and size of the equipment</td>
<td>(Chee H. Wong et al., 2000), (Bendaña et al., 2008)</td>
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<tr>
<td>Condition and procedures of equipment</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Type of plants and equipment available</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Relationship with local authority</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Productivity improvement procedures and awareness</td>
<td>(Chee H. Wong et al., 2000), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Engineering coordination</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Communication and transportation office to jobsite</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Familiarity with local labour</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Familiarity with local suppliers</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Contractors Familiarity with geographic area</td>
<td>(Chee H. Wong et al., 2000)</td>
</tr>
<tr>
<td>Knowledge of codes and regulations on local market</td>
<td>(Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Participate in other issues than construction</td>
<td>(Bendaña et al., 2008)</td>
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<tr>
<td>Personnel turnover (risks of high turnover ratio’s)</td>
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<tr>
<td>Subcontractors Quality Assurance</td>
<td>(Bendaña et al., 2008)</td>
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<tr>
<td>Participation as investor in projects</td>
<td>(Bendaña et al., 2008)</td>
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<tr>
<td>Ability to design</td>
<td>(Bendaña et al., 2008)</td>
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<tr>
<td>Relationships with public agencies</td>
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<tr>
<td>Age of the company</td>
<td>(Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
</tr>
<tr>
<td>Project understanding</td>
<td>(Bendaña et al., 2008)</td>
</tr>
<tr>
<td>Authorized and paid-up capital</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Working capital</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Current and fixed assets</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Net worth</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Turnover</td>
<td>(Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Profit generating ability of the company</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Liquidity status of the company</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Capital structure of the company</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Finance arrangement</td>
<td>(Singh &amp; Tiong, 2006)</td>
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<tr>
<td>Past performance &amp; experience</td>
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<tr>
<td>Organizational experience</td>
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</tr>
<tr>
<td>Past Project performance</td>
<td>(Watt et al., 2009), (Phillips et al., 2008), (Abdelrahman et al., 2008), (El-Sayegh, 2009), (Chee H. Wong et al., 2000), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
</tr>
<tr>
<td>History of reasonable bid price submissions</td>
<td>(Turskis, 2008)</td>
</tr>
<tr>
<td>Decorum, conduct and non-disruptiveness of contractor staff and subcontractors</td>
<td>(Turskis, 2008)</td>
</tr>
<tr>
<td>Cooperation with other contractors on the project and in the vicinity</td>
<td>(Turskis, 2008), (Singh &amp; Tiong, 2006)</td>
</tr>
<tr>
<td>Responsiveness to warranty issues</td>
<td>(Turskis, 2008), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>Flexibility and corporation when resolving delays</td>
<td>(Turskis, 2008), (Abdelrahman et al., 2008), (El-Sayegh, 2009), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
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<tr>
<td>General contracting experience</td>
<td>(El-Sayegh, 2009)</td>
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<tr>
<td>Actual schedule achieved on similar works</td>
<td>(Chee H. Wong et al., 2000), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
</tr>
<tr>
<td>Experience with specific type of facility</td>
<td>(Chee H. Wong et al., 2000)</td>
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<tr>
<td>Debarment and/or demerit points in past projects</td>
<td>(Singh &amp; Tiong, 2006)</td>
</tr>
<tr>
<td>Past record of conflicts / disputes</td>
<td>(Doloi et al., 2010)</td>
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<tr>
<td>On budget delivery</td>
<td>(Doloi et al., 2010)</td>
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<tr>
<td><strong>Commercial bid</strong></td>
<td></td>
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<tr>
<td>Tendered price</td>
<td>(Watt et al., 2009), (Abdelrahman et al., 2008), (El-Sayegh, 2009), (Chee H. Wong et al., 2000), (El-Sayegh, 2009)</td>
</tr>
<tr>
<td>Life-cycle costs</td>
<td>(Abdelrahman et al., 2008), (Bendaña et al., 2008)</td>
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<tr>
<td>Transparency of cost data</td>
<td>(Phillips et al., 2008)</td>
</tr>
<tr>
<td>Cost savings</td>
<td>(Doloi et al., 2010)</td>
</tr>
<tr>
<td><strong>Technical bid</strong></td>
<td></td>
</tr>
<tr>
<td>Proposal</td>
<td>(Watt et al., 2009), (El-Sayegh, 2009), (Chee H. Wong et al., 2000), (Singh &amp; Tiong, 2006)</td>
</tr>
<tr>
<td>Degree of participation in the stakeholders bid process</td>
<td>(Turskis, 2008), (Phillips et al., 2008), (Abdelrahman et al., 2008), (Bendaña et al., 2008)</td>
</tr>
<tr>
<td>Method / technical solution</td>
<td>(Watt et al., 2009), (El-Sayegh, 2009), (Chee H. Wong et al., 2000), (Bendaña et al., 2008), (Singh &amp; Tiong, 2006), (Doloi et al., 2010)</td>
</tr>
<tr>
<td>Shortest completion time</td>
<td>(El-Sayegh, 2009), (Singh &amp; Tiong, 2006)</td>
</tr>
<tr>
<td>Preconstruction phase management</td>
<td>(El-Sayegh, 2009)</td>
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<tr>
<td>Construction resources</td>
<td>(El-Sayegh, 2009)</td>
</tr>
<tr>
<td>Subcontracting strategies</td>
<td>(El-Sayegh, 2009), (Singh &amp; Tiong, 2006)</td>
</tr>
<tr>
<td>Social impact of the proposal</td>
<td>(Bendaña et al., 2008)</td>
</tr>
</tbody>
</table>

Table 1: Overview selection criteria

Some of the criteria listed in table 1 are broad. For instance ‘workload / capacity’ or ‘organizational experience’. Others are specific and measurable, for example ‘shortest completion time’ or ‘turnover’. Fact is that the list of contractor selection criteria is much longer than the list of award criteria. In case of a public procedure, contractor selection and award criteria are used in one phase to conclude which contractor is most suitable for the job. Question that rises is, if this means that contractor selection criteria represent a bigger weight than the award criteria.
2.5 Influence variables on the purchase situation

The purchase process and the result of it can be influenced by various variables. According to Weele (2008) two sorts of variables can be distinguished:

1. Variables that influence the purchase process of organizations
2. Variables that influence the purchase behavior of organizations

The following variables can influence the purchase process:
- Product or project characteristics
- Strategic importance of the purchase
- Degree of risk of the purchase
- To which degree the purchase intervenes in the own organization
- Position of the purchase-department in the organization

According to Webster Jr and Wind (1972) organizational buying usually involves many people in the decision process with complex interactions among people and among individual and organizational goals. In their model on organizational buying behavior they distinguish four groups of influences:
- Environmental influences provide information as well as constraints and opportunities. These influences can be geographic, climate or ecological, technological, economic, legal, political or cultural of nature.
- Organizational factors cause individual decision makers to act differently than they would if they were functioning alone or in a different organization. Organizations are composed of four sets of interacting variables: tasks-structure-technology-people. Together, these four interacting sets of factors define the information, expectations, goals, attitudes and assumptions used by each of the individual actors in their decision making.

Figure 4: Model buying behavior (Webster Jr & Wind, 1972)
• Social influences comprise roles in the buying center, interpersonal reaction and the functioning of the group as a whole. Group processes involve activities and also interactions and sentiments among members, which have both task and nontask dimensions. The output of the group is not only a task oriented problem solution, but also nontask satisfaction for the group and its members. Non task motives relate to the personality of the buyer himself, like his character or personal wishes.

• Influence of the individual. Only the individual can define and analyze buying situations, decide and act. This individual is motivated by a complex combination of organizational and personal objectives. Information is filtered through the formal organization, constrained by policies and influenced by other members of the buying center. The buyers personality, role, motivation and knowledge affect his response to the buying situation. In figure 4 the social and individual influences are shaded to show that these factors lie within the person or the small group around him.

This model is used to gain more understanding about how a purchase process, like a tender procedure, works and which influence factors are applicable.

2.6 Influence variables on contractor selection

In literature also indications are found on the topic of influence factors on contractor selection. G. Holt (2010) conducted a meta research on the topic of contractor selection. An import conclusion of him is that the use of a cocktail of optimal selection criteria is not useful, given the transient and dynamic environments in which they are applied. Every construction project is unique and is matched by unique contractor selection criteria. The contractor selection criteria and their degrees of importance will fluctuate; both as function of objective factors related to the project (such as time, quality, and value targets) along with the more subjective counterparts, such as decision makers’ predilection, his position and perceived utility of (those) criteria. Implicitly he advises with this conclusion to search for information on how contractor selection criteria are chosen and which situational factors apply.

Jennings and Holt (1998, p. 657) mention the influence of company size: ‘Overall, contractors believed they would be more successful in achieving a contract award if Multi Criteria Selection (MCS) process was adopted universally by construction principals. The authors mention an increase in confidence to win the contract if MCS is used for larger contractors. Their conclusion also works the other way around: When a Contracting Authority chooses MCS, the change to select a larger contractor increases.

Watt et al. (2009) did a thorough literature study on contractor selection. They mention that influence variables on this process apply. According to them, which criteria or categories are used in an evaluation is a function of a number of factors. These are, the client or project outcomes to be met, the availability and completeness of information required to assess a contractors’ ability in achieving those outcomes, along with the skills and experience of the evaluators. In their following research, Watt et al. (2010) add industry, position (of the evaluator) and project complexity as influence factors.

Singh and Tiong (2006) did their research amongst construction practitioners in Singapore. The main motive for them to conduct this research is that the construction industry has witnessed failure of many contractors due to reasons like poor performance, financial problems or lack of safety considerations at worksites. They conclude that the current system of awarding contracts is inefficient. Their respondents share some degree of commonality with respect to relevance of the contractor selection criteria, but their decision making preferences during the selection process are context specific. The (relative importance of)
contractor selection criteria depend upon the specific requirements of the project, their personal experiences and preferences during the decision making process.

These findings in literature confirm that the model of Webster Jr and Wind (1972) can be used to explain more about influence factors on contractor selection. Organizational, social and individual factors are found in articles cited in this paragraph.

2.7 Research model

A research model is a schematic overview of the steps leading to the research objective. In figure 5 the research model for this study is depicted.

![Research Model Diagram]

**Influence factors**
- Industry
- Organizational goals
- (compliance to) EC Procurement Law
- Project goals
- Project complexity / Project risks
- Project size
- Evaluator experience
- Evaluator preferences

**Selection of the contractor**

**Project success**

*Selection of the contractor*

The concepts of contractor selection and tender evaluation are sometimes mixed up in literature, this is explained earlier in paragraph 2.3. It is important to distinguish two ways of tendering: tendering with pre-qualification (public procedure) and tendering without pre-qualification (restricted procedure). In case a pre-qualification selection takes place, a certain amount of contractors can qualify themselves for the tender. The next step is tender evaluation, now the offer of the contractor for this specific tender is evaluated. In case of a public tender there is no pre-qualification section. Selection of the contractor and his offer for this specific tender coincide. In paragraph 2.3 of this thesis is indicated that in this report the phrase contractor selection criteria will be used, comprising contractor selection and tender evaluation criteria, this is in line with also (Watt et al., 2010).
Projectsuccess
According to D. Kashiwagi and Savicky (2003), Hatush and Skitmore (1997b) and Doloi (2009) the predominant project success factors are time, cost and quality.

Time
The time to complete a project as scheduled and keep the turnaround as short as possible are important for the principals. Some contracts include a bonus clause to encourage the contractor to yield in time and avoid delays.

Costs
Cost is historically considered to be the most important by principals. The traditional competitive bidding is based on spending as little as possible. However, it’s important to look at the Total Costs of Ownership (TCO) of the project. D. Kashiwagi and Savicky (2003) conclude that Best Value procedures lead to lower costs of ownership.

Quality
Quality in construction is defined as the totality of features required by a product or service to satisfy a given need. According to many researchers including Alarcon and Mourgues (2002) and Lo and Yan (2009) quality is regarded as a main criterion in contractor selection.

Alarcon and Mourgues (2002) mention contractor performance in this context en add a fourth factor ‘safety’.

Contractor selection and project succes
In literature studied on contractor selection the relationship between contractor selection and project success is often not mentioned directly. The research question in articles studied is frequently ‘which criteria play a role when selecting a contractor and what is their relative importance’. With this implicitly is meant that the contractor will be selected for the project that has the biggest chance to accomplish a successful project.

Turskis (2008, p. 235) developed a decision making model on contractor selection and states: ‘Choosing the right contractor for the right job influences the work quality as well as the Construction progress’. Abdelrahman et al. (2008) focus on key factors that match the specific needs of a project, this increases the possibility of selecting the best contractor for the project. Meland et al. (2011) state that contractor selection is directly related to project success and achieving project goals.

Alarcon and Mourgues (2002) developed in their study an system that predicts the potential performance of the contractor. They state that contractor selection is a decisive event for project success. One of the main objectives in the recent study of Walraven and De Vries (2009) in The Netherlands was to rate the needs of the clients being the building needs of primary schools. An important advice of them was that the selection process should be conducted optimal to reach in the biggest value for the client.

Doloi (2009, p. 1248) researches the relationship between prequalification of the contractor and the impact on project success, she states ‘……however, a clear consensus on the contractor selection criteria and their quantitative impacts on successful time, cost and quality outcomes in projects could not be drawn decisively’. This is actually the basis to conduct her research. She finds that technical expertise, past project success and sound programming capability have a significant influence on achieving overall project success. Later on, in her next research in 2010 on medium sized construction projects in Australia, the results confirmed the contractor selection criteria technical planning and controlling are key in achieving project success.
And Li, Nie, and Chen (2007) searched in their study if there is an impact of the number of bids on the bid values. They also state that construction contractor prequalification is a crucial decision making process to select capable potential bidders and ensure the success of construction projects. Based on the above mentioned studies, the proposition can be set that contractor selection has a positive effect on project success.

**Influence factors and contractor selection**

In paragraph 2.6 is explained that according to literature contractor selection is influenced by several factors. The factors that are found in this paragraph are in line with the categorization of the model of Webster Jr and Wind (1972).

Interesting with this respect is also the study of Caniëls and Gelderman (2005), in which they place the Kraljic matrix in a power – dependence perspective. According to them, the relative power and dependence position of buyers and suppliers are expected to be factors of importance in explaining the conditions that influence the choice of purchasing strategy. The writers emphasize the mutuality of the relationship between buyer and supplier.

The degree a contracting authority has power over the supplier (contractor) is influencing the selection process. For example, if the CA has more power, it’s possible to set higher requirements to the contractors. On the other hand, if the contractors have more power, for example because only few bidders have certain skills, the CA should be careful not to exclude bidders in an early stage by setting to high requirements.

Another important matter mentioned in this study is the Kraljic matrix. In this in purchasing field very well-known matrix two factors are determining the purchase strategy. These factors are supply risk and impact on financial result. Therefore these factors are also (indirectly) included as influence factors in figure 5, research model.

Influence factors on contractor selection can also be placed in a broader perspective by using the model of Treacy and Wiersema (1993). In this model Treacy & Wiersema introduce three general strategies that companies can use to gain market leadership. According to them, companies that have proven to be successful in their industries, have done so by narrowing their business focus, not by broadening it.

The first general strategy is operational excellence. With this is meant that customers are equipped with reliable products or services at competitive prices and minimal difficulties or inconvenience. The second strategy, customer intimacy means segmenting and targeting markets precisely and then tailoring offerings to match exactly the demands of those niches. Having detailed customers knowledge, operational flexibility and customizing products are key-words in this strategy. The third strategy is product leadership. This means offering customers leading-edge products or services that consistently enhance the customers’ use of the product.

Interesting for this study is to see if these general strategies are also used in industry of infrastructural works. The use of these strategies can be viewed from customer or supplier point of view. For example: if a contracting authority has product leadership as a strategy this can influence the tender process. Probably the CA will strive for an innovative solution in her tender procedure. If the strategy is operational excellence it is likely that the CA will strive for reliability and a low price when tendering.

The model can also be viewed from a supplier point of view for the studied industry. It is plausible that contractors choose a strategy meeting the expectations of their (desired) customers. If contracts are awarded on lowest price, operational excellence is a logical strategy. If the customers want to be innovative, the contractors can choose product leadership as strategy.
2.7.1 Research objectives

Now that the literature research has been completed the research objectives and questions can be finalized. In chapter 1 is stated that this research wants to contribute to the knowledge on the subject contractor selection and tender evaluation in the public sector. The main objective of this research is to give clarification on contractor selection in a setting around large public principals.

The problem statement of this study is: Which selection criteria are applied to ensure success in public infrastructure projects?

The subsequent research questions of this study are:

- How does a selection procedure work out in a setting around large public principals?
- Which factors influence contractor selection and what is this influence?
- How can project success be defined and how does selection of the contractor influence project success?

Goal of this research is to give clarification on which factors determine the choice for a type of procedure and the selection criteria. The study also wants to explain if there are innovative ways of tendering.

2.7.2 Relevance and importance

The selection of a contractor for a project is one of the most critical undertakings performed by contracting authority’s. The effectiveness of this selection is directly related to project success and the achievement of specified objectives (G. D. Holt, 1997), (Doloi, 2009), (Alarcon & Mourguès, 2002). Selection of an inappropriate contractor for the job increases the chance of the client being dissatisfied (Chee H. Wong et al., 2000).

Contractor selection is not only important, it is also a theme surrounded by decisional difficulties (Watt et al., 2009), (Doloi et al., 2010). These difficulties are the complex environment with competing stakeholder values and complicated relationships. Construction projects are one-off endeavors with unique features such as long period, complicated processes and changing environment. Many trade-offs occur in decision making (Turskis, 2008). Contractor selection is often based on subjective judgment as intuition and past experience (G. Holt, 2010). Jakrapong and Liston (2003) focus on the complicating factor that in most organizations multiple decision-makers are involved.

In his meta research on the topic of contractor selection, G. Holt (2010) has examined academic outputs for the period circa 1990-2009. He concludes that one may question the reliability or relevance of ‘optimal’ selection criteria, given the transient and dynamic environments they applied. So, a set of criteria might be optimal in one setting, but will this be the case in a different setting, or a similar setting at a different point in time? Insight in the factors that influence the choice of the contractor selection criteria and the contractor selection can be helpful for evaluators to make the right choices regarding the criteria.

There can be concluded from literature that there are mixed findings on what the right selection method is and the insight in factors influencing contractor selection is limited. Also the use of new selection methods and criteria is mentioned, but not described thoroughly. This provides relevance and importance to conduct this research.
3. Methodology

There are various methods to carry out a research. In this chapter will be described the characteristics of the type of research, research methodology and the way the analysis of the research data has been conducted.

3.1 Research strategy

This research tries to give insight in how public tender procedures work and what contractor selection criteria are used in public tendering in The Netherlands. Based on a thorough literature review is sought to find out what the most commonly used selection criteria are. This literature shows mixed findings on which contractor selection criteria are most commonly used. In literature is found that influence factors on contractor selection apply. But there is not found what these relationships actually are. To gain more insight in this relationship and the relationship between contractor selection and project success (figure 5) is chosen to conduct an exploratory case study research.

Given the research questions the choice has been made to perform a case study. By conducting a case study it is possible to investigate in depth and therefore gain more specific knowledge on this subject. This research requires no control of behavioural events and focuses on contemporary events. According to Yin (2003), these two factors plead for the use of a case-study.

3.2 Research design

Yin (2003) distinguishes single-case designs and multiple case designs. Single- and multiple-case designs, however, are variants within the same methodological framework. According to Yin (2003) multiple-case designs have distinct advantages and disadvantages in comparison to single-case designs. Evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust. On the other hand, if there is an unusual or rare, a critical or revelatory case, it is likely to involve only single case.

This research is a multiple case-study with a small number of cases. Because of the explorative character three holistic cases are selected. The number of three cases allows on one hand to conduct this research within limited research capacity available. On the other hand, the analytical benefits of having three cases may be substantial. Literal replication of the cases is enabled and analytical conclusions can be drawn from the cases independently and after that the results of the cases will be compared with each other.

3.3 Quality of research design

The quality of a research design depends on its construct validity, internal validity, external validity and reliability. To increase the construct validity of this research multiple sources of evidence are used. These sources are literature, interviews and archival records. The results of these different sources are combined to achieve triangulation. According to Yin (2003) the need to use multiple sources of evidence far exceeds that in other research methods, such as experiments, surveys, or histories. There is triangulation if the events or facts of the case study have been supported by more than a single source of evidence, if converging lines of evidence can be developed. A measure to increase construct validity is by letting the informants review the draft case study report. This review has been executed the informants, which enhances the accuracy of the case study.
Besides triangulation it is important to create a chain of evidence, which increases the construct validity and reliability. The chain of evidence is achieved by archiving the evidence and clarifying the linkages between the research questions, the interview protocol, the results and finally the conclusions. This enables an external observer to follow the derivation of any evidence from initial research questions to ultimate case study conclusions.

With regard to the reliability of the case study it is important that if the study will be replicated under the same circumstances by another researcher, almost the same outcomes will be found (Baarda, 2010). Therefore the methodological steps, data collection and analyzing methods that are followed are described carefully.

3.4 Units of analysis

The three organisations operating as contracting authorities in public procurement are the units of analysis in this study. The nature of the chosen cases is the most important selection criterion. Since the subject of this thesis is contractor selection in public procurement, there is chosen to select two large and one intermediate sized tenderers in civil infrastructures. The reason to choose for to large tenderers is it is likely that these organisations can provide the most information about this subject. Within each case, one unit of data collection (key informant) is selected. The informants are tendering / purchasing experts working with the senior management of the organisations. The case-study structure is shown in figure 6.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Key informants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil infrastructures: Rijkswaterstaat</td>
<td>Senior purchasing advisor : Mr. W. Bossink</td>
</tr>
<tr>
<td>Regional Water Authority: Velt &amp; Vecht</td>
<td>Purchasing coordinator : Mrs. B. Broekert</td>
</tr>
<tr>
<td>Rail infrastructures: ProRail</td>
<td>Manager tenders, purchasing &amp; cost management: Mr. G.K. van der Wal</td>
</tr>
</tbody>
</table>

Figure 6: case-study structure

3.5 Collecting evidence

In general, there are six different sources of case-study evidence: documentation, archival records, interviews, direct-observation, participant-observation and physical artifacts (Yin, 1990). The use of observation and physical artifacts in this research is not an option. These latter sources are mainly used in psychology and/or anthropology. Also observation is not chosen as a method, mainly due to practical reason that is time consuming, compared to the information it will yield.

On the topic of contractor selection a lot of documentation is available. (Semi-) governmental organizations like Dutch Public Procurement Expertise Centre (PIANOo), PSI bouw (Innovation in building and construction) and TenderNed provide a lot of information on the internet.

The most important source of evidence in this case-study are the interviews. The main reasons to choose for interviews, is that it is possible to focus directly on the topic of the case
study. If the interview is held with a key-informant, this person can give insights in the case and provide access to corroboratory sources of evidence. Yin (1990) mentions three forms of interviews: open-ended, focused and formal surveys. The interview method in this case-study is of a semi-structured nature consisting of mostly open questions that are derived from theoretical propositions.

To ensure that in the different interviews the same information emerges, it is necessary to follow a certain set of questions. In this way the benefits of the open-ended interview and the formal survey are combined. The interviews were held in Dutch with managers who are responsible for tender procedures and contractor selection. Each interview was conducted at the interviewee's office and lasted for about one to two hours. Altogether, three senior staff members from the participating organisations were finally captured for interviews as listed in figure 6.

The interviewees were warranted that all the project information and opinions collected will be solely used for research purposes. Since all three interviewees had a lot of experience in the theme contractor selection, the interviews were flexibly structured to facilitate free flow of ideas. The open-ended questions were asked to convey a general idea of the information solicited, while the interviewees were encouraged to express on the subject, without being restrained by the pre-set questions related to the case study.

Accurate notes of the interviews have been made and were placed in a case-study database. Since in the interviews the questions on influence factors and on project success were not answered completely, additional questions were later asked and answered via email. The case-study database is an archive that contains all the collected data (notes of interviews and documents) and is accessible on request. This case study database is part of the chain of evidence and contributes to the reliability of this study.

Archival data were provided by interviewees, these are documents about their policy on tendering and contractor selection. Files about tender procedures were found on the national tender platform www.aanbestedingskalender.nl.

### 3.6 Analysing case study evidence

Analysing case study evidence is difficult because the techniques still have not been well defined. Therefore it is important to follow a general analytic strategy, defining priorities for what to analyse and why. For this case-study is chosen to follow the strategy of relying on theoretical propositions. According to Yin (2003) theoretical propositions stemming from ‘how’ and ‘why’ questions can be extremely useful in guiding case study analysis in this manner and help to focus on certain data and ignore other data. The results of the interviews will be compared with the conclusions from literature.

Yin (2003) names five analytical techniques are relevant for case studies. These five are pattern matching, explanation building, time-series analysis, logic models and cross-case synthesis. In this case study is chosen to follow the recommendations of Miles (1994) to conduct the case analysis in three stages.

The first stage is the within-case analysis. Data from each case were analysed separately to give a complete picture of the organizations’ approach on tendering. The second stage is data reduction, this was performed and two- to three-page descriptions were written on each organization. These descriptions were then submitted to informants at the case companies to check the details given in the case description. Such feedback is
essential to prevent observer bias and to enhance credibility and interpretation. Final stage is the cross-case analysis (Yin, 2003). Comparisons across the three organizations were made to determine where similarities and differences existed. The researcher can, by comparing sites or cases, establish the range of generality of a finding or explanation and, at the same time, pin down the conditions under which that finding will occur (Green, 2006).

An aid by using cross-case analyses is the use of Word tables to display the data from the individual cases according to some uniform framework. Yin (2003) states that the examination of Word tables for cross-case patterns will rely strongly on argumentative interpretation and not on numeric tallies. The Word table with a summary of the interview results is included in appendix 2 of this report.
4. Results

4.1 General
For understanding the results of the interviews it is important to know in which area the organizations are working and to know about their policy on tendering.

Rijkswaterstaat
Rijkswaterstaat is the executive arm of the Dutch Ministry of Infrastructure and the Environment. On behalf of the Minister and State Secretary, Rijkswaterstaat is responsible for the design, construction, management and maintenance of the main infrastructure facilities in the Netherlands. Rijkswaterstaat manages the main road network, main waterway network and main water systems in the Netherlands. Rijkswaterstaat headquarters in Utrecht and employs over 9,000 employees. The organization consists of ten regional departments (including 19 road districts and 16 water districts) and one project organization. Rijkswaterstaat is the biggest tenderer on the Dutch market for infrastructural works, with an estimated yearly tendered volume of over 3 billion euro.

Rijkswaterstaat tenders more and more in partnership with the market. Therefore new contract types are necessary. Rijkswaterstaat uses the principle of ‘the market unless’, this means that Rijkswaterstaat wants to delegate as many tasks as possible to professional parties on the market. Rijkswaterstaat dictates how things should work, but leaves the design and / or creating the solution to the market. This requires good cooperation between the government and the market.

Rijkswaterstaat uses the following principles in tendering:
- Rijkswaterstaat is rival-tenderer, i.e. Rijkswaterstaat is not the only principal on infrastructural works.
- The market is self-regulating
- Rijkswaterstaat aspires to:
  - Durable effective competition
  - An effective procurement process
  - An optimal price / performance ratio

Because sometimes there is tension between these principles, in the procurement policy is searched for an optimal balance.

Waterschap Velt en Vecht
Regional Water Authorities like Velt en Vecht carry out several tasks on water management. The main tasks are ensuring the safety of the citizens against floods, managing the levels of surface waters and purification of wastewater. Velt en Vecht carries out these tasks in the provinces Southeast Drenthe and Northeast Overijssel. The Velt en Vecht Regional Water Authority is a governmental organization that has a work area with ca. 200,000 people in it and has 185 employees. The highest body of Velt and Vecht is the democratically elected board. The daily routine is provided by the civil service.

The purchased volume of Velt en Vecht was plm. € 35 mln in 2010, 60% of this was spent on infrastructural projects. Velt en Vecht has the following purchase mission- and strategy:

Velt en Vecht wants to be a socially responsible and reliable principal, based on the core values of integrity, transparency, objectivity and non-discrimination. Velt en Vecht focuses on results, to achieve these, also the solutions, knowledge, innovation and creativity of the market parties will be used.
The management of Velt en Vecht has formulated in 2010 the following purchasing goals:

- A balance between price and quality, with taking into account regional suppliers;
- Set up clear specifications and requirements for the market;
- Aim at economic advantages by corporation and equalization with the Rijn-Oost Water Authorities;
- Sustainability in the chain;
- Having a good suppliers file that connects to the mentioned goals

To give clarification what Velt en Vecht means by sustainability, their definition of sustainability is formulated:

*Meet the needs of the present generation without compromising the needs of future generations in jeopardy. Besides criteria regarding the environment, attention should also be given to social issues such as opportunities for local SMEs and social work facilities and also provide insight into life cycle costs.*

The use of sustainability criteria is a new influence factor, this is only seldom mentioned in recent literature.

**ProRail**

ProRail is responsible for the railway system in the Netherlands: construction, maintenance, management and security. ProRail has over 4000 employees that take care of about 7000 kilometers of railways. ProRail divides the space on the railway, executes all traffic control, builds and manages stations and builds new railway. Also existing equipment such as rail, turnouts, signals and level crossings is maintained by ProRail.

The collaboration between ProRail, Carriers and Governments in the Railways law is known as the so-called institutional triangle. The Ministry of Infrastructure and Environment acts herein as grantor. It grants a concession to ProRail to manage and transport concessions to carriers. Under the management concession ProRail operates a plan in which the agreements are described in detail. To be able to honor these agreements, the government pays a concession fee to ProRail. The carriers pay ProRail a so-called user fee. ProRail offers in return a safe and reliable railway to the carriers.

ProRail is one of the biggest tenderers on the Dutch public procurement market with an estimated yearly tendered volume of 2 billion euro. Approximately 85% of this amount is spent on infrastructural works. The policy of ProRail is to be a good principal and pay decent prices. On the other hand ProRail wants to spent the money of the tax payers carefully. Therefore ProRail aspires to realistic prices to avoid discussions about extra payments during the work because the tender price was too low.

The contracting-out by ProRail is largely based on the ’Tender on Public Utilities Act’ (BASS) and article 10 of the Infrastructure Fund Decree. ProRail is obliged to apply tender procedures which have been adapted to the provisions of this guideline. In the contracting plan ProRail makes a conscious choice with regard to the tender method for each individual contract. Here too is an obligation to record its decision making. ProRail's contracting extends over numerous areas. Most of these contracts are placed in markets with sufficient market forces (competitive power). This applies to a lesser extent to typically ‘railway’ markets. It never becomes involved in past established monopoly positions, and in some instances it involves unique technologies for which there was no market at all until only very recently.
4.2 Tender Procedures

Rijkswaterstaat (RWS) is the biggest contracting authority on the Dutch public procurement market when it concerns infrastructural projects. Knowledge and experience on tender procedures is therefore broadly available. Since the amount of infrastructural works covers around 85% of the total tendered volume, the department Purchase Management Infrastructural Works has a lot of knowledge on this field. Other departments within RWS can use this knowledge too. The department has an advisory role towards project managers. The project managers must comply to this advice or must be able to explain why they want to deviate from the policy/advise.

When tendering, RWS often chooses the public procedure. ‘In general we strive to have about five contractors that apply for the tender. In many cases there are not more than five contractors that apply for the tender, but in the current market situation we see that more and more contractors apply to the tender. This may be a reason to use the restricted procedure increasingly in future. We use the public procedure frequently since this lowers transaction costs’.

Headlines in the tender policy of RWS are:

- Provide information. Early information for the market is in the interest of RWS. It improves competition and makes the tender process more efficient. Also information on the tender outcome should be provided to give the tenderers insight in their market position.
- Draw a uniform line to void applications because of incomplete application forms.
- Stimulate constitution of combinations. The requirements for these combinations should not be higher than for singular tenderers to broaden competition.

Velt en Vecht is getting increasingly professional when it concerns tendering. Being a medium sized tenderer, it cannot reach the level of professionalism as the big tenderers like Rijksgebouwendienst or Rijkswaterstaat. Services and projects with a tendered volume higher than € 193,000,- should be tendered European. One of the major tasks of the purchase department is to implement the transformation from tendering prescriptive towards tendering effective (functional).

‘We are still a traditional organization when it concerns tendering. Our department is trying to change this, but this is not always going as quick as we want. We have a lot of experienced projectmanagers who like to keep their habits in case of tendering. An example of this is that often is chosen to ask a contractor for a quotation, that has worked successfully for us in the past or with whom the projectmanager has a good relationship. Our department wants more focus on objectivity and legality’.

The tender strategy contains the following focus points:

- A balance between price and quality with a focus on local suppliers;
- Use clear demand specifications;
- Economic advantages by cooperation with other Regional Water Authorities
- Strive for sustainability

ProRail’s goal when it concerns tendering is to reach reasonable prices. The department AKI (Tenders, Costmanagement and Purchasing) is the central department within ProRail coordinating al tender affairs. The three disciplines purchasing, cost management and tender affairs are working closely together. The different regional departments within ProRail set the
requirements, all the tender procedures are developed and executed by the central headoffice in Utrecht.

‘At ProRail we have a lot of knowledge on costmanagement. Before the decision to build is taken, we make an investment proposal. Herein is described what it’s use and necessity. A very important item of this investment proposal is the expense form. This form contains an analysis of investment costs and maintenance. Probabilistic techniques as well as accounting is used to make a good estimation. The reason that we focus a lot on cost management is the we really want to spent the money of taxpayers carefully’.

ProRail uses the public procedure only during purchasing standardized products. In this situation there is a commodious market and the tenderers have only minor offer costs. The restricted procedure is used in case of a commodious market and reasonable bid costs. This procedure is frequently used by ProRail.

ProRail uses the negotiated procedure when there are few tenderers and when substantial bidding costs have to be made. Also the need for early-supplier involvement can lead to the choice of this procedure. All tenders of ProRail are published on her own tender website https://aanbesteden.prorail.nl.

4.3 Contactor selection and project success

The question to be answered in this paragraph is how can project success is defined by the experts and how contractor selection influences project success.

4.3.1 Project success

In paragraph 2.7 of this thesis is explained what is found in literature on project success. To get knowledge of the experts opinion on project success, they are questioned on project success factors, failure factors and what causes these. The answers to these questions are summarized below.

<table>
<thead>
<tr>
<th>Project success factors</th>
<th>RWS</th>
<th>Velt en Vecht</th>
<th>ProRail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Right price/quality ratio</td>
<td>1. Accomplish projectgoals</td>
<td>1. No incidents</td>
<td></td>
</tr>
<tr>
<td>4. No change of scope</td>
<td>4. Environmental factors</td>
<td>4. Stable scope of the project</td>
<td></td>
</tr>
<tr>
<td>5. Low transaction costs</td>
<td>5. Long term feasibility project goals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project failure factors</th>
<th>RWS</th>
<th>Velt en Vecht</th>
<th>ProRail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bad project quality.</td>
<td>1. Projectgoals not accomplished</td>
<td>1. Poor project quality</td>
<td></td>
</tr>
<tr>
<td>2. Extra work / claims during execution of project</td>
<td>2. Cost overrun</td>
<td>2. Project running out of budget</td>
<td></td>
</tr>
<tr>
<td>3. Yield is delayed</td>
<td></td>
<td>3. Unstable scope of project</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Project success & failure factors

Interesting regarding this, is to see what the experts name as cause for project failure. RWS calls a passive attitude and contractors’ focus on cost reduction during the execution of the project as main causes for poor project quality. Change of the scope of the project during the execution is the cause for the second failure factor mentioned by RWS. As major cause for late project yielding a too tight schedule is given.
Prorail states that if the project is accepted by the contractor for a (abnormal) low price, this leads to a strong contractor focus on cost reduction during the project. The relationship with the public principal is secondary, since this principal, for future projects, always has to use public tender procedures. Mistakes in the contracts are sometimes noticed by the contractor, but on purpose they don’t mention this. If the contractor gets the project awarded, these mistakes are used to claim extra costs. If the scope of a project is unstable (for example due to political pressure), budgets and money are gliding.

Velt en Vecht mentions as reason for not accomplishing the project goals, that the expectation of the board and project team were not tuned. As a reason for cost overrun Velt en Vecht mentions insufficient market research and unrealistic estimation.

4.3.2 Influence contractor selection on project success

The theory in chapter 2 presumes selecting the right contractor for the job has a big influence on project success. The impact of contractor selection on project success is obvious according to RWS. ‘A good contractor that is skilled for the job will of course improve the chance of a successful project. But it doesn’t mean that the contractor needs to have all the required skills itself. For us, project management skills of the contractor are very important too. Second, financial strength of the contractor is also momentous, because our projects usually demand a large investment. Technical skills are of course important, but can be hired by the main contractor’.

Also Velt en Vecht sees the link between choosing a good contractor and project success. ‘But what the appropriate contractor is, is sometimes hard to say upfront. Past performance is of course important, but is not easy to objectify. Sometimes contractors haven’t worked for us a few years, so our information is aged. We also have problems with the legitimacy of past performance data’.

According to ProRail selection of the right contractor increases the chance of project success in general. ‘For us this is the reason that we very frequently work with pre-qualification procedures. For us size of the right contractor is also an important criteria, a contractor should not be too big or too small for the job. We also use an advanced performance measurement system, this works pretty good, if the contractors work for us on a regular basis’.

In literature (paragraph 2.7) was found that the predominant success factors are time, costs and quality. The three interviewees confirm these factors, but also add new factors: No incidents, environmental factors and pro-active attitude of the contractor.
4.4 Contractor selection criteria and award criteria

4.4.1 Rijkswaterstaat

For RWS is important not to mix up contractor selection and award criteria. The guidelines for contractor selection criteria are restricted by law. ‘for example, we are not allowed to require a location where the contractor should be located. We can mention in the program of requirements that, after a call, the contractor should be able to be at the project location within an hour’.

When tendering, RWS sets suitability requirements to determine whether a tenderer is suitable or not. Tenderers that are not suitable will be excluded from further participation on the tender.

The main suitability requirements for RWS follow from the Tender law and the BAO (decree public contracts):

Financial and economical capacity
- Tenderers have to satisfy the turnover requirement. The rule of thumb that RWS uses is that the turnover of the contractor should be at least between 100% or 200% of the estimation for the project. If the estimation for the project is lower than 500.000,- no turnover requirement will be set.
- Tenderers have to declare that the financial statement does not contain a paragraph that the continuity is at stake.
- Regarding the financial statement: There has not been deposited a disapproved accountants statement.

Technical capabilities
With respect to technical capabilities RWS uses project management requirements and experience requirements.

Project management requirements
A contractor should have experience with project management of one or more projects in building or utilities with the minimum size of 30-60% of the projects estimation. The exact percentage will depend on the degree of complexity of the project.

Technical experience requirements
Setting more technical experience requirements leads to restrictive competition, according to RWS. The policy is therefore to set, besides the project management requirements, only two experience requirements. The requirements should be proportional related to the size of the tender and the reference project has to be executed, but not necessarily yielded.

Bank warranty
The tenderer with the best assessed offer will be asked for a bank warranty of maximum 5% of the contract value.

Standing policy for RWS is to use EMVI criteria. In 80% to 90% percent of the tenders EMVI criteria are used. If there is no value to use EMVI criteria, for example the tendered product or project is very straightforward, the choice will be made to award on lowest price. In general, price / quality ratio and striving for effective competition should always be part of the EMVI criteria. ‘Important in our tender policy is to stimulate innovation. RWS’ is a trendsetter on the tender market. Many organizations look at us and see RWS as an example.'
Compared with, for example the building market, the Rijksgebouwendienst (Governments Buildings Agency) being a big contracting authority, we are more innovative. In the building & construction market many projects are still rewarded on lowest price. The attitude of a contractor is very important; is the contractor capable to invent solutions. Out of the box thinking can lead to project approach that has advantage for both RWS and contractor.

4.4.2 Velt en Vecht

Velt en Vecht wants to be a modern principal that tenders products and projects for the right price/quality ratio. Within Velt en Vecht still the traditional method of awarding on lowest price reigns. Estimation is that 70% of the tenders of Velt en Vecht are still awarded on lowest price. Velt en Vecht recognizes that this leads to minimalistic performance of the contractor and less focus on quality.

Therefore new tender policy has been developed that has a better balance with the organizational goals. A change process is needed from prescriptive towards results-oriented tendering.

When selecting a contractor, we use legal and financial requirements as exclusion criteria. When a contractor can’t meet these criteria, we will not proceed with him. We also use references on contractors, this can be from our database of suppliers (past performance) or we use the phone to get information how the contractor was doing in previous works. Our project managers are in general very experienced on their field. They know which local contractor is suitable for the job. They also might have a good relationship with certain contractors. We are aware of the subjectivity of this and we want to reduce this subjectivity in our purchase process’.

Sustainable criteria are getting more and more important for Velt en Vecht. Being a governmental agency, Velt en Vecht is following the Dutch guidelines for sustainable purchasing. For Velt en Vecht, past performance criteria are hard to use due to legality problems. In case of long term contracts, the use of past performance criteria is possible.

Before a project will be tendered, a project team is formed. The project manager of the section is chairman of this group and this group will set the selection method and criteria. The role of the purchasing department is advisory. The use of EMVI criteria is rising within Velt en Vecht. Sometimes more complex projects are selected to experiment with innovative ways of tendering and with qualitative selection criteria.

4.4.3 ProRail

Basis in the selection and award policy of ProRail is lowest price. The selection and award phase is taken apart frequently. Philosophy of ProRail is, making use of pre-qualification ensures that the right contractors are selected to apply for the tender. This enables to award the tenders on lowest price.

Important in the policy of ProRail is to know what the price of a certain project should be. In case of a tender procedure with substantial higher bid prices than the probabilistic estimation of ProRail, the bidder with the most favorable bid will be invited to compare the mutual estimates. Aim of this is to investigate if ProRail made a mistake when setting up the estimation.
When from the comparison can be concluded that the estimation of ProRail must be adjusted upwards, ProRail will continue the award procedure with the concerning bidder. If ProRail concludes there is no reason to adjust the estimation from ProRail, the tender procedure will be declared ‘failed’. Afterwards a new tender procedure can be started.

Sometimes, in tender procedures, there are (very) low bids. ProRail has learned in the past that, if the award is based on such low a bid, execution of the project will run problematic. To avoid this situation ProRail has developed two options. First option is to publish the bidding sums quickly and offer a withdraw settlement. This means that, in case a contractor made a miscalculation, he can withdraw his offer within three days.

The second method of ProRail to handle such abnormally low bids, is to invite the bidder to give further explanation on his bidding. If this explanation is complete and in time, ProRail will compare the bid with ProRails’ own estimation. This can lead to the following conclusions:

- The contractor has a good explanation why the bid is so low, for example because of an innovative design or method. ProRail will proceed the award procedure with this contractor.
- The bidder did a ‘strategic bidding’. The bidder knows that this project will not be profitable for him. ProRail will respect this commercial freedom for this contractor. A complementary agreement will be negotiated, in which is stated that the loss that the contractor will lead on the project, will be no reason for the contractor to cause stagnation or to claim additional payments.
- The contractor is not aware of the costs that he should make for this project. ProRail will offer the contractor the withdraw regulation. If the contractor refuses this, ProRail makes a risk assessment. If the risks of awarding the project to the contractor on this basis and the financial capabilities of the contractor are acceptable, the tender will be awarded to this contractor.

Innovative tendering at ProRail

‘Besides our normal way of tendering with pre-qualification of the contractors and awarding on lowest price we also use innovative tendering. An example of this is the tender to build the Hanze Railway Bridge near to Zwolle. For this project the basic requirement that we set was to design the most good looking bridge for the budget of maximum € 50.000.000,-. Price counted in this procedure for 40% and design for 60%. The design was judged by a committee of independent architects. The winning design is a classical rail bridge with a modern construction and design. The red colored bridge has a fluent shape above the river and has because its unusual shape his own character. The bridge is in harmony with the panoramic river landscape. Quality of this project is insured by assured quality agreements.’

Another trend in tendering at ProRail is the use of alliances. A disadvantage of the usual tender procedures is the difference in interest between principal and contractor. After awarding the tender, both parties have their own responsibilities. In case of an alliance the underlying idea is ‘shared responsibilities’. If a project runs into problems, both parties anticipate and decide on these and eventual losses will shared. On the other hand, smart solutions can be invented together, both parties can share the gains of this. In case of an alliance three parties exist: Contractor, Principal and Alliance. Risks and chances of the project are hosted in the alliance. This way of tendering is practiced at complex projects. The selection and award procedure works gradually as follows:

1. Selection on execution, the bidder with the highest bid sum on this share falls.
2. Selection on the Alliance share Design & Construct (normally contractor cost). In this stage the bidder with the highest sum of execution + D&C share falls.
3. Selection on the Alliance share Desing & Construct plus (normally principal costs). The lowest bidder on the sum of (Execution + Alliance share D&C+ Alliance share D&C plus) wins the tender.

4.5 Influence factors on contractor selection

In paragraph 2.7 was concluded based on literature review that the use of contractor selection criteria is context specific. An important goal of the interviews was to find out which factors influence the contractor selection process and what this influence is.

Industry
Since in this case study three cases are examined that are basically working in the same industry it’s not easy to find evidence for this influence factor. However, all three experts confirm that the industry wherein the tender is held does influence contractor selection. RWS gives as an example that the infra-sector is more innovative and uses more EMVI criteria than the building & construction sector. ProRail explains that contractors that are working ‘at the heart of the railways’ are selected through acknowledgement measures and that railway contractors depend for 90% of ProRail. According to Velt en vecht the innovativeness of the project (sector), leads to less contractors that are able to subscribe.

Organizational goals
All three experts confirm that organizational goals do influence contractor selection. The tender strategy is mentioned, being the set of internal choices that have to be made to indicate how the suppliers market will be approached. RWS gives as a clarification that the organizational goals ‘strive for innovation and creativity’ lead to use the of EMVI criteria. According to ProRail governmental and ProRail policy leads to the use of environmental and sustainability criteria, and example of this is the use of the CO2 prestatieladder (Carbondioxide performanceladder). Velt en Vecht states: ‘Environment and sustainability are very important in our organization policy. This led in a tender procedure for the transportation of liquid sludge to choose a restricted procedure. The contractors to bid were selected on their environmental care system’.

(Compliance to) EU tender law
The applicability of this influence factor is confirmed by ProRail. The use of lock-out criteria stem from EU tender law. Velt en Vecht thinks this factor is limited, but mentions that SME’s are less capable to meet tender requirements than large contractors.

Project goals
The influence of this factor is obvious for the three experts. What the principal wants to reach by executing the project influences contractor selection (RWS). ProRail mentions the example of the tender for the railway bridge near Zwolle. A main project goal was to build a bridge that is in harmony with the panoramic river landscape. This led to the assignment to design and construct the most well looking bridge for the sum of € 50 mln.

Project complexity and risks
Project complexity is an important influence factor on the contractor selection process. If the degree of complexity of a project rises, principles will search for alternative ways of tendering. For RWS, higher complexity of a project will lead to use of the restricted tender procedure. Increasing project complexity can also be a directrix for RWS to use the competitive dialogue as a selection procedure. This procedure starts with a question to which no clear solution known is yet (Nagelkerke, 2009). Based on the solutions that the bidders bring, the contracting authority is having a dialogue with the bidders that leads to optimization of demand and proposal. At least three bidders will be selected based on selection documents. There will not be one specification for the tender, every bidder makes their own proposal based on the solution it developed itself.
For Velt en Vecht tendering more complex projects leads to procedures with EMVI criteria. Increased project complexity leads also to innovative tender procedures and selection criteria.

Higher project complexity leads for ProRail to use tender procedures with alliances and negotiated procedures. Higher complexity means higher risks, and risks can be shared in ProRail Alliances. The project plan of the contractor will be judged on specific criteria.

**Projectsize**
For RWS a larger project leads to selection criteria that focus to select a large contractor or selection of a contractor that has proved to have skills to manage large projects. Large projects also demand financial strong contractors. For ProRail the match between project size and size of the contractor is important. A small contractor is not capable to execute a large project. Velt en Vecht mentions the need for increased professionalism in tender procedures on large projects.

**Evaluator experience**
All three experts state that this factor has no influence on contractor selection.

**Evaluator preferences**
RWS mentions in this context that they strive to make the outcome of the tender procedure as objective as possible. The biddings are judged by project teams, one is trying to achieve consensus on the best bid. Professional judgment is important and by using a clear procedure RWS tries to minimize the influence of personal preferences as much as possible.

Velt en Vecht validates that personal preferences play a role in tender procedures. ‘Our project managers are in general (very) experienced. Some of them have good experiences with certain contractors they worked with in the past. They like to fall back on historic success’. ProRail states that decision makers preference is not influencing contractor selection.

**Additional influence factors**
All three interviewees mention transaction costs as an influence factor on the choice of the tender procedure. If the transaction costs are high, there will be chosen for a restricted procedure with not too many contractors.
5. Academic and Managerial Concluations

The aim of this thesis is to give clarification how contractor selection in a setting around public infrastructure principles works out. The topic of contractor selection and tender evaluation has been an active area of research for several decades. From the literature study a lot of information has been found on tender procedures, contractor selection- and award criteria and its advantages and disadvantages. Since there is not much research available on what influences the contractor selection process, this is an important research question that needs to be answered. The definition of project success needs to be verified, as well as the influence that has contractor selection on project success. There is searched for if innovative procedures and criteria are being used by the principals. This chapter presents the research answers, reflects on the research limitations and ends with recommendations for further research.

5.1 Conclusion

Each of the research questions formulated in chapter 2 has been answered in the previous chapters. In short each of the questions and answers will be addressed in this section.

The problem statement was: Which selection criteria are applied to ensure success in public infrastructure projects

Hence, the research questions of this study are:

- How does a selection procedure work out in a setting around large public principals?
- Which factors influence contractor selection and what is this influence?
- How can project success be defined and how does selection of the contractor influence project success?

5.1.1 Contractor selection

Tender procedures are used to select a contractor. Similar to the model of Weele (2008, p. 59) three levels apply: tender strategy, tendering at a tactical level and the execution of the contract. A definition for a tender procedure is: A procedure that uses a contracting entity to call competition in the market and with which he tries to select a contractor with whom he wants to conclude a framework agreement or to whom he intends to award a contract (Aanbesteden, 2010).

The six types of tender procedures that are explained in paragraph 2.2.3 are: Public procedure, restricted procedure, competitive dialogue, the negotiated procedure with or without announcement and request for quotation.

These procedures are all recognized in either the interviews held with the experts or the documentation that they provided. The three studied organizations have their own preference for procedures. RWS chooses the public procedure frequently and mentions maximizing competition and lowering transaction costs as explanation for this. ProRail uses the restricted procedure frequently. By using pre-qualification is assured that only capable contractors can apply for the tender. Therefore it’s no problem for ProRail to award tenders commonly on lowest price.
5.1.2 Contractor selection criteria

According to Weele (2008) alternating selection and award criteria does occur frequently. In literature some researchers do distinguish contractor selection criteria and tender evaluation criteria (Watt et al., 2009), (Jakrapong & Liston, 2003), and others just use the phrase contractor selection criteria for both (G. Holt, 2010), (Alarcon & Mourgues, 2002), (Walraven & De Vries, 2009; Chee H. Wong et al., 2000). The alternating of these two concepts is also a finding from the cases in this manuscript. Contractor selection criteria is about who can execute the assignment. Tender evaluation criteria handles the question: How does the bidder want the execute the assignment and what are the costs. RWS mentioned explicitly not to mix up contractor selection and award criteria, since this is restricted by law.

The two main methods to award public contracts are lowest price or multi-criteria selection (C. H. Wong, Nicholas, & Holt, 2003). Several authors state that awarding contracts on lowest price does still occur frequently (Alarcon & Mourgues, 2002), (Walraven & De Vries, 2009). On the other hand other authors notice a shift from lowest price as single criterion to multi-criteria selection (Abdelrahman et al., 2008), (Waara & Bröchner, 2006).

The experts confirm the varied picture from literature. ProRail still uses lowest price as the main award method and tries to minimize the disadvantages of this method by use of the restricted procedure (pre-qualification). ProRail does recognize that tenders that are awarded on lowest price lead to claims and extra work of the contractor, leading to poor quality. These phenomena are mentioned by Lo and Yan (2009), Walraven and De Vries (2009), (Meland et al., 2011) and Hartmann, Ling, and Tan (2009). For ProRail it is important to know what a reasonable price for a project should be. If the winning bid price of a contractor is too low compared the calculated price of ProRail, ProRail can either declare the procedure invalid or make additional agreements to avoid contractors claims during the execution of the project.

Velt en Vecht confirms that tenders frequently are awarded on lowest price, yet the policy is to increase the use of EMVI criteria. Rijkswaterstaat uses lowest price as single criterion only if the tendered product or project is very straightforward. Policy is to use EMVI-criteria, 80-90% of the infrastructural projects are awarded with this method and this share is still rising.

Conclusion from both literature and the cases is that projects that are straightforward are suitable for awarding on lowest price. If a project is complex or needs to be designed by the contractor multi-criteria selection is the desired method. This in line with the conclusions of Meland et al. (2011).

5.1.3 New contractor selection methods & criteria

All three organizations mention the use of new or innovative methods of tendering. ProRail uses Alliances, this a new tendering method that has aspects of public procedure, the restricted procedure or the competitive dialogue. Especially for large, complex projects the tendering method with alliances is used. With this method the risks and gains of the tender are equally shared by contractor and principal. This method is an answer to the problem of the differences in interests between principles and contractors, as described in paragraph 2.3.2 of this report. RWS uses EMVI criteria frequently and wants to stimulate innovativeness and sustainability with these. Velt en Vecht also experiments with EMVI criteria and wants to stimulate sustainability.
5.1.3 Influence factors on contractor selection

A purchase process does not stand by itself, but is exposed to influences. Weele (2008) distinguishes influence factors on the purchase process and on purchase behavior. In their frequently cited model on influences factors on purchasing Webster Jr and Wind (1972) mention four groups of influence factors: Environmental, organizational, social and individual influences. These models are used in this study to gain more understanding about how a purchase process, like a tender procedure, works and which influence factors are applicable.

An important inducement for this study is the conclusion of G. Holt (2010) that the use of a cocktail of optimal selection criteria is not useful, given the transient and dynamic environments in which they are applied. He stresses the uniqueness of every construction project and states that the contractor selection procedure should be matched to each project. G. Holt (2010) and Watt et al. (2009) mention several influence factors, but conclude that it is not clear how this influence on contractor selection works. This information is to be matched in the research model of this study.

When comparing the answers that the three organizations gave on the questions on influence factors, the following can be noticed. The influence factors project goals and organizational goals seem to be obvious for the experts and it’s easy for them to give examples of this. Governmental policy on sustainability and innovation are mentioned more than once an influence factor. The factors project-complexity, -risks and -size seem to overlap. Following the experts, large projects lead to the selection of a large and financial strong contractor. Increased project-complexity/-risks ask for, according all three organizations, the award method multi-criteria selection or innovative procedures like competitive dialogue or alliances.

Prominent is the answer on the influence factors evaluator experience and evaluator preferences. ProRail, Velt en Vecht and RWS state that these factors are not applicable, the organization selects the contractor and not an individual person. Albeit, Velt en Vecht states in this context that past experiences of project managers can lead to preferences for certain contractors. This is an indication that the official answer to this question might differ from practice. As an additional influence factor the experts mention that transactions costs determine (additionally) the choice of the tender procedure. This new influence factor can be added to the research model as depicted in paragraph 2.7. RWS mentions that a public procedure can lower transaction costs for the principal.

5.1.4 Project success

An important concept in the research model of this study is project success. According to D. Kashiwagi and Savicky (2003) and Doloi (2009) the predominant project success factors are time, costs and quality. The three organisations mention in general also these three factors. Strikingly however, is that for ProRail the most important success factor is a project without incidents. Obviously ProRail is very cautious on her reputation with respect to safety and work habits when working at the railways. Also a stable project scope and environmental factors are mentioned as a project success factor by both RWS and ProRail.

As answer to the question on project failure factors both ProRail and RWS mention additional work and claims during the execution of the projects, this is in line with Lo and Yan (2009) and Meland et al. (2011). The latter concludes that especially in complex design and construction situations awarding on lowest bid alone is not a suitable method. This
The impact of contractor selection on project success that amongst others mentions Turskis (2008) and Doloi (2009) is confirmed by all three experts. For ProRail this a reason to often use the restricted procedure. Velt en Vecht states that past project performance is not always a guarantee for results in a new, unique project.

5.2 Practical implications

From a managerial perspective knowledge on the topic of contractor selection is important for both principals and contractors. Principals want to know which tender procedures and contractor selection and award criteria they have to use to select the most suitable contractor for the project. Contractors are private organizations that strive for continuity and need to execute profitable works. They need to know how contracts are awarded to be successful in their acquisition activities.

This research contributes to the knowledge on tender procedures and pictures how contractors are selected and contracts are awarded. Innovative tender methods are described and experts on this field gave their opinion in which circumstances lead to the choice of award methods and selection criteria. Trends on this topic that are found in the cases are an increased use of sustainability criteria and also an increased use of EMVI criteria.

Important in this study are the influence factors on contractor selection. Principals can use the overview on contractor selection criteria as presented in this study to set up their tenders. This study offers insight in the factors that influence the choice of tender procedures and contractor selection. Principals can make their choices more conscious which selection methods and criteria are preferable to use in a certain situation.

5.3 Limitations and further research

This research has an exploratory nature and therefore the evidence provided is not enough to draw indisputable conclusions. However, the interview results provide clarification in the way three principals are executing their tender procedures for public works. Also the question is answered what influences contractor selection in public procurement.

A limitation of this research is that it was an exploratory study and although established literature set the research in a theoretical framework, there was no formal hypothesis development or testing.

As always qualitative research is much dependent on the interpretations of the researcher. The research was aimed to be as objective as possible with a questionnaire and interviewing multiple people using the same questions. By using multiple data sources, such as the provided documents and governmental websites, internal validity was improved as well. The advantage of probing on answers during the interviews gave a better understanding of the execution of the procedures and the relation between influence factors and contractor selection. The construct validity is increased by letting the informants review the draft case study report. This review has been executed by the informants, which enhanced the accuracy of the case study.
Concerning external validity to generalize the results it should be noted that since the three cases studied are in one sector (infrastructural works), the results should be interpreted with cautiousness. The results cannot be generalized to other sectors. Another limitation of this case study is that for each of the three cases only one expert has been interviewed.

It’s important to note that this research concerns only tender procedures in public procurement in the infrastructural sector. Further research is needed to test the primary conclusions on the influence factors on contractor selection. It’s also recommended to further investigate the use of innovative tendering in public procurement. To be able to generalize the results, this research should be conducted in multiple sectors of public procurement. To gain a complete perspective of the contractor selection process, it would be beneficial to include the point of view from the contractors as well.
References


Appendix 1: Interview structure for all key-informants

Place:
Time:
Date:
Informants name:
Informants job title:

1. Organization
   1.1. What is the core business of your organization
   1.2. What kind of activities is your organization performing
   1.3. How many people are working in your organization
   1.4. Can you draw the organization chart of your organization
   1.5. What is your function (tasks and responsibilities)

2. Tendering
   2.1. Can you explain what is tendered by your organisation
   2.2. In which geographical area is your organisation active
   2.3. Can you explain the tender policy of your organisation
   2.4. Can you explain which tender procedure is used is which situation

3. Selection and award criteria
   3.1. In literature is found that the selection of the contractor has a big influence on project success. Do you agree with this?
   3.2. What other factors influence project success?
   3.3 Can you name five project success factors? Can you rank them by grade of importance?
   3.4 Do you use pre-qualification in tender procedures
   3.5. In which circumstances do you use the award criteria ‘lowest price’
   3.6. Can you provide information on which criteria is used in which situation
   3.7. Do you see a trend that EMVI is more and more used as award criteria?
   3.8. Can you give your opinion on the selection criteria mentioned in table 1?
      What is your opinion about the categorization?
   3.9. A research conducted in the UK mentions the use of new selection criteria like transparency of cost price data, understanding clients objectives, innovative management and understanding of partnering. Do you recognise these criteria and do you use them

4. Influence factors
   4.1. In the research model eight factors are mentioned that influence contractor selection. Do you recognize these criteria and can you tell if they are applicable? If Yes, can you explain what the influence is? Can you name more influence factors?

5. Rounding off
   5.1. Would you like to add something with regard to tender procedures and the influence factors on contractor selection criteria.
   5.2. Can you provide additional data on the topic as just discussed.
### Appendix 2: Summary of interview results

<table>
<thead>
<tr>
<th>Item</th>
<th>RWS</th>
<th>Velt en Vecht</th>
<th>ProRail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tendering policy</strong></td>
<td>Knowledge, Innovative, ‘the market unless’, forehanded and clear information for the market</td>
<td>Tendering legitimately, sustainable purchasing, focus on local supplier market, develop strategic purchase function.</td>
<td>Focus on cost management, centralized tendering, share risks and award for a reasonable price</td>
</tr>
<tr>
<td><strong>Tendered volume (2010)</strong></td>
<td>Approx. 3,000,000,000,- 85%+ infrastructural projects</td>
<td>Approx. 35,000,000,- 85%+ infrastructural projects</td>
<td>Approx. 2,000,000,000,- 85%+ infrastructural projects</td>
</tr>
<tr>
<td><strong>Type of projects</strong></td>
<td>Build roads, bridges, dykes. Maintenance of them.</td>
<td>Sewage treatment installations, landscaping projects.</td>
<td>Build railways, rail bridges, railway installations, Maintenance of them.</td>
</tr>
<tr>
<td><strong>Used tender procedures</strong></td>
<td>Public and restricted procedure</td>
<td>Public and restricted procedure</td>
<td>Exclusive restricted procedure</td>
</tr>
<tr>
<td><strong>Opinion on award criteria</strong></td>
<td>Only ‘lowest price’ in case of straightforward, smaller projects</td>
<td>More than 50% of the projects are still awarded on ‘lowest price’</td>
<td>Most of the projects are awarded on lowest price</td>
</tr>
<tr>
<td><strong>Opinion on award criteria</strong></td>
<td><strong>EMVI</strong></td>
<td>Use EMVI for larger/complex projects. The use of EMVI is still rising.</td>
<td>Quality is a requirement, sometimes quality is guaranteed by an assurance company.</td>
</tr>
<tr>
<td><strong>Project success factors</strong></td>
<td>1. Right price/quality ratio</td>
<td>1. Accomplish project goals</td>
<td>1. No incidents</td>
</tr>
<tr>
<td></td>
<td>4. No change of scope</td>
<td>4. Environmental factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Low transaction costs</td>
<td>5. Long term feasibility project goals</td>
<td></td>
</tr>
<tr>
<td><strong>Project dis-success factors</strong></td>
<td>1. Passive contractor causes bad execution quality.</td>
<td>1. Project goals not accomplished</td>
<td>1. Contracting price to low leads to minimizing project quality</td>
</tr>
<tr>
<td><strong>Impact contractor selection on project success</strong></td>
<td>Hard to say up front whether the contractor will succeed the project. Of course past performance tells something, but every project is unique again</td>
<td>Selection criteria are specified on an individual project base. The tendering policy of Velt en Vecht determines the focus. Legal and financial requirements are used, as well as references (phone) are used to select the contractor.</td>
<td>Impact is significant, therefore ProRail uses mainly the pre-qualification procedure and has a advanced performance measurement system</td>
</tr>
<tr>
<td><strong>Selection criteria</strong></td>
<td>It’s important to separate contractor selection criteria and award criteria. Exclusion criteria and suitability requirement to select the contractor. Main suitability requirements are financial: Turnover and solvability as well as technical capabilities: Projectmanagement- and technical experience skills.</td>
<td>Project management- and technical experience skills.</td>
<td>ProRail’s performance measurement system is used to select the contractor. Minimum turnover and past project requirements are also used. Exclusion requirements are used.</td>
</tr>
<tr>
<td><strong>Trends</strong></td>
<td>Try to stimulate ‘out of the box thinking’ and increase the innovativeness of the contractors. Design is moving more and more to contractors.</td>
<td>The use of sustainability criteria is increasing. The collaboration with other Regional Water Authorities is increasing. There is a shift within the organisation to more professional purchasing and tendering</td>
<td>The use of new sustainability criteria (CO2 prestatieladder, Carbondioxide performance ladder). Sharing and not dividing risk in the ProRail Alliance. Using probabilistic estimating.</td>
</tr>
<tr>
<td>Influence factors on contractor selection (applicable Y/N or Limited)</td>
<td>Y/N</td>
<td>RWS</td>
<td>Y/N</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Industry</td>
<td>Y</td>
<td>L</td>
<td>Innovativeness of project/sector leads to less contractors that subscribe</td>
</tr>
<tr>
<td>Organisational goals</td>
<td>Y</td>
<td>RWS strives for innovation and creativity, Therefore EMVI criteria are used frequently</td>
<td>L</td>
</tr>
<tr>
<td>(compliance to) EU tender law</td>
<td>?</td>
<td>L</td>
<td>SME’s are less capable to meet tender requirements then large companies.</td>
</tr>
<tr>
<td>Projectgoals</td>
<td>Y</td>
<td>N</td>
<td>That what the principal want to reach by the execution of the project obviously influences CS.</td>
</tr>
<tr>
<td>Projectcomplexity/-risks</td>
<td>Y</td>
<td>Y</td>
<td>Increased project complexity leads to use of the restricted procedure and competitive dialogue procedures.</td>
</tr>
<tr>
<td>Projectsize</td>
<td>Y</td>
<td>L</td>
<td>Large project leads to the selection of large and/or financial strong contractor</td>
</tr>
<tr>
<td>Evaluator experience</td>
<td>N</td>
<td>N</td>
<td>Experiences of project managers lead preference of certain contractors</td>
</tr>
<tr>
<td>Evaluator preferences</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Additional influence factor</td>
<td>Transaction costs determine (additionally) type of tender procedure</td>
<td>Transaction costs determine (additionally) type of tender procedure</td>
<td>Transaction costs determine (additionally) type of tender procedure</td>
</tr>
</tbody>
</table>