

FREEDOM FOR CONTRACTORS



Cross-border analysis on the solution
space for contractors within
infrastructure projects

 **TU Delft**


AT OSBORNE
CONSULTANTS & MANAGERS

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Freedom for contractors

Cross-border analysis on the solution space for contractors within infrastructure projects

Colophon

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*“Uncertainty is a very good thing: it’s the beginning of an investigation,
and the investigation should never end.”*

Tim Crouch

*“Now this is not the end. It is not even the beginning of the end. But it is,
perhaps, the end of the beginning.”*

Winston Churchill

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PREFACE

The thesis in front of you is part of a graduation project for the master Construction Management and Engineering at Delft University of Technology. It is the last milestone of a two-year master track and can be combined with a graduation internship at a firm. In this case the consultancy firm AT Osborne was looking for an intern student with a German background to research the differences between the German and Dutch way of conducting an infrastructure project.

The issue of cross-border contracting is currently a very relevant and interesting topic, with a lot of opportunities but also constraints. During an internship at a very large German architectural firm in Düsseldorf two years ago, I already noticed large differences in their approaches compared to what I already knew from Dutch practise and the lectures at university. The architect in Germany plays such an important role during the whole process of the projects. Besides the design; the work area of an architect in Germany also includes disciplines like engineering, finance and the management of projects. These observations sparked my curiosity in how this works with infrastructure projects. How are those organised?

I would like to thank everyone who helped me during this graduation process. Firstly my graduation committee; Marleen Hermans, Martijn Leijten and Sander van Nederveen. They all helped steering the research in the right direction with their extensive knowledge. Of course I would also like to thank my graduation company AT Osborne for offering me an internship at their firm and the warm welcome I received. Thank you, Jan-Pieter van Schaik and Geertje van Engen for supervising me at the side of AT Osborne and helping by connecting me to the right people and reading my reports. And of course thank you to all the nice colleagues at AT Osborne who were always prepared to listen, help and share their opinions.

Next to my graduation committee I would also like to thank everyone who contributed to content of this research; all interviewees, Rijkswaterstaat and Dieter Schmoll who first introduced me to a German Engineering firm and thereby helped me in picturing the German situation. Thank you Gilbert Peiker for welcoming me in Munich at the highway agency of South-Bavaria and providing a lot of information. Especially in the beginning it was not very easy to collect information on the German side and therefore I am very grateful for the great help I received.

And last but not least I thank my family, boyfriend and friends for all the mental support in this last phase of my master!

Enjoy reading this thesis.

M.C. (Christine) Siedenburg

Delft, June 15th 2017

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EXECUTIVE SUMMARY

Stimulating cross-border contracting is one of the main objectives of the European Union according to the Green-book on modernising the EU-policy regarding tendering. They intend to make the European market better accessible for contractors to compete in other European countries. This would result in a reduced public expenditure by increasing the competition on the market. However, there are also some barriers that need to be overcome when considering cross-border contracting. Removing or reducing these barriers will create opportunities for the construction industry.

Besides cross-border contracting, the rise of integrated contracts, and especially those involving private investors, is an additional opportunity for the construction industry to grow further and ensure continuity. The integral approach has to improve overall project performance by providing freedom or solution space to the market. This freedom is also linked to a certain responsibility the contractors have to take on, which can benefit the project. The development to an integral approach and more freedom for the contractor is not the same in every country or project; integrated contracts can be interpreted very differently.

Currently, Dutch contractors are still primarily dependent on their home market and the economical crisis of 2008 hit the Dutch construction market harder than some other European countries. Germany could be an interesting market for Dutch contractors as it is a neighbouring country in desperate need of improving and expanding their existing infrastructure network the coming years. The differences, or barriers as mentioned earlier, between countries can complicate cross-border contracting for contractors. This research aimed on identifying the differences regarding infrastructure projects with integrated contracts in the Netherlands and Germany, with a focus on the solution space that contractors receive. The main research question stated;

“What factors, related to the design of the tender phase defined by the client, influence the decision on the degree to which contractors can contribute to the design of the realization of an infrastructure project with an integrated contract in Germany and the Netherlands?”

During a literature study and a Dutch and German case study, consisting of five road infrastructure projects and one sea lock, different factors influencing the solution space for contractors were found and categorized. The first category that was found is the *public policy*, which consists of regulations and the track decision. These can both influence the solution space because of the level of fixation of the plans they can cause up front.

The second category entails the influence of the *public client*, which consists of the choice in contract, tender procedure, project specifications, and award criteria. With these four aspects the client can have a great influence on the solution space. First of all, the choice for an integrated contract is the basis. In traditional contracts the contractor has non- to very limited solution space. This research focussed on the maximal integrated form; the DBFM(O) contracts. One would expect that this contract is providing the contractor with the biggest solution space, as all project phases are integrated. The literature and cases actually showed that this is not entirely true. The tender procedure is another choice for the public

client, which can influence the solution space for contractors. Some procedures are more open and leave more room for contractors to provide input than others. The same goes for the project specifications; if the project demands are specified in a technical and detailed way, not much room is left for contractors to use their expertise to contribute to the project. The way contractors will or can use the solution space is greatly determined by the award criteria. A contractor can get all the space possible but if this will not be rewarded in the right way, it will not be beneficial for the contractors to add a certain value and on top of that be unique.

The third and last category influencing the solution space for contractors is the *project context*. This category consists of agreements with stakeholders, the physical environment and project scope. The more agreements are made and the more the scope is fixed, the smaller the solution space will be.

If public clients would like to benefit more from the opportunities a bigger solution space for contractors has to offer, it is recommended to take the following aspects into account:

- (1) It starts with the determination of public policy. Public authorities should have more faith in the market and loosen the regulations to some extent.
- (2) The same goes for the factors that influence the solution space that are determined by the client. Public clients should not tighten everything to deal with their uncertainty.
- (3) It is also very important for clients to put a high (monetary) incentive on quality aspects to stimulate the full use of the solution space for contractors within a project.
- (4) Currently, when a big technical solution space is requested within a DBFM(O) contract, the private financing seems to be the limiting factor. Further research will be needed to find a way to involve private financiers but create more space for more innovative solutions.

Furthermore, when contractors are interested in competing in tenders for infrastructure projects with integrated contracts across their borders, they will have to be aware of some of the existing barriers that can complicate the process. Germany and the Netherlands showed significant differences in how they deal with DBFM(O) contracts in infrastructure projects. The differences mainly are in the governmental organisation of the country, the stimulation for a bigger solution space by the public client, language, and culture.

To decrease or remove the existing barriers it is for a starter recommended to publish all European tenders in the same language, such as English. It could also help if the European union would develop a European norm for contracts. Another solution could be to establish an institution that will help foreign contractors to understand local regularities and the state of affairs.

Besides the general observations on the barriers for cross-border contract, the research objectives also entailed to identify the opportunities for Dutch contractors in Germany. The Dutch could help by sharing their knowledge and expertise which they gained from previous projects on how to use integrated contract forms with infrastructure projects.

MANAGEMENTSAMENVATTING

Het stimuleren van grensoverschrijdend aanbesteden is één van de hoofddoelstellingen van de Europese Unie. Ze willen de Europese markt beter toegankelijk maken voor aannemers om in andere Europese landen te concurreren. Dit zou leiden tot een lagere overheidsuitgaven door de concurrentie op de markt te verhogen. Er zijn echter enkele hindernissen die moeten worden overwonnen bij het participeren in grensoverschrijdende aanbestedingen. Vermindering van deze barrières kan kansen creëren voor de huidige bouwsector.

Naast grensoverschrijdende aanbestedingen is de opkomst van geïntegreerde contracten en met name die met betrokkenheid van particuliere beleggers een extra mogelijkheid om de bouwindustrie verder te groeien en continuïteit te waarborgen. De integrale aanpak moet de algehele projectprestatie verbeteren door vrijheid of oplossingsruimte aan de markt te geven. Deze vrijheid gaat gepaard met een bepaalde verantwoordelijkheid die de aannemers moeten dragen. De ontwikkeling naar een integrale aanpak en meer vrijheid voor de aannemer is niet hetzelfde in elk land of project; geïntegreerde contracten kunnen zeer verschillend worden geïnterpreteerd.

Momenteel zijn Nederlandse aannemers nog steeds voornamelijk afhankelijk van hun thuismarkt en de economische crisis van 2008 heeft de Nederlandse bouwmarkt moeilijker dan sommige andere Europese landen. Duitsland zou een interessante markt kunnen zijn voor Nederlandse aannemers. Het is een buurland met een sterke behoefte aan het verbeteren en uitbreiden van hun bestaande infrastructuurnetwerk de komende jaren. De verschillen, of barrières, tussen landen kunnen de grensoverschrijdende aanbestedingen voor aannemers moeilijker maken. Dit onderzoek was gericht op het identificeren van de verschillen met betrekking tot infrastructuurprojecten met geïntegreerde contracten in Nederland en Duitsland met de nadruk op de oplossingsruimte die aannemers krijgen. De hoofdonderzoeksvraag luidt:

“Welke factoren, gerelateerd aan de inrichting van de tenderfase gedefinieerd door de opdrachtgever, hebben invloed op het mate waarin opdrachtnemers kunnen bijdragen aan de inrichting van de realisatie van een infrastructuur project in Duitsland en Nederland?”

Tijdens een literatuurstudie en een Nederlandse en Duitse casus bestaande uit vijf wegeninfrastructuurprojecten en één sluisproject, zijn verschillende factoren die van invloed zijn op de oplossingsruimte voor aannemers gevonden en gecategoriseerd. De eerste categorie is *openbaar beleid*, bestaande uit regelgeving en het tracébesluit. Deze kunnen de oplossingsruimte beïnvloeden door het niveau van fixatie van de plannen die ze kunnen veroorzaken.

De tweede categorie is de invloed van de *publieke opdrachtgever*, die bestaat uit de keuze in contractvorm, de aanbestedingsprocedure, projectspecificaties en gunningscriteria. Met deze vier aspecten kan de klant grote invloed hebben op de oplossingsruimte. Allereerst is de keuze voor een geïntegreerd contract de basis. In traditionele contracten heeft de aannemer niet tot zeer beperkte oplossingsruimte. Dit onderzoek richtte zich op de maximale geïntegreerde vorm; DBFM(O) contracten. Men zou

verwachten dat dit contract de aannemer de grootste oplossing biedt, aangezien alle projectfasen zijn geïntegreerd. De literatuur en de casussen hebben echter aangetoond dat dit niet helemaal klopt. De aanbestedingsprocedure is een andere keuze voor de publieke klant, die de oplossingsruimte voor aannemers kan beïnvloeden. Sommige procedures zijn meer open en voorzien aannemers van meer ruimte om input te leveren dan anderen. Hetzelfde geldt voor de projectspecificaties; als de projectbehoeften zeer technisch en gedetailleerd worden gespecificeerd blijft er weinig ruimte voor aannemers om hun expertise te gebruiken om iets te kunnen bij dragen aan het project. De manier waarop contractanten de oplossingsruimte kunnen gebruiken, wordt sterk bepaald door de gunningscriteria. Een aannemer kan de volledige ruimte krijgen, maar als dit niet op de juiste manier wordt beloond, is het niet aantrekkelijk voor de aannemers om een bepaalde waarde toe te voegen en daarbovenop uniek te zijn ten opzichte van de concurrentie.

De derde en laatste categorie die de oplossingsruimte beïnvloedt is de *projectcontext*. Deze categorie bestaat uit afspraken met belanghebbenden, de fysieke omgeving en de projectscope. Hoe meer afspraken vooraf gemaakt worden en hoe meer de scope wordt vastgezet, des te kleiner de oplossingsruimte zal zijn.

Als men meer van de kansen wil profiteren die een grotere oplossingsruimte voor de aannemers kan bieden moet er rekening worden gehouden met de volgende aspecten:

- (1) Het begint bij de bepaling van het openbare beleid. Overheden zouden meer vertrouwen moeten hebben in de markt en de regelgeving tot op zekere hoogte versoepelen.
- (2) Hetzelfde geldt voor de opdrachtgever; ze zouden niet alles moeten willen vastleggen als middel voor het omgaan met hun eigen onzekerheden.
- (3) Het is ook erg belangrijk voor opdrachtgevers om een hoge financiële drijfveer te creëren voor opdrachtnemers zodat deze bereid zijn de gegeven oplossingsruimte zo optimaal mogelijk te benutten.
- (4) Als er vraag is naar een grote technische oplossingsruimte van vormt de betrokkenheid van private financiers op dit moment een belemmering, ondanks dat de gekoppelde onderhoudstermijn juist een stimulans vormt voor het geven van een grotere oplossingsruimte door de opdrachtgever. Er moet een manier worden gevonden waarbij betrokken private financiers bereid zijn om meer ruimte toe te staan voor de opdrachtnemers. Hier zal verder onderzoek naar gedaan moeten worden.

Tevens, wanneer aannemers geïnteresseerd zijn in het participeren in aanbestedingen voor infrastructuurprojecten met geïntegreerde contracten buiten hun eigen landsgrenzen, dan moeten zij zich bewust zijn van de bestaande barrières die het proces kunnen bemoeilijken. Duitsland en Nederland lieten aanzienlijke verschillen zien in hoe zij omgaan met DBFM(O) contracten in infrastructuurprojecten. De verschillen zitten voornamelijk in de organisatie van overheden, de stimulering van een grotere oplossingsruimte door de publieke opdrachtnemer, de taal en cultuur.

Om bestaande barrière te verlagen, is het allereerst aanbevolen om Europese aanbestedingen in dezelfde taal publiceren, zoals bijvoorbeeld in het Engels. Misschien zou het ook helpen als de Europese Unie een Europese norm voor contracten zou ontwikkelen.

Een andere oplossing zou kunnen zijn om een instituut op te zetten die buitenlandse aannemers kan helpen om lokale regelgeving en de stand van zaken te begrijpen.

Naast het identificeren van de verschillen/barrières was één van de doelstellingen voor dit onderzoek ook om te kijken waar de kansen liggen voor Nederlandse aannemers in Duitsland met de infrastructuuropgave van de komende jaren. De Nederlanders zouden kunnen helpen bij het delen van kennis over het gebruik van geïntegreerde contractvormen met infrastructuurprojecten en in het bijzonder hoe de projecten goed geëvalueerd kunnen worden en deze kennis te gebruiken voor toekomstige projecten.

ZUSAMMENFASSUNG

Die Förderung von grenzüberschreitenden Ausschreibungen ist eines der Hauptziele der Europäischen Union. Sie wollen den Zugang zum Europäischen Markt für Auftragnehmer verbessern, damit sie in anderen Europäischen Ländern mit konkurrieren können. Dies könnte durch Marktmechanismus zu geringeren Staatsausgaben führen. Allerdings gibt es einige Barrieren, die überwunden werden müssen, wenn Bauunternehmen sich an grenzüberschreitenden Ausschreibungen beteiligen möchten. Wenn diese Barrieren reduziert werden könnten, würden mehr Chancen entstehen für den heutigen Baumarkt.

Neben grenzüberschreitenden Ausschreibungen ist die Entstehung von integrierten Verträgen, insbesondere da wo privaten Investoren miteinbezogen werden, eine zusätzliche Möglichkeit für Wachstum und Kontinuität in der Bauindustrie. Der integrierte Ansatz soll die gesamte Projektleistung verbessern, indem der Markt mehr Planungsfreiheit bei Bauprojekten erhält. Diese Freiheit resultiert auch in einer Verantwortung die durch den Auftragnehmer übernommen werden muss. Die Entwicklung zu einem mehr integrierten Ansatz und mehr Freiheit für den Auftragnehmer ist nicht in jedem Land oder Projekt gleich, da integrierten Verträge sehr unterschiedlich interpretiert werden können.

Heutzutage sind niederländische Unternehmer immer noch in erster Linie abhängig von ihren jeweiligen Heimatmärkten. Auch die Wirtschaftskrise des Jahres 2008 hat den niederländischen Baumarkt härter getroffen als einige andere europäischen Länder. Deutschland könnte ein interessanter Markt für niederländischen Bauunternehmer werden, ein Nachbarland mit dem starken Bedürfnis, um die bestehende Netzinfrastruktur in den kommenden Jahren zu verbessern und auszubreiten. Die Unterschiede oder Barrieren zwischen den einzelnen Ländern können jedoch grenzüberschreitende Ausschreibungen für Auftragnehmer beeinträchtigen. Diese Studie soll die Unterschiede und Problematik in Bezug auf Infrastrukturprojekte mit integrierten Verträgen zwischen den Niederlanden und Deutschland verdeutlichen; dabei liegt der Schwerpunkt auf der Planungsfreiheit und damit dem Verhandlungsrahmen den Auftragnehmer in diesen Verträgen bekommen. Die zentrale Forschungsfrage ist:

'Welche Faktoren beeinflussen das Ausmaß auf die vom Kunden definierte Einrichtung der Angebotsphase, in dem der Auftragnehmer für die Durchführung eines Infrastrukturprojektes sowohl in Deutschland als auch in den Niederlanden beitragen könnte?'

In einer Literaturstudie und einem niederländischen und deutschen Kasus mit fünf Straßeninfrastrukturprojekten und einer Meeresschleuse, sind mehrere Faktoren gefunden und kategorisiert welche die Projektfreiheit für Auftragnehmer stark beeinflussen. Die erste Kategorie ist die öffentliche Ordnung, welche Gesetzgebung und das Planungsverfahren umfassen. Diese können den Auftragsrahmen deutlich einschränken durch das Ausmaß der Festlegung der Pläne vor der Vergabe des Auftrags.

Die zweite Kategorie ist der Einfluss der öffentlichen Auftraggeber; es betrifft die Wahl der Vertragsform, das Ausschreibungsverfahren, die Leistungsbeschreibungen und die

Zuschlagskriterien. Mit diesen vier Aspekten kann der Auftraggeber seine Planungsfreiheit in den Verhandlungen stark beeinflussen.

Zunächst ist die Wahl eines integrierten Vertrages eine wichtige Basis. In traditionellen Verträgen hat der Auftragnehmer gar keine oder nur eine sehr beschränkte Planungsfreiheit. Diese Studie konzentriert sich auf die maximale integrierte Form, die DBFM(O) Verträge. Man würde erwarten dass diese Verträge den Auftragnehmern den größten Verhandlungsrahmen bieten, da alle Projektphasen integriert sind. Allerdings haben Literatur und die Fallstudien gezeigt, dass dies nicht so ist. Das Ausschreibungsverfahren ist eine weitere Option für öffentliche Auftraggeber, welche die Projektfreiheit für Auftragnehmer beeinflussen können. Einige Vergabeverfahren sind offener und bieten daher manchen Auftragnehmern mehr Möglichkeiten um etwas beizutragen.

Das Gleiche gilt für die Leistungsbeschreibung; wenn das Projekt sehr technisch und detailliert ausgeschrieben wird, bleiben nur wenig Möglichkeiten für den Bauunternehmer um sein Know-how zu nutzen für eventuelle Projektverbesserungen. Ob und wie Auftragnehmer die Planungsfreiheit nutzen können, wird stark von den Zuschlagskriterien bestimmt. Ein Unternehmer kann sehr viel Freiheit bekommen, aber wenn dies nicht auf richtige Art und Weise belohnt wird, ist es für den Auftragnehmer nicht attraktiv um mehr Qualität hinzuzufügen und sich so von der Konkurrenz zu unterscheiden.

Die dritte und letzte Kategorie, welche die Planungsfreiheit beeinflusst, ist der Projektkontext. Zu dieser Kategorie gehören Vereinbarungen mit allen Beteiligten und auch die physischen Umgebung und der Projektumfang. Je mehr Vereinbarungen im Voraus schon festgelegt werden, desto kleiner wird die Planungsfreiheit eines Projektes .

Wenn man die Chancen ergreifen möchte, die größere Projektfreiheit für die Auftragnehmer bieten kann, sollten folgende Aspekte berücksichtigt werden:

- (1) Es beginnt mit der öffentlichen Ordnung. Die öffentlichen Einrichtungen sollten mehr Vertrauen in den Markt haben und Vorschriften bis zu einem gewissen Maße lockern.
- (2) Das Gleiche gilt für den Auftragnehmer; sie sollten nicht alles festlegen wollen um so eigene Unsicherheiten auszuschließen und damit nur eigene Risiken zu reduzieren.
- (3) Es ist auch sehr wichtig für Auftragnehmer um einen hohen finanziellen Anreiz zu schaffen, so dass die größere Planungsfreiheit von den Auftragnehmern optimal genutzt werden kann.
- (4) Wenn größere technische Planungsfreiheit gefragt ist, dann wird dies momentan meist noch von den beteiligten privaten Investoren abgebremst. Trotz der verbundenen Wartungsperiode die den Auftraggebern einen Anreiz bieten sollte mehr Freiheit zu geben, bleibt nur wenig Raum für Innovation. Es muss ein Weg gefunden werden, worin die privaten Geldgeber bereit sind, mehr Freiheit und Raum für die Auftragnehmer zu ermöglichen. Dies muss sich in einer weiteren Studie ergeben.

Wenn Auftragnehmer Interesse daran haben um an Ausschreibungen für Infrastrukturprojekten mit integrierten Verträge außerhalb ihrer eigenen Landesgrenzen teilzunehmen, dann müssen sie über die bestehenden Barrieren, die den Prozess

erschweren können, informiert sein. Deutschland und die Niederlande zeigen signifikante Unterschiede wie sie mit DBFM(O) Verträgen in der Infrastruktur umgehen. Die Unterschiede bestehen vor allem aus der Organisation der Regierungen, der Stimulation größerer Planungsfreiheit durch öffentliche Auftragnehmer und der Sprache und Kultur.

Um die bestehenden Barrieren zu reduzieren, würde es helfen zunächst Europäische Ausschreibungen in derselben Sprache zu veröffentlichen, wie zum Beispiel in Englisch. Auch wäre es eine gute Idee wenn die Europäische Union einen Europäischen Standardvertrag entwickeln würde der als Basis benutzt werden kann. Eine andere Lösung könnte daraus bestehen, eine Institution zu gründen, die ausländischen Auftragnehmern hilft den heutigen Stand der Dinge von örtliche Vorschriften zu verstehen.

Neben dem Identifizieren der Barrieren, war auch eines der Ziele dieser Forschung um die Chancen für niederländische Bauunternehmer in Deutschland zu zeigen. Die heutige Infrastruktur dort lässt eine Große Herausforderung für die kommenden Jahre sehen. Die holländischen Bauunternehmer könnten helfen beim Wissensaustausch über den Einsatz integrierter Verträge in vielen Infrastrukturprojekten. Insbesondere könnte man lernen wie diese Projekte korrekt ausgewertet werden müssen um dieses Wissen für zukünftige Projekte sinnvoll anwenden zu können.

CONTENT

PREFACE	6
EXECUTIVE SUMMARY	8
MANAGEMENTSAMENVATTING	10
ZUSAMMENFASSUNG	13
CONTENT	16
LIST OF FIGURES	19
LIST OF TABLES.....	20
LIST OF ABRIVIATIONS	20
1. INTRODUCTION.....	21
1.1. RESEARCH CONTEXT.....	21
1.2. PROBLEM DEFINITION	22
1.3. RESEARCH OBJECTIVES & -QUESTION	23
1.4. RESEARCH SCOPE	24
1.5. RELEVANCE.....	25
1.6. THESIS OUTLINE	25
2. RESEARCH METHODOLOGY.....	26
2.1. LITERATURE REVIEW.....	26
2.2. CASE STUDIES.....	27
2.2.1. DOCUMENT ANALYSIS.....	28
2.2.2. INTERVIEWS	28
2.3. MODEL DESCRIPTION.....	29
2.4. VALIDATION	29
3. LITERATURE REVIEW	30
3.1. THE INTEGRAL APPROACH.....	30
3.1.1. CONTRACT TYPES.....	31
3.1.2. DBFM(O) CONTRACTS	31
3.2. SOLUTION SPACE FOR THE CONTRACTOR.....	32
3.2.1. PROJECT SPECIFICATIONS	32
3.2.2. CONSEQUENCES OF CHOOSING A CERTAIN DEGREE OF FREEDOM	33
3.3. TENDER/PROCUREMENT PROCEDURES	34
3.3.1. TENDER PROCEDURES	34
3.3.2. AWARD CRITERIA	35
3.3.3. STIMULATING COMPETITIVENESS.....	35
3.4. POLICY AND LEGAL FRAMEWORKS FOR INFRASTRUCTURE PROJECTS	37
3.5. RESULTS LITERATURE REVIEW	37
3.6. INFLUENCING FACTORS DERIVED FROM LITERATURE.....	38
3.7. VALIDATION	39
3.6.1. CONTRACT FORM.....	39

3.6.2. LEVEL OF DETAIL OF SPECIFICATIONS	39
3.6.3. TENDER PROCEDURE.....	40
3.6.4. AWARD CRITERIA	40
4. DUTCH CASE STUDY.....	41
4.1. GENERAL INFORMATION	41
4.1.1. THE DUTCH INFRASTRUCTURE PROCEDURE	41
4.1.2. THE INTEGRAL PROCUREMENT DECISION OF RIJKSWATERSTAAT	42
4.1.3. DUTCH CULTURE	43
4.2. PROJECT A12 EDE-GRIJSOORD	44
4.2.1. DOCUMENT ANALYSIS.....	44
4.2.1. INTERVIEWS	44
4.3. PROJECT A6 ALMERE HAVENDREEF – ALMERE BUITEN-OOST	45
4.3.1. DOCUMENT ANALYSIS.....	46
4.3.2. INTERVIEWS	46
4.4. PROJECT SEA LOCK IJMUIDEN.....	47
4.4.1. DOCUMENT ANALYSIS.....	48
4.4.2. INTERVIEWS	48
4.5. RESULTS DUTCH CASE STUDY.....	49
4.6. INFLUENCING FACTORS DERIVED FROM THE DUTCH CASE	50
5. GERMAN CASE STUDY	52
5.1. GENERAL INFORMATION	52
5.1.1. GERMAN INFRASTRUCTURE PROCEDURES.....	52
5.1.2. GERMAN INTEGRATED CONTRACT FORMS.....	53
5.1.3. GERMAN CULTURE.....	53
5.2. PROJECT A94 MÜNCHEN – POCKING	54
5.2.1. DOCUMENT ANALYSIS.....	55
5.2.2. INTERVIEWS	55
5.3. PROJECT A8 ULM – AUGSBURG.....	56
5.3.1. DOCUMENT ANALYSIS.....	57
5.3.2. INTERVIEWS	57
5.4. A4 THÜRINGEN	58
5.4.1. DOCUMENT ANALYSIS.....	58
5.4.2. INTERVIEWS	58
5.5. RESULTS GERMAN CASE STUDY	59
5.6. INFLUENCING FACTORS DERIVED FROM THE GERMAN CASE	60
6. CASE COMPARISON	62
6.1. CASE COMPARISON	62
6.2. INFLUENCING FACTORS DERIVED FROM THE CASES	63
6.3. INFLUENCE OF CULTURE	64
6.3.1. COMPARING GERMANY AND THE NETHERLANDS ON THE HOFSTEDE DIMENSIONS.....	64
6.3.2. OBSERVATIONS IN THE CASES.....	64
6.4. VALIDATION	65

7. MODEL DESCRIPTION	66
7.1. INFLUENCING FACTORS ON THE SOLUTION SPACE FOR CONTRACTORS	66
7.2. CONSEQUENCES OF A BIGGER SOLUTION SPACE FOR CONTRACTORS	68
7.2.1. RISK DIVISION.....	68
7.2.2. PROJECT EFFICIENCY	69
7.2.3. ADDED VALUE.....	69
8. CONCLUSIONS	71
9. RECOMMENDATIONS	74
10. DISCUSSION	76
BIBLIOGRAPHY.....	78

LIST OF FIGURES

Chapter 1:

Figure 1.1. Project frame

Chapter 2:

Figure 2.1. Overview of Research Design

Figure 2.2. Structure case studies

Chapter 3:

Figure 3.1. Different types of integrated contracts and responsibilities

Figure 3.2. Solution space vs. control

Figure 3.3. Allocation of responsibility in a DBMF contract by a balanced risk allocation (Brommet, Schoenmaker, & Hertogh, 2016)

Figure 3.4. Cycle of sustainable market dynamics based on differentiation (Sanchez & Heene, 2010)

Chapter 4:

Figure 4.1. Models of interweaving the track-, EIA- and tender procedures (van Valkenburg, Lenferink, Nijsten, & Arts, 2008)

Figure 4.2. Cultural dimensions of the Netherlands (Hofstede Centre, n.a.-b).

Figure 4.3. Track of project A12 Ede-Grijsoord (Heijmans, 2016)

Figure 4.4. The Schiphol-Amsterdam-Almere project with on the right the A6 Almere part (Rijkswaterstaat, n.a.)

Figure 4.5. New sea lock IJmuiden (RWS, n.a.-b).

Chapter 5:

Figure 5.1. A94 München – Pocking project (Autobahndirection Südbayern, 2017)

Figure 5.2. Cultural dimensions of Germany (Hofstede Centre, n.a.-b).

Figure 5.3. Project A8 Ulm-Augsburg (Autobahndirection Südbayern, 2009)

Figure 5.4. Track of the A4 Thüringen project (BMVI, n.a.-c).

Chapter 6:

Figure 6.1. Netherlands in comparison with Germany (Hofstede Centre, n.a.-a)

Chapter 7:

Figure 7.1. Public policy factor

Figure 7.2. Public context factor

Figure 7.3. Public client factor

Figure 7.4. Schematized overview of influencing factors

Figure 7.5. Complete schematic representations of influencing factors on the solution space

LIST OF TABLES

Table 2.1. Chosen case study projects

Table 5.1. Tasks belonging to the maintenance and operation phase of the contract.

LIST OF ABRIVIATIONS

BMVI = Bundesministerium für Verkehr und Digitale Infrastruktur

CBS = Centraal Bureau voor de Statistiek

D&B = Design and Build contract

DBFM(O) = Design, Build, Finance, Maintain (and Operate) contract.

EMAT = Economically Most Advantages Tender

NOA = New Design Guideline Highways (Dutch: Nieuwe Ontwerprichtlijn Autosnelwegen)

PPP = Public-Private-Partnership

ROK = Guideline Design Civil Structures (Dutch: Richtlijn Ontwerp Kunstwerken)

RWS = Rijkswaterstaat

SAA = Schiphol – Amsterdam – Almere project

SMART = Specific, Measurable, Acceptable, Realistic and Tolerant

1. INTRODUCTION

1.1. Research context

Stimulating cross-border contracting is one of the main objectives of the European Union, according to the Green-book on modernising the EU-policy regarding tendering (European Commission, 2011). They intend to make the European market more accessible for contractors to compete in other European countries. The European legislation aims to end the “national preference in the award of public sector contracts” (Cox & Furlong, 1997, p. 9) and “assist in the removal of artificial barriers to trade by encouraging greater cross-border trade in the award of public sector contracts to second and third-country suppliers” (Cox & Furlong, 1997, p. 9). This results in a reduced public expenditure by increasing the competition on the market (Cox & Furlong, 1997; European Commission, 2011). However, there are also some barriers that need to be overcome when considering cross-border contracting (Norden, 2007).

One of the first barriers that need to be overcome is the legality. Despite the overarching EU regulations, which can sometimes also be implemented in a different way, every country has its own regulations and policies. Besides the legal barriers, differences in culture, language, traditions, organisational structure and leadership styles can also complicate cross-border contracting. Removing or reducing these barriers will create opportunities (Cox & Furlong, 1997; De Sousa, 2012; Norden, 2007).

Besides cross-border contracting, the rise of *integrated contracts* and especially those involving private investors, is an additional opportunity for the construction industry to grow further and ensure continuity (Gülker, 2015; Lastdrager-van der Woude, n.a.). In the 90s a shift took place from traditional to more performance-based (integrated) contracts (Gann, Wang, & Hawkins, 1998). Part of this new type of contracting method is the integration of different tasks/project-stages into one contract, tendered to one contracting party. This development in the construction industry was necessary because of the increasing technical, economical, and legal complexity of projects (Geraedts, 2010; Gordon, 1994). Construction projects were performing very poorly worldwide; cost- and time overruns were everyday-business (Flyvbjerg, Holm, & Buhl, 2002). The integral approach had to improve overall project performance (Sanvido & Konchar, 1998) and furthermore stimulate process- and product innovations, by giving the market the freedom to contribute to the solution of a project (Kuypers & Mooiman, 2006; Nyström, Nilsson, & Lind, 2016).

The freedom for contractors or the solution space entails the degree to which the contractor can contribute to the solution of a project. This does not only apply to the physical design but also to the design of the construction processes. The contractor carries the responsibility to deliver a long-term integral solution. Moreover, it should be noted that the client determines this amount of freedom for contractors (or the solution space) within the contracts during the tender phase (Leendertse, Jos, & de Ridder, 2012; S. Lenferink, 2013; Nyström et al., 2016).

The development to an integral approach and more freedom for the contractor is not the same in every country or project; integrated contracts can be interpreted very differently across the globe (Leiringer, 2005). This is in line with the previous reviewed literature on the barriers regarding cross-border contracting. Leiringer (2005) and Nyström et al (2016) also observed, through multiple case studies, that in general the idea of more freedom for contractors to optimize processes and increase innovation is often still very limited. "Public bodies that procure large capital assets using public funds typically have detailed manuals and standards that specify, for example, the designs, materials, and components that should be used" (Leiringer, 2005, p. 304).

Currently, Dutch contractors are still primarily dependent on their home market and the economic crisis of 2008 hit the Dutch construction market harder than some other European countries (Battes, 2015; Verhagen, 2015). However, growth has been visible again since 2014 (CBS, 2016). Entering the market of other European countries could be an opportunity to further improve results (Battes, 2015). According to Verhagen (2015), Germany could be an interesting market for Dutch contractors as it is a neighbouring country in desperate need of improving and expanding their existing infrastructure network the coming years (BMVI, 2016).

The differences, or barriers as mentioned earlier, between countries can complicate cross-border contracting for contractors. When Dutch contractors would consider undertaking infrastructure projects with integrated contract forms in other European countries like Germany, more knowledge on these different approaches has to be collected in order to reduce or remove the barriers. It can already be mentioned that Germany and the Netherlands seem to show essential differences in the use of integrated contract forms, especially in the amount of freedom provided to the contractors to contribute to the solution of infrastructure projects (BMVI, 2011; Schönenberger, 2012).

The question remains what influences this decision for a certain solution space for contractors in both countries? And what are the consequences? What are areas of opportunities, what can these companies contribute to the market, and is there is learning possibility for both countries?

1.2. Problem definition

The main problem of this research entails:

With European procurements, cross-border contracting forms an opportunity for European contractors as well as the market. Europeans could potentially increase their businesses, and the market could in turn benefit from the increased competition as this could lead to higher quality. When Dutch contractors consider expanding their businesses to other European countries like Germany, they will definitely face some barriers. These barriers complicate the process of cross-border contracting and could withhold contractors from expanding or cause failure when doing so.

Currently there is too much ignorance on the barriers and what factors, related to the tender phase, could potentially influence the decision on the degree of freedom or solution space for contractors in different countries. Moreover, it is unclear what the corresponding consequences will be when this decision is made by the client.

1.3. Research objectives & -question

Within the European Union, borders fade away and consequently opportunities arise for all union members. To seize these opportunities, some boundaries have to be overcome. Gaining more knowledge on these existing boundaries could help a great deal in coping with them. Cross-border contracting could thus be an opportunity for all European Union members. To keep the research domain manageable and because Germany is currently in desperate need of improving and expanding their existing infrastructure network, this research will focus on infrastructure projects with integrated contracts within the two neighbouring countries Germany and the Netherlands.

The earlier mentioned problem statement identified the current ignorance on the existing barriers and focuses on what factors, related to the tender phase of an infrastructure project, influence the decision on the degree of freedom or solution space for contractors in different countries. It moreover probes the question of what possible corresponding consequences are when the client makes this decision.

The objectives for this research will be: (1) identifying the influencing factors, during the tender phase, on the extent to which the contractor has the ability to contribute to the solution of an infrastructure project in Germany and the Netherlands; (2) analyse possible consequences of these factors; (3) provide recommendations on how the solution space can be increased to optimize project performance. Next to identifying the size of the solution space in both countries and what influences this this research will also try to identify (4) additional existing differences/barriers. Once these factors and barriers have been identified, opportunities can be recognized for Dutch contractors that are interested in expanding their businesses to the German market.

The main research question of this graduation project will be:

“What factors, related to the design of the tender phase defined by the client, influence the decision on the degree to which contractors can contribute to the design of the realization of an infrastructure project with an integrated contract in Germany and the Netherlands?”

In order to answer the research question this thesis will firstly provide some basic knowledge on integrated contract forms, and then address the main question through several sub-questions, which are listed below.

Sub-question 1:

What do integrated contracts entail according to literature?

- a. What different forms of integrated contracts exist?

An important part of integrated contracts entails the freedom provided to contractors to contribute to process of realizing an infrastructure project, as can be seen in the introduction. It is important to find out what is already known on this subject in existing literature.

Sub-question 2:

How much freedom/solution space do contractors get to contribute to the design of the realization of an infrastructure project according to literature?

Sub-question 3:

What are the consequences of a bigger solution space for contractors according to literature?

After gathering more general knowledge, specific information on each country is needed, as well as specific information about the degree of freedom that was handled in past infrastructure projects.

Sub-question 4:

What sort of integrated contract forms are currently used in the Netherlands and Germany within infrastructure projects?

Sub-question 5:

What does the freedom for contractors look like in actual infrastructure projects in the Netherlands and Germany?

- a. What is the reasoning behind the differences between the two countries?
- b. What sorts of documents are being exchanged between the client and the contractor?

1.4. Research scope

In order to conduct this research it was important to have a clear vision on the frame in which this research takes place. As this thesis is written for the master Construction Management and Engineering with a focus on infrastructure, the research will focus on infrastructure projects as well. Infrastructure projects deal with public clients and therefore this is bounded by the European rules for tendering of these projects.

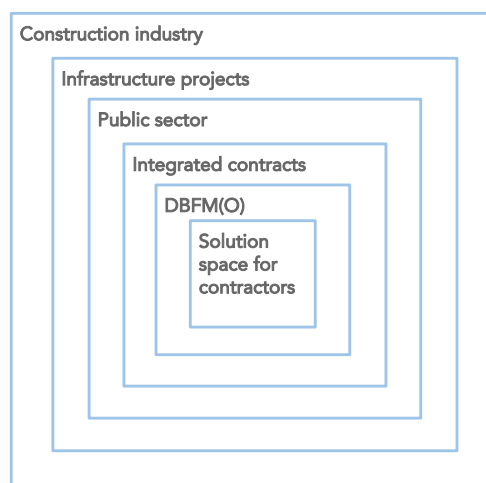


Figure 1.1. Project frame (own figure)

1.5. Relevance

Why is it relevant to identify the barriers that contractors face when they want to compete for infrastructure projects in other European countries? With European procurements, parties from other countries should have the opportunity to compete in these tender procedures (European Commission, 2011). Cross-border contracting can increase the competitiveness of the market that leads to increased revenues, added value and employment opportunities (Boneschansker & Hospers, 2013). Increased competition as well as higher transparency of the European procurements will most likely lead to a decreased price, and thus to the possibility for public parties to significantly save money (Kühler & Manunza, 2011). Especially after an economic crisis, cross-border contracting can provide the market with an extra boost. With cross-border contracting, new contacts and references that can form the basis of other future collaborations will moreover emerge (Boneschansker & Hospers, 2013).

Identifying the existing barriers will help in stimulating cross-border contracting, which will create the opportunities described above.

1.6. Thesis outline

This thesis report will start with the explanation of the research methodology in chapter 2. Chapter 3 will display the literature review where the first 3 sub-questions will be answered which can be seen in paragraph 1.3. After the literature review, the two cases will be reviewed in chapter 4 (Dutch case) and chapter 5 (German case) to get a more complete picture by also including practice. In chapter 6 both cases will be compared; the two cases aim on finding an answer for the last two sub-questions. The results of the literature review and the cases will come together in a model which describes the different factors that influence the solution space for contractors in chapter 7. In the conclusions (chapter 8), the main research question will be answered. After forming conclusions, the recommendations will be discussed in chapter 9. The thesis will end with chapter 10, the discussion part, where the shortcomings of the research will be discussed as well as opportunities for further research.

A schematized outline of the structure of this research can be viewed in chapter 2.

2. RESEARCH METHODOLOGY

To achieve the research objectives and answer the research question, a certain research strategy was applied. Figure 2.1. shows an overview of the research design for this graduation project. The research started with a general literature study to answer the first three sub-questions. The second step consisted of analysing two case studies to search for answers out of practice and country specific information to answer the last two sub-questions. After collecting the empirical data, the cases were compared and the results were discussed. After the literature review and the cases, a validation step took place to form the conclusions and recommendations. All steps will be elaborated further below (see figure 2.1 for a complete overview).

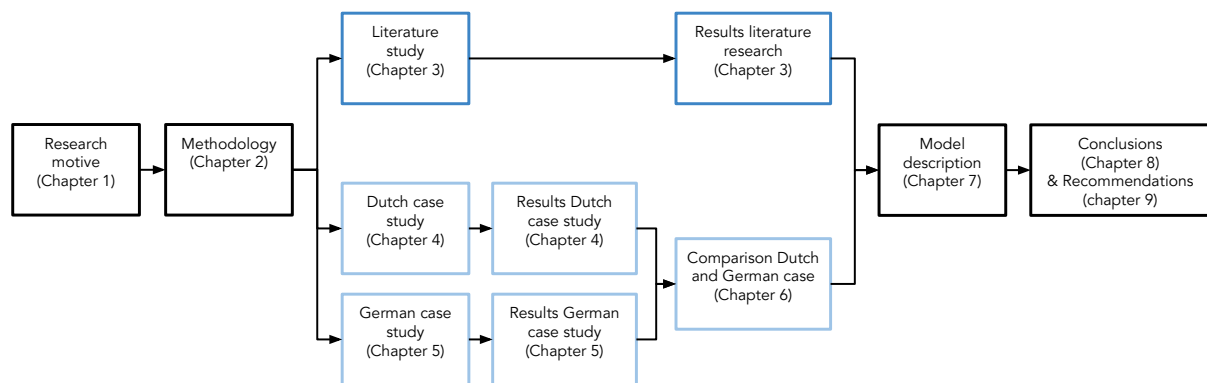


Figure 2.1. Overview of Research Design (own figure)

This research entails qualitative empirical research, which means an in-depth research is conducted where observations are made to answer the research question (Verschuren & Doorewaard, 2010). Given the timeframe for the graduation project and the type of information needed from the cases and interviews, an in-depth, qualitative review was most suitable. Going through contract documents moreover is a time-consuming activity, and another difficulty is the amount of projects suitable for the research.

Because of the qualitative nature of this research it will not be possible to draw any general conclusions but only create a small insight on the topic in Germany and the Netherlands.

2.1. Literature review

A review of literature aims to create a clear overview on what past research has showed about the area of the research topic (Saunders, Lewis, & Thornhill, 2009). This literature framework provided the basis for the next step of the research; case studies. In the literature review answers were searched for the first 3 sub-questions of this research project. Interesting literature for this research included information on integrated contracts, contractor freedom, drivers of public clients to choose certain contracts, degrees of contractor freedom, process- and product innovations within infrastructure projects, and

finally on tender procedures. The results of the literature research were later tested on the cases. This concerns “a deductive approach in which you develop a theoretical or conceptual framework, which you subsequently test using data” (Saunders et al., 2009, p. 61). Part of this research relates to an area with a lot of uncertainties. Meaning, that there is a lot of literature available on integrated contract forms, but not as much on exactly *what* influences the choice of providing a bigger solution space/more freedom for contractors. The literature thus formed the basis of this research, after which the findings were tested on empirical data. The case studies, however, also showed some new insides that could complement an existing theory or maybe even form a new one. This is called a more inductive approach (Saunders et al., 2009). The combination of both inductive and deductive approached best suits this research.

2.2. Case studies

The second step of this research consist of case studies to collect data from practice in both countries to answer the last two sub-questions, and moreover test the theories from the literature review. Germany and the Netherlands are seen as the two cases (see figure 2.2.) as the main objective of this research is to compare them. Within these two main cases, different infrastructure projects were reviewed through the analysis of contract documents as well as semi-structured interviews.

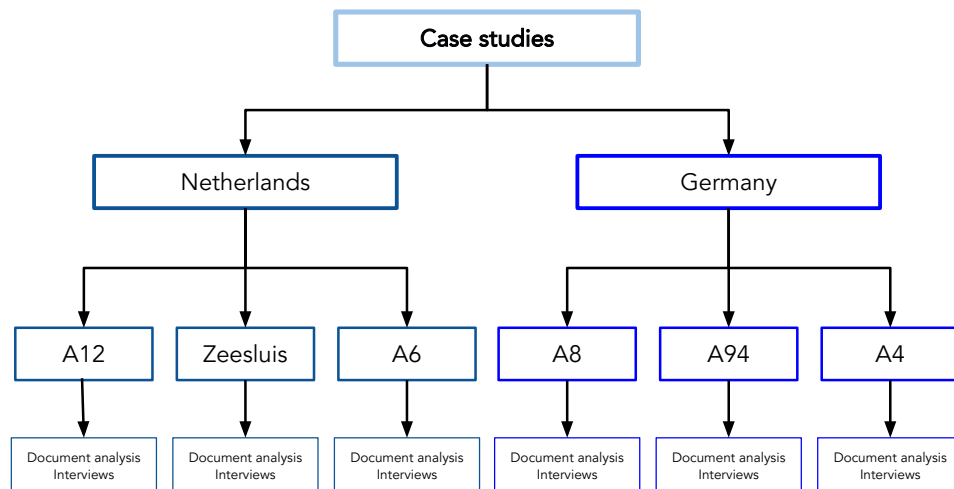


Figure 2.2. Structure case studies (own figure)

Within the different projects the amount of freedom/solutions space for the contractor was looked at:

- 1) To what extend can the contractor still contribute to the realization of the project?
- 2) How detailed are the exchanged documents?
- 3) How did the client experience this project and the solution space for the contractor?
- 4) How did the contractor experience the solution space provided by the client?
- 5) Was the right contract type used?

When selecting a project, it is important to keep the comparability of the projects in mind, for which it is essential to find a contract form that exists in both countries. When investigating the solution space for contractors, it is important to look at integrated contract forms because within the traditional contracts the degree of freedom can be neglected. The projects selected for the research have to be a reflection of typical/standard-integrated contract for infrastructure projects in that country. When projects would be an exception of the standard it would be harder to draw conclusions about the approaches within the countries.

A difficulty with finding a project is the willingness of the client or contracting party to share the contract documents of the project. As these contracts are confidential and generally not open to the public, this research (and ultimately its results) partly depends on the willingness of the involved party to provide documentation. This could cause a bias because the projects could thus not be randomly selected. The cooperating parties could have, for example, only shared the documentation successful projects to maintain their image. Table 2.1. shows the chosen projects per country.

Project	Country	Explanation
A12 Ede - Grijsoord	NL	This project concerns a road expansion with a DBFM contract.
A6 Almere -Havendreef	NL	Part of the SAA project; concerns a road expansion with a DBFM contract.
Zeesluis IJmuiden	NL	Replacement of the existing sea lock
A8 Augsburg	DE	Road expansion project with a DBFMO-contract
A94	DE	Realisation of a new highway in a DBFMO-contract
A4 Thüringen	DE	Road expansion and a part of new highway

Table 2.1. Chosen case study projects

2.2.1. Document analysis

To collect data on the amount of freedom or the solution space for contractors in both countries, the different infrastructure projects from table 2.1. were reviewed. Part of this review was going through contract documents of the different projects to see what agreements have been made between client and contractor, as well as what the division of responsibilities was. Another interesting document to review was the procurement guidance (Dutch: aanbestedingsleidraad). This document gave a lot of information on what the client finds important during the tendering of a project. Next to the contract- and procurement guidance documents, relevant governmental information and news articles regarding the different projects were taken into account.

For every project in chapter 4 and 5, the review started with some general information after which the interesting and relevant observations from the documents are described. Due to the confidentiality of a lot of these documents, most of the information cannot be published.

2.2.2. Interviews

Parallel to the study process of the documents, semi-structured interviews were conducted to collect more information on both the current situation in Germany and the Netherlands, as well as the experience of client and contractor that were involved in the integrated

infrastructure contracts. The interviews were semi-structured because of the amount of uncertainties on the subject. The interviews were a means to increase insight in what exactly influences the freedom/solution space. Semi-structured interviews fit the exploratory in-depth research (Saunders et al., 2009). Prior to the interviews, the interviewees received a short introduction about the topic. During the interviews, the following themes were discussed (at least):

- 1) Integrated contracts.
- 2) Solution space/freedom for contractors to contribute to the realization of infrastructure projects.
- 3) Stimulants from the client's side to be creative and innovative (on the process- as well as technical side).

Other topics evolved at a later stage; after reviewing the literature or during the interview sessions. The interviews were either recorded and transcribed (see Appendix B) or notes were taken. This depended on the situation and location of the interviews.

The detailed list with interviewees can be found in appendix A. The interviewees included professionals from the construction industry that were, or still are, involved with the different cases presented in chapter 4 and 5. Furthermore, the interviews were taken on either the contractor or client side.

2.3. Model description

In chapter 7 all identified factors that influence the solution space for contractors within infrastructure project will be combined into a model. The factors were found during the literature research and in the cases from both countries. The model will form the basis for answering the main research question in chapter 8, and forming the recommendations in chapter 9.

2.4. Validation

For the validation of the findings of the research, different expert meetings were planned. These experts will comment on the results of the literature review as well as the comparison of the Dutch and German case.

For the validation step after the literatures review, two experts that are currently working in the Netherlands (a contractor and a client) critically reviewed the findings of the literature study. They compared the findings to what they have personally experienced. Their comments can be viewed at the end of chapter 3. For the case studies an expert with an extensive experience with working in both countries on infrastructure projects was approached. He could critically review the results of the cases and compare them with his own observations from past experiences. The results of this validation can be viewed at the end of chapter 6.

3. LITERATURE REVIEW

This chapter will provide a theoretical background on integrated contracts and the solution space for contractors to contribute to the realization of an infrastructure project. The literature will help in trying to answer the first three sub-questions of this research:

- (1) What do integrated contracts entail according to literature?
 - a. What different forms of integrated contracts exist?
- (2) How much freedom/solution space do contractors get to contribute to the design of the realization of an infrastructure project according to literature?
- (3) What are the consequences of a bigger solution space for contractors according to literature?

3.1. The integral approach

An infrastructure project is a complex system that asks for an integral and multidisciplinary approach (RWS, n.a.-d). As mentioned in the introduction, integrated contracts integrate different project tasks/phases into one contract after which they are tendered to one contracting party or a consortium (PIANOo, n.a.-a). This integral approach is part of what is called systems engineering. "Systems engineering is an interdisciplinary approach with associated means that focuses on the realisation of a successful system" (INCOSE, n.a.). Traditionally the different project phases are tendered separately to different contractors. In that situation the client is responsible for the design and the contractor for the execution (Gordon, 1994; Grit, 2006; Nyström et al., 2016). With the new integral approach, the responsibility of multiple tasks can be placed at the contracting party. The client only sets functional requirements; the level of detail of these requirements is to be agreed upon and also translates into the allocation of risk (Grit, 2006; PIANOo, n.a.-a). A plan with a high level of detail and active client involvement also translates into more responsibilities for the client (Chao-Duivis, 2013a). With integrated contracts the market receives the freedom to contribute to the solution of a project and therefore also has to bear the responsibility. This will create an incentive for contractors to maximize performance (Sanvido & Konchar, 1998).

Thinking of a project as a system that needs to be treated in an integral and multidisciplinary way, instead as in separate parts, should result in a high quality service delivered by the contractor. Because an integrated contract asks more than just a product (the long-term contract includes several project stages) it can be seen as an integral long-term service contract (Grimsey & Lewis, 2004; PIANOo, n.a.-c). Especially complex infrastructure projects are suitable for the integral approach (de Ridder, 2009; Miller, 1997); the risks within these projects are very high in the alignment of the different project phases. With an integral approach the responsibility of delivering an integral solution for the client

lies with the contractor, he will manage the interfaces (Blanchard, 2004; INCOSE, n.a.; PPSsupport, 2014).

3.1.1. Contract types

There are different types of integrated contracts, the difference lies in the amount of project phases integrated into one contract, these different phases can be: design, build, finance, maintenance and operation (Geraedts, 2010; Nilsson, 2012; PIANOo, n.a.-c). Figure 3.1. shows the different possible ways of task integration in one contract and the responsible party. This research will focus on the most integrated contract form DBFM(O) as mentioned in the methodology chapter.

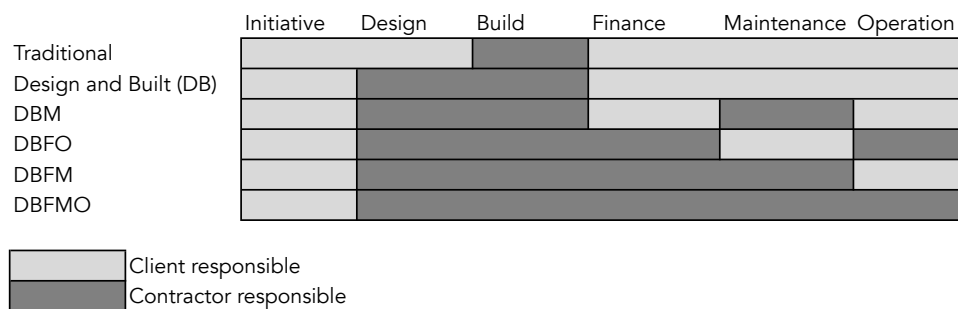


Figure 3.1. Different types of integrated contracts and responsibilities (own figure)

3.1.2. DBFM(O) contracts

Projects with a DBFM(O) contract involve private financiers into their projects as well as a maintenance period and sometimes operation. The contract is applied if the procuring body wishes for an extra incentive from the financial sector (PIANOo, n.a.). The inclusion of private financiers makes a DBFM(O) contract a form of a long-term Public-Private Partnership. The long duration of the contract is also needed for the consortium to earn its investment back (Est et al., 2013). Moreover, the inclusion of maintenance should give the contractor an incentive to optimize the lifecycle of a project and deliver a high quality solution (S. Lenferink, Tillema, & Arts, 2012). When the contractor would deliver bad quality he would also harm his own business because he also has the responsibility for the phases after the execution of the project (PIANOo, n.a.-c). Again this is also part of the systems engineering way of thinking. The client only formulates functional specifications and the contractor looks at the project as a whole multidisciplinary system. It is in both the clients and contractors interest that the project becomes a success.

The integration of the whole project-process can be seen as an opportunity to optimize and therefore reduce the total costs of a project compared to when the project would be procured in a traditional way (Est et al., 2013; Roohé, 2007). Contractors receive payments that are spread over the whole contractual period after completion of the project. "The procuring authority pays the private party for an agreed level of service" (Est et al., 2013, p. 3). This provides the contractors with an incentive to deliver the project on time or even earlier (PIANOo, n.a. ; Roohé, 2007).

However, there are also some arguments against the use of DBFM(O) contracts. Infrastructure projects are very complex projects with a lot of uncertainties. A DBFM(O)

contract is seen as a contract form where the scope has to stay rather fixed. Changes will have too much influence moneywise and for the tight time schedule. The involvement of the private financiers puts a relatively high pressure on the contracting party. This will benefit the availability date of the project but changes or optimizations could be too expensive or not fit the time schedule (Franken, 2010; PIANOo, n.a. ; RWS, 2015). Moreover, it is also stated that the transaction costs are rather high. Preparing a bid for a DBFM(O) contract costs a lot of time and money for the contractors and only one market party will win in the end (Est et al., 2013; RWS, 2015).

3.2. Solution space for the contractor

The solution space for the contractor can be described as the freedom that the client provides to the contractor to contribute to the *design of the realization* of an infrastructure project. This freedom can be throughout all different project phases that are integrated into the contract. The degree of freedom can vary per project and also per country for several reasons (Leiringer, 2005). But how much freedom do contractors get and how is this expressed?

3.2.1. Project specifications

The research of Nyström et al. (2016) linked the amount of freedom to the level of detail of the requirements of the contract. The requirements given in a contract are referred to as the specifications. Specifications defined in The Free Dictionary (n.a.) represent "a detailed, exact statement of particulars" and in the case of infrastructure projects "a description of the procurement needs" (PIANOo, n.a.-e).

The specifications have to be a good representation of what the client wants/expects. Contractors will interpret the specifications and form an offer. The best offer than has to be accepted. When the specifications are not formulated correctly, one could get something very different than expected (PIANOo, n.a.-e). Specifications are also bounded by some rules, e.g. they have to be transparent, non-discriminating, not in conflict with the principle of equality and they have to be proportional. Otherwise there would be no fair competition possible (European Union, n.a.).

With traditional contracting, the specifications are detailed and technical. The work, product or service is described precisely as well as *how* this has to be realized (PIANOo, n.a.-e). Integrated contracts nevertheless require functional specifications. Functional specifications describe the requested *output* of the project rather than how it has to be realized (ter Huerne & de Ridder, 2007).

According to ter Huerne and de Ridder (2007) in traditional contracts, the contractor has to redo a part of the design work presented by the client to check and actually being able to build the requested. This is double work and inefficient. Functional specifications were initiated to prevent this inefficiency and stimulate innovation (Rijksoverheid, 2013; ter Huerne, Veenvliet, & Tolman, 2006). This is in line with the systems-engineering movement, which strives for a complete integration of the process to prevent unnecessary redesign cycles and therefore extra costs (ter Huerne et al., 2006).

The Dutch Government (2013) created an assessment model to display the need for functional specifications. The model can be summarized in the following way: the bigger the

need for internal and/or external innovation, the bigger the need for functional specifications instead of detailed and technical. By specifying the demand in a functional and therefore in a more open way the competition between contracting parties will be increased. Parties can distinguish themselves by presenting higher quality and/or innovative ideas. This will benefit the project (PIANOo, n.a.-e; Rijksoverheid, 2013; ter Huerne et al., 2006).

In reality it is almost never achieved to specify completely functional. "When Rijkswaterstaat specifies in a functional way, it still becomes a thick book with thousands of requirements" (ter Huerne & de Ridder, 2007, p. 13). The reason for this according to ter Huerne and de Ridder (2007) is the amount of regulations and procedures Rijkswaterstaat must adhere. Functional specifications would work better if the clients would make a separate list with requirements and one with their wishes. Contractors then could distinct themselves through these wishes. This would lead to very different offers from the contractors and increase quality and decrease costs. Innovation then will be rewarded (ter Huerne & de Ridder, 2007; ter Huerne et al., 2006).

Choosing a certain degree of freedom for a project has consequences for the division of responsibilities between client and contractor, but what are these consequences exactly?

3.2.2. Consequences of choosing a certain degree of freedom

The main drivers for introducing integrated contract forms and especially DBFM(O), with a private finance component, were to create more market involvement and thereby stimulate project efficiency by better managing project interfaces as well as stimulating creative ideas (PPSsupport, 2014; RWS, n.a.-c). In literature however it is stated that these sorts of contracts are mainly initiated to shift the risks to the market (Leiringer, 2005; S. Lenferink et al., 2012; Nilsson, 2012; Nyström et al., 2016). Shifting all the risks to one party based on a certain contracting model like DFBM(O) is incorrect according to de Ridder (2009). Regarding the division of risk, one should look at which party can best bear the risks: "some risks maybe can be less expensively borne by the owner" (Gordon, 1994, p. 203). The ability to handle risks has everything to do with control. As a shift of risks is linked to the amount of freedom that is given to the market and gaining or losing control (Chao-Duivis, 2013a). Determining the right amount of freedom is part of a balance between the desire for an effective/efficient or innovative solution and staying in control (figure 3.2.).

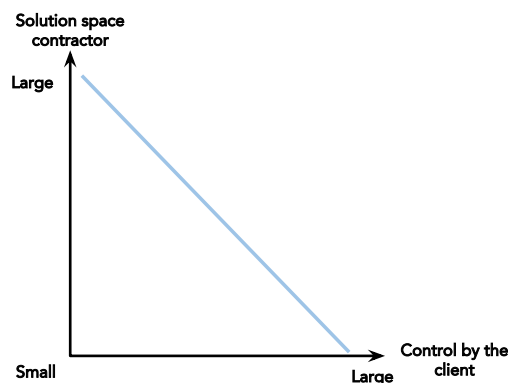


Figure 3.2. Solution space vs. control (own figure)

DBFM(O) contracts have a very long duration (e.g. 30 years). Placing the responsibilities at the right party is key, especially in these long-term contracts (Ward, Chapman, & Curtis, 1991). The long duration because of the maintenance and/or operation involved brings a lot of uncertainties along because no one is sure what will happen in those years (Brommet et al., 2016; Demirel, de Ridder, & Hertogh, 2013). The risks during the different phases of a project differ a lot (Brommet et al., 2016), one can imagine that during design and construction there are very different issues that can evolve than during the maintenance phase. This contributes to the difficulty of putting all risks at the contracting party by providing a lot of freedom. Brommet et al. (2016) advises to increase the control of the public client in the maintenance phase again because of the high amount and uncertainties and to create the possibility to adapt to developments during the contract term.

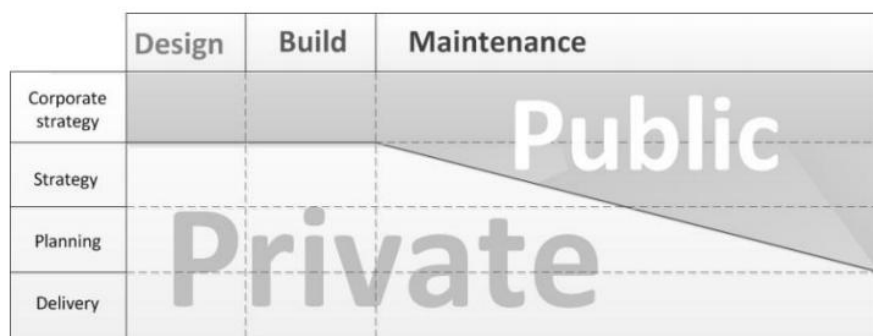


Figure 3.3. Allocation of responsibility in a DBMF contract by a balanced risk allocation (Brommet et al., 2016)

This goes against the movements of providing as much freedom as possible to stimulate innovations by handing it all over to the market. An interesting option from the article of Brommet et al. (2016) is to postpone some of the decisions on the allocation of risk or responsibilities. This corresponds with the opinion of Demirel et al. (2013) which state that early fixation stands in the way of innovation. According to S. Lenferink et al. (2012, p. 624) freedom is very important to stimulate innovative ideas but hard to realise because of the extensive amount of regulations during the procurement phase: “detailed inflexible procurement, which limits freedom in adjusting scope.”

3.3. Tender/procurement procedures

Tender procedures were introduced to create a fair, non-discriminating and transparent competition for contractors (European Commission, 2014). The national government, provinces, municipalities, special sector companies and other public bodies like schools are obliged to tender out their projects (Rijksoverheid, n.a.). When projects exceed a certain monetary threshold for works, supply or services they have to be tendered under the European tender regulations (Chao-Duivis, 2013b; Rijksoverheid, n.a.).

3.3.1. Tender procedures

As infrastructure projects are considered a public matter with public clients, the projects have to be put out for tender, in most cases under the European tender regulations. Different tender procedures can be chosen when tendering a project. In principle one can choose between two standard procedures; the open or the restricted procedure (PIANOo, n.a.-b). With the open procedure everyone can subscribe to the tender, this creates a very

transparent and non-discriminating procedure with a lot of competition. However this procedure often takes a lot of time and therefore has high procedure costs (PIANOo, n.a.-b). The restricted procedure deviates from the open procedure by including pre-selection. Again everyone can subscribe to the tender "but a limited number of tenderers is selected to the actual tender" (Chao-Duivis, 2013b, p. 140). This lowers the administrative burden and costs (PIANOo, n.a.-b). For specific cases there are also other procedures besides the open- and restricted procedure. Examples of these procedures are: the competitive dialog, negotiation procedure, design contest, concession procedure, innovation partnerships and a framework agreement (Chao-Duivis, 2013b; Europa decentraal, n.a.).

In general tender procedures all start with the tender documents being published followed by open information rounds. After this, depending on the chosen procedure, all parties (or a group of pre-selected ones) can submit their bids. Then the public client reviews the bids and selects a winner based on predetermined award criteria (Chao-Duivis, 2013b; Europa decentraal, n.a.).

3.3.2. Award criteria

When the client reviews the different bids received on a tender, he has to compare these on predetermined award criteria. Pursuant to Article 2114 paragraph 2 Procurement Act 2012, a contracting authority awards a contract on the basis of the award criterion "the most economically advantageous tender" (Dutch: Beste Prijs-Kwaliteitverhouding, voorheen EMVI). In special cases the tenderer can choose for the lowest price criterion, however, this choice has to be motivated. Generally exceptions are made in three situations: (1) when the requested is standardized to a large extent available in the market, and; (2) differences in quality are not expected and; (3) the content and scope of the contract are easy to define (PIANOo, n.a.-d). Examples of award criteria belonging to the Most Economically Advantageous Tender (=MEAT/EMAT) are price, quality, delivery conditions, sustainability, functionality, social benefits, nuisance, risk management, alignment with existing systems, usability, etc. (Jansen et al., 2007).

The award criteria often are linked to the functional specifications that are drawn up prior to the tender by the client (RWS, 2005). The difficulty with award criteria other than lowest price is the ability to compare them. The most objective way to assess qualitative award criteria is to install a jury (Jansen et al., 2007).

Awarding bids with the best value-for-money principle stimulates higher quality and innovation within projects but also can add complexity. Procuring bodies often find it hard to find the right value assessment mechanism (Bergman & Lundberg, 2011). They tend to fall back on awarding mainly on price because it is easier to compare and more transparent (Tadelis & Bajari, 2006). A difficult part of awarding is the weighing of the different award criteria (Jansen et al., 2007). According to Plu and Telgen (2007, p. 30) "procuring bodies sometimes are insufficiently aware of the role of the weights in the assessment". This often results in very surprising outcomes of the tenders. Defining the award criteria and displaying the weighing is an important part of getting the requested work, product or service. From the weighing of the different criteria the contractor can see what the client finds most important, transparency is key (Plu & Telgen, 2007).

3.3.3. Stimulating competitiveness

In the infrastructure sector, contractors are very depended on the few clients existing. However, as projects are getting more and more complex, the number of contractors

capable of executing the projects is also small. This creates a mutual dependence. The public parties use this dependence of contractors to create added value to their projects by changing the procurement procedures and create a bigger solution space (Leendertse, Arts, & de Ridder, 2016). For contracting firms this creates a difficult situation, they have to invest in innovations and stand out but this asks for very high investments accompanied with a lot of risks. In addition, an infrastructure project is often unique en thereby not suitable for repetition. This makes the investment extra costly (Leendertse et al., 2016; S. Lenferink, 2013).

As contractors have to deviate themselves from the competition, they have to add value and be unique. Having creative skills in-house therefore is a very important aspect for the contractors (Treacy & Wiersema, 2007). Figure 3.4. shows a cycle of market dynamics based on differentiation. It is important that the added value can be appreciated proportional by the client in a monetary way, this is needed to create an investment fund (Sanchez & Heene, 2010).

According to the research conducted by Leendertse et al. (2016) the procuring bodies say they want to stimulate high quality and innovations. However in fact it is still the case that there is not enough room for the contractors to develop the skills to differentiate. This is due to remaining importance of cost in the evaluation of offers: "The market policies of public transport infrastructure administrators (still) favour price competition and risk opportunism, thereby inhibiting a healthy development of the industry" (Leendertse et al., 2016, p. 2942). Because of that, contractors have no reason to invest more into real added value; the risks are simply too high.

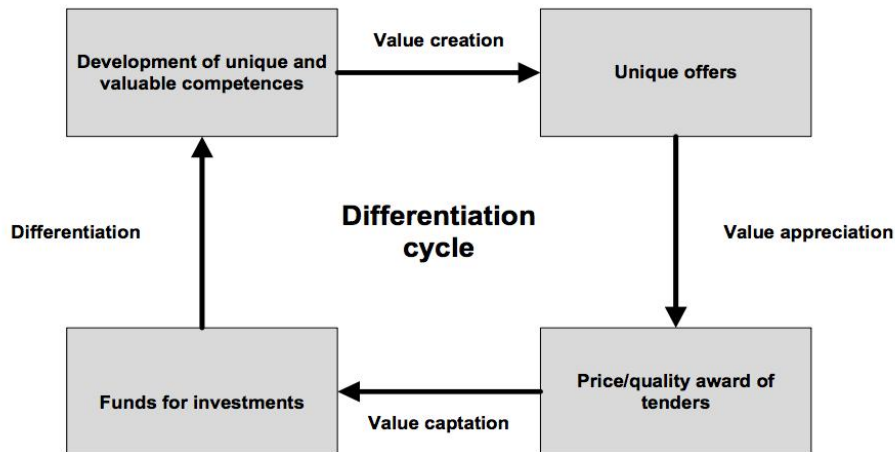


Figure 3.4. Cycle of sustainable market dynamics based on differentiation (Sanchez & Heene, 2010)

To stimulate creativity or innovation Leendertse et al. (2016, p. 2943) recommends very early contractor involvement and stimulating long-term added value by e.g. "spreading innovation over a number of projects through (for example) programs or innovation development contracts".

3.4. Policy and legal frameworks for infrastructure projects

Realising an infrastructure project is a complex and long-term process bounded by laws and policy frameworks. These regulations can differ per country. Because this research focuses on two different countries, the Netherlands and Germany, it is necessary to find out the procedures for realising infrastructure projects in those two countries. The distinctions will be discussed country specific in the case studies.

3.5. Results literature review

In order to answer the main research question of this master thesis, first the sub-questions need to be answered. After reviewing literature the first three sub-questions can be answered.

Sub-question 1:

What do integrated contracts entail according to literature?

Integrated contract forms were introduced to improve overall project performance and increase the market involvement and thereby their responsibility and accountability. Different project tasks/phases are integrated into one contract and tendered to one contracting party or a consortium. Thinking of a project as a system that needs to be treated in an integral and multidisciplinary way, instead as in separate parts, should result in a high-quality long-term service delivered by the contractor. Contractors become responsible for the project performance. By integrating the different project phases into one contract, interfaces can also be managed more efficient and costs can be saved. Besides the increased efficiency, integrated contracts can also stimulate creative/innovative designs because contractors have to deviate themselves from their competition.

a. What different forms of integrated contracts exist?

There are different types of integrated contracts, the difference lies in the amount of project phases integrated into one contract, these different phases can be: design, build, finance, maintenance and operation. The inclusion of maintenance and/or operation should give the contractor an incentive to optimize the lifecycle of a project and deliver a high quality solution

Sub-question 2:

How much freedom/solution space do contractors get to contribute to the realization of an infrastructure project according to literature?

Integrated contracts create room for contractors to contribute to the design of the realization of a project by using their experience and expertise. The client specifies the project in a functional way, which describes the requested output of the project rather than how it has to be realized. By specifying the demand in a functional and therefore in a more open way the competition between contracting parties will be increased. Parties can distinguish themselves by presenting higher quality and/or innovative ideas; this will benefit

the project. Determining the right amount of freedom is part of a balance between the desire for an effective/efficient or innovative solution and staying in control

In line with the European regulations regarding tendering, contracting authorities award a contract on the basis of the award criterion "the most economically advantageous tender" (EMAT) or "best value-for-money" principle. Awarding bids with this principle stimulates higher quality and innovation within projects but also can add complexity. Procuring bodies often find it hard to find the right value assessment mechanism. They tend to fall back on awarding mainly on price because it is easier to compare and more transparent. This emphasis on price limits the room for the contractors to develop the skills to differentiate themselves from others. Because of that, contractors have no reason to invest more into real added value; the risks are simply too high. If the public clients would appreciate the development of added value of contracting firms more by awarding on other aspects than price, the contractors would see the benefits of investing long-term.

Sub-question 3:

What are the consequences of a higher degree of freedom for contractors according to literature?

With the new integral approach, the responsibility of multiple tasks can be placed at the contracting party. The client only sets functional requirements; the level of detail of these requirements is to be agreed upon and also translates into the allocation of risk. A plan with a high level of detail and active client involvement also translates into more responsibilities for the client. When the responsibilities are placed at the contractor side and a bigger solution space is offered, contracting parties have to be able to bear these risks. An infrastructure project is often unique and thereby not suitable for repetition. This makes the investment extra costly. As contractors have to deviate themselves from the competition, they have to add value and be unique. It is important that the added value can be appreciated proportional by the client in a monetary way; this is needed to create an investment fund. Another way of stimulation could be to spread innovations over a number of projects so the contractors have enough time to earn their investments back.

3.6. Influencing factors derived from literature

Thinking of the main research question on the influencing factors on the solution space for contracts, the literature review already displayed some of these factors;

- (1) Contract form: the amount of project phases integrated into a contract is linked to the size of the solution space. When a contract only exists of design and build, the influence a contractor can have on a project is obviously smaller than when a contract involves all project phases (DBFMO). The more phases involved, the more space the contractor will have to contribute to the design, construction process, actual execution, maintenance or operation.
- (2) Level of detail of project specifications; if the project demands are specified in a technical and detailed way, not much room is left for contractors to use their expertise to contribute to the project. The client must provide enough space for contractors by specifying in an open and functional way.

- (3) Tender procedure: the chosen tender procedure by the client can also influence the solution space for contractors. Some procedures are more open and leave more room for contractors to provide input than others.
- (4) Award criteria: the award criteria determine for a great deal in what way the contractors will use the solution space they receive. From the weighing of the different criteria the contractor can see what the client finds most important and can decide what is worth investing in.

3.7. Validation

During an expert meeting the literature review was discussed in detail. The experts shared their opinion and expertise from practise on the gathered information. The elaborated versions of the meetings can be viewed in appendix D. The first expert meeting was with a senior consultant who has a lot of experience in working at the client side and helping with selecting bids during tender phases of infrastructure projects. The second meeting was with a lawyer specialized in procurement law. The experts reflected on the four factors that were found during the literature research that influence the solution space for contractors.

3.6.1. Contract form

The first expert confirmed to seeing the actual project performance increase since integrated contracts were introduced. During the revision of the bids a lot of different offers can be observed caused by the solution space given to the contractors, provided that this is encouraged enough by the award criteria. One of the causes of the increased performance is the different role division. When engineering firms' work on the side of the client they have to generate a rather universal design because all market parties have to be able to build this design. When engineering firms' work on the market side they can design a plan specifically to the possibilities of that market party and also more cost efficiently. Market parties also seem to stimulate engineering agencies and are better at cost efficiency.

Besides the general impression on integrated contracts, the experts were also consulted on the differences between the different forms of integrated contracts. Does a DBFM(O), the most integrated form of all, provide the biggest solution space? According to the two experts this is not necessarily the case. The F-component can also be a constraint when it comes down to for example innovations. The private financiers show a risk-averse attitude and contractors will only use proven technology. On the other hand, a DBFM(O) does provide the space for contractors to create *smart solutions with existing technology*. And the involvement of the maintenance component forms an incentive for contractors to think long-term, as they also carry the responsibility. With a D&B contract for example, public clients would have a greater tendency to remain in control, as the contractor is not responsible for the period afterwards. To ensure a certain quality level, clients will try to fix the project more on beforehand which will limit the solution space for the contractors according to the legal expert.

3.6.2. Level of detail of specifications

The level of detail of specifications does relate to the solution space of contractors. However, within the functional specifications there are a lot of references to norms, guidelines and other regulations that will limit the solution space for contractors according

to the experts. Therefore the fact that projects are specified in a functional way will not by definition guarantee a bigger solution space for contractors.

3.6.3. Tender procedure

According to the legal expert the European procurement legislation nowadays provides more freedom for countries to make it easier to use tender procedures like the competitive dialog and the negotiation procedure where information and knowledge is shared between client and contractor. The contact with the market increased because of the European procurement rules. This also has influence on the solution space for contractors as they have a greater influence when they get involved earlier on in the process.

As European procurement legislation aims to increase cross-border contracting, it is interesting to know if this is already visible in practice. According to the legal expert with very large and complex infrastructure projects one can observe that foreign countries often compete as part of a consortium together with local contractors. There are still a lot of barriers like for example the language of the tender and local regulations, which make it difficult for foreign countries to actually compete in another European country.

3.6.4. Award criteria

Literature states the still existing emphasis on price during the awarding. According to the expert this is generally not true within the Dutch infrastructure projects. However clients have to be experienced in tendering integrated contract forms and quality aspects must be sufficiently distinctive. The minimizing of nuisance for the users and environment of the infrastructure projects are frequently used quality aspect as well as the design being "fit for construction". It is very important that the client values these plans correctly but so far the expert observed the positive impact on contractors to innovate.

4. DUTCH CASE STUDY

This chapter displays the first case study for this research; the Netherlands. The gathered information will help in answering the last two sub-questions of this research:

- (4) What sort of integrated contract forms are being used in the Netherlands and Germany within infrastructure projects?
- (5) How does the freedom for contractors look like in actual infrastructure projects in the Netherlands and Germany?
 - a. What sorts of documents are being exchanged between the client and the contractor?
 - b. What is the reasoning behind the differences between the two countries?

4.1. General information

In the Netherlands the Ministry of Infrastructure and Environment takes the position of policy maker regarding the following five subjects; water, climate, accessibility, waste to raw material and environmental law. Rijkswaterstaat executes the policy that has been devised by the directorates. With most large infrastructure projects, Rijkswaterstaat will be the public client who will put a project on the market for tendering (Ministry of Infrastructure and Environment, n.a.).

4.1.1. The Dutch infrastructure procedure

The Netherlands has a multiannual program for infrastructure and transport (Dutch: Meerjarenprogramma Infrastructuur, Ruimte en Transport/MIRT) (RWS, 2016b). This programme, drawn up by the Ministry of Infrastructure and Environment together with the region, displays an overview of the current or planned infrastructure projects. The MIRT rules are divided into three main phases: (1) orientation, (2) plan development and (3) realisation (RWS, 2016b). The second part, the plan development, involves the track decision procedure. There are two procedures for defining a track decision (Dutch Government, 2017; RWS, n.a.): (1) an elaborate procedure for the construction of new main roads, or a modification of an existing road with more than 2 lanes or (2) a regular procedure for adjustments of existing main roads. The procedure begins with a start decision and an exploratory phase where a current or future problem is analysed and a solution is formed. For the elaborate procedure also an environmental impact report (Dutch: m.e.r.) and a spatial development plan (Dutch: structuurvisie) are drawn up. After the exploratory phase, all the gathered information is reviewed and a preferred decision is formed. This decision then is elaborated into a draft track decision (Dutch: OTB) where stakeholder have the opportunity to react for six weeks. After reviewing and processing the reactions, the minister of Infrastructure and environment forms the definitive track decision (Dutch Government, 2017; RWS, n.a.).

A few years ago a new procedure for infrastructure projects was introduced in the Netherlands. It is called the interweaving of the track decision, the environmental impact assessment (EIA) and the tender procedures (Dutch: Vervlechting tracé/m.e.r.- en aanbestedingsprocedure). The interweaving of these procedures is mainly introduced to achieve time gains, higher project control and early contractor involvement to stimulate innovation and efficiency (S. Lenferink, Arts, Tillema, van Valkenburg, & Nijsten, 2012). Figure 2.5 below shows different models possible. The differences between the models lies in the stage where the contractor is involved into the process. Model 4 displays the traditional way where the contractor is involved after the track- and EIA decision is formed (van Valkenburg et al., 2008).

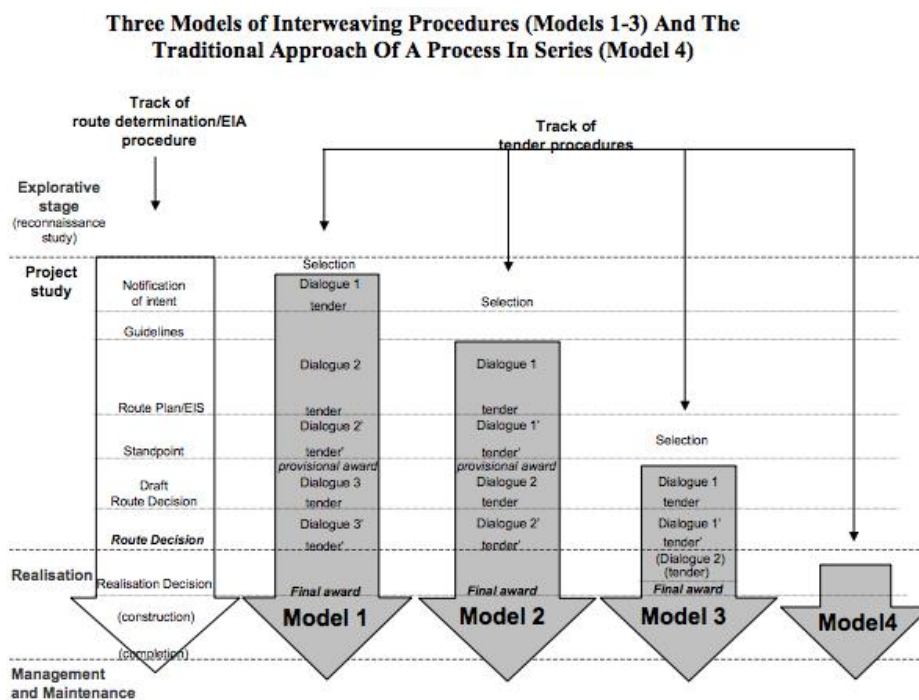


Figure 4.1: Models of interweaving the track-, EIA- and tender procedures (van Valkenburg et al., 2008)

The time of contractor involvement is an important influencing factor on the freedom the contractor gets to contribute to the realization of a project. When a contractor is involved early in the process he will have more influence on the design of the project. This will result in more room for creative and innovative ideas (S. Lenferink et al., 2012; Wondimu et al., 2016).

4.1.2. The integral procurement decision of Rijkswaterstaat

In the year 2005 Rijkswaterstaat implemented the policy "market, unless". This policy entails a decrease in staff and a higher amount of outsourcing (shift to the market) (RWS, 2008). This policy was implemented to turn the tide and improve the performance of infrastructure projects as well as improve the reputation of Rijkswaterstaat as public client. The construction fraud affaire, which came to light around the year 2002, caused a lot of distrust between the government and the private companies. Contractors were found guilty of cartel formation to increase their positions against the public clients (Metze, 2012). The "market, unless" policy meant the change to the use of integrated contract forms.

For the integral procurement decision per project Rijkswaterstaat uses an integral procurement decision framework. The basic input for this approach concerns the project context where project -goals, -ambitions, -scope, -market, -environment, -technique, -boundary conditions, -opportunities and -risks are taken in consideration (RWS, 2017). After considering these aspects, they have to be sharpened and specified in a SMART way (Specific, Measurable, Acceptable, Realistic and Tolerant) (RWS, 2005). Subsequently the market approach, procurement procedure, contract type and EMAT-criteria have to be chosen.

4.1.3. Dutch culture

As culture could also have great influence on the way Dutch clients and contractors proceed with infrastructure projects, this element cannot be left out of this research. Geert Hofstede, a known researcher in the field of cultural differences, works with 6 dimensions to compare cultural preferences. These dimensions entail power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence (Hofstede Centre, n.a.-b). The scores for the Netherlands can be viewed in figure 4.1. below.

The Netherlands scores low on power distance and masculinity. This entails a society where equal rights are important, informal work relations, not very hierarchical, direct communication, decision-making through involvement, managers strive for consensus and conflicts are resolved by compromise and negotiation.

The highest score for individualism shows the high preference for individuals taking care of themselves close family only. "The employer/employee relationship is a contract based on mutual advantage, hiring and promotion decisions are supposed to be based on merit only, management is the management of individuals (Hofstede Centre, n.a.-b)".

The relative high scores on long-term orientation and indulgence mean respectively the ability to easily adapt to changes, the willingness to invest in the future, a positive attitude and optimistic (Hofstede Centre, n.a.-b).

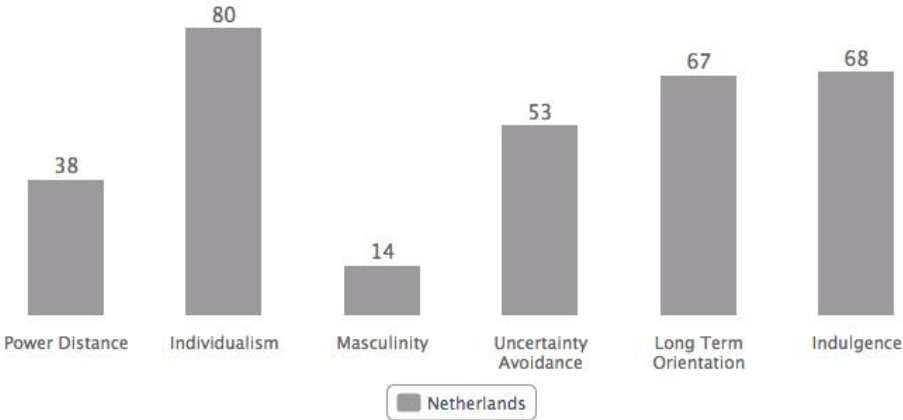


Figure 4.2. Cultural dimensions of the Netherlands (Hofstede Centre, n.a.-b).

4.2. Project A12 Ede-Grijsoord

This project concerns a road expansion of the A12 highway between Ede and Grijsoord to improve the traffic flow and the accessibility of the area. The track crosses the nature area De Veluwe; contributing to the ecological value of the area is a focal point in the project. The other two focal points of the project are minimizing nuisance for road users and the train traffic (RWS, n.a.-a).

The project started in the beginning of 2015 and the construction phase is now completed. The contract runs until the end of summer 2032. The project has a value of 80 million Euros and was awarded to Heymans as a DBFM contract. The A12 is one of the most important connections between the east and west of the Netherlands and the payment mechanism is therefore on the basis of the availability model. This means that the contractor gets payments linked to the availability of the road. An example of one of the availability demands is that during the day at least 2 lanes of the highway have to be open to the users to prevent serious traffic congestion (Heijmans, 2014).



Figure 4.3. Track of project A12 Ede-Grijsoord (Heijmans, 2016)

4.2.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

4.2.1. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

During the interviews different subjects were addressed which can be categorized in 3 main subjects: the solution space for the contractor, the chosen contract form and award criteria. When considering the solution space for the contractor, all interviewees stated that in road projects (line infra) the freedom for the contractor comes down to the execution of the project. With projects concerning civil structures (object-projects) there will be more actual physical space for contractors to vary in their designs. There is not much to decide on the design any more and the track decision already fixes all boundaries. Also the agreements with the environment prior to the procurement cause a high level of fixation for these kinds of projects.

The degree of variety of the bids that were handed in for the A12 project showed essential differences in the phasing and project execution. On the question if in the opinion of the interviewees there was enough room for left for innovative ideas both the client and contractor side confirmed that there is room but mostly for optimisations and innovations regarding proven technology. Both sides also emphasized the importance of clear agreements/projects requirements. Otherwise both sides could face unnecessary risks.

The contract type chosen for this project was a DBFM. The involvement of the private financiers/banks influences the solution space for contractors according to both sides. The financiers show a risk adverse attitude. This together with the maintenance period of 25 years make it preferable not to innovate as much. Only proven technologies will be used and the scope is rather fixed. Contractors' want to deliver at the agreed availability date at all cost to receive their availability bonus. This causes a very high pressure on the project. This can come at the expense of quality and safety according to the interviewees. There is no room for buffers and especially with complex infrastructure projects this is not an ideal situation.

The EMAT-criteria at the A12 project concerned the minimalizing of nuisance for the road-, rail users and the environment because the project crosses a nature reserve; these were also the main project goals. This last environmental aspect was rather new in the Netherlands and therefore this was the point in the project where creativity of the contractors was requested. Innovative thinking was needed to minimize all forms of nuisance. When EMAT-criteria are valued high enough to be attractive for the contractor to invest in they really can make a difference according to the interviewee on the client side. If the EMAT-criteria are valued to low, it could happen that they will be ignored and that the parties focus on delivering at the lowest price. But also when the EMAT is valued high enough it always in the end comes down to lowest price.

4.3. Project A6 Almere Havendreef – Almere Buiten-Oost

The project A6 Almere is part of a bigger project Schiphol-Amsterdam-Almere (SAA). These projects were initiated to increase the capacity of the road network around the Dutch capital city Amsterdam. Because of the expected growth of traffic between the region of Amsterdam and the rest of the Netherlands, it is necessary to expand the roads to improve the accessibility and flow of traffic. The A6 Almere project concerns the road expansion of the A6 between Almere Havendreef and Almere Buiten-Oost. The construction of the project will start in 2017 and will be ready in 2020 (RWS, n.a.-e).

The project was awarded as a DBFM contract and the maintenance part will last for 20 years after completion of the work. One of the focal points of this project is striving for energy neutrality of the road by generating as much energy as is needed for the operation of the road and the road systems. Another important point of the project is to improve the quality of life in the area around Amsterdam. This is accomplished by increasing the accessibility and the traffic flow but also by placing more and higher noise walls and by embedding the road more into his environment (RWS, 2016a).



Figure 4.4. The Schiphol-Amsterdam-Almere project with on the right the A6 Almere part (Rijkswaterstaat, n.a.)

The DBFM contract was awarded to the Parkway6 consortium on the 11th of May 2016 for 300 million Euros also on the basis of the availability model as with the A12 Ede - Grijsoord project (Dura Vermeer, 2016). The consortium consists of construction companies Dura Vermeer Groep NV and Besix Group SA for the design, construction and maintenance part. The financing is taken care of by RebelValley BV and John Laing Investments Limited (RWS, 2016a).

4.3.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

4.3.2. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

The interviews confirmed also with this project that the solution space for the contractor mainly comes down to the building method, phasing and the planning of a project. The interviewee on the contractor side states that Rijkswaterstaat often already has a clear vision on what they want to have in a project. With the SAA project for example they managed to optimize the road width from 70 to 50 meters at some places. Another example is a steel bridge instead of a concrete bridge. These are different solutions than presented in the reference design of the client. But Rijkswaterstaat is not always happy with the different solutions and sometimes it then needs to be changes to a solution according to their vision even though the solution fits the functional specifications.

Both the client and contractors side confirm the limits of the freedom for contractors with road infrastructure projects. With civil structures there is more physical room to come up with another design for contractors. The freedom to determine the way of construction and the phasing is the same with both types.

Also at this project the choice for a DBFM project has its effect on the solution space for contractors. Investors/banks are risk adverse and the maintenance component involved in the contract is another incentive to only choose proven technology. The contracting parties need certainty on the performance of technologies and processes that they use according to the interviewees. Another effect of the DBFM contract is the time pressure because the availability date has to be achieved. According to the contractor the time pressure is too high at this moment. An incentive to finish early is fine but at this moment Rijkswaterstaat values this too high. This goes at the expense of quality and sometimes

safety. The construction has to continue 24/7 and this is not always more efficient according to the contractor. People make mistakes more easily with this pressure and this also costs extra money. Rijkswaterstaat acknowledges the time pressure on the project but emphasises that the contractors pick their own availability date. The contractor is of opinion that at this moment Rijkswaterstaat does not realize the impact of the incentive on time efficiency they stimulate.

The award criteria of this project also entail a lot of quality aspects. But also in this project both the client and contractor confirm that price is the most important one. According to the contractor the different parties who tendered were awarded with very little differences when concerning the quality/EMAT-criteria. This strengthens the emphasis on price and also on planning. That are the two factors were contractors could make the difference; this determines the competition position

4.4. Project sea lock IJmuiden

At the end of the year 2029 the existing Noordersluis (Northern lock) reaches the end of its technical lifetime. Additional to this the sea lock has become too small for the present and still growing seagoing vessels. The new and bigger sea lock is needed to maintain the international position of the Amsterdam harbour area by providing tide-independent space for the growing vessels (RWS, n.a.-b). The new sea lock will be the largest in the world with a size of 500 meters length, 70 meters width and 18 meters deep. Besides the size the complexity of the project lies in the requirement that the lock has to maintain in operation during the whole construction process. The construction started in January 2016 and the new lock will be available for use in the end of 2019 (BAM, n.a.).

The new sea lock IJmuiden is part of the lock-programme of Rijkswaterstaat that consists of 6 projects. For the sea lock project Rijkswaterstaat collaborates with the province of Northern-Holland, the municipality of Amsterdam and the Port of Amsterdam (RWS, n.a.-b).

The project was awarded to the OpenIJ consortium after a competitive dialogue tender procedure. The consortium consists of a combination of BAM-PGGM, VolkerWessels and DIF who are responsible for the design, construction, finance and maintenance of the project during 26 years (VolkerWessels, n.a.). The contract was awarded to this party because they presented some very smart solutions (BAM, n.a.);

- (1) Levelling of the water through the doors instead of through culverts (Dutch: omloopriolen). Because of this solution there are no culverts needed and this ensures the stability and therefore the functioning of the existing lock during the construction. It also brings the advantage in construction time and costs.
- (2) The double-retaining lock with identical doors inside and outside one spare door. The double retaining function ensures that with high water both the door at the sea side as well as the one on the canal side can be used to retain the water. This saves one spare door.
- (3) Construction of the door boxes by means of pneumatic sinking instead of construction in deep (heavy, risky) cofferdams.

- (4) Large-scale application of deep walls instead of combination walls to prevent vibration damage and noise nuisance.

The sea lock turned out to be 93 million euros cheaper than Rijkswaterstaat expected it to cost. A result of the innovative design (Van Zoelen, 2016).



Figure 4.5. New sea lock IJmuiden (RWS, n.a.-b).

4.4.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

4.4.2. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

Both the client and contractor confirm to the increased freedom for contractors with civil structures like the sea lock IJmuiden in comparison with line-infrastructure projects. The increased freedom is especially in the area of technical solutions. They also confirmed that this is the case with other object-infrastructure projects. In the case of the sea lock the freedom was visible during the revision of the different bids. The bids showed a lot of differences, examples are the amount of lock doors as well as the way of levelling the water. With line infrastructure the freedom concentrates more on the process side. Line infrastructure is also simpler and the functional fulfilment is very clear and already fully developed.

Also in the sea lock project the involvement of private financiers has an effect on the solution space of the contractors. They show very risk adverse behaviour, a high-risk profile is not appealing to them. One will only see proven technology within DBFM contracts. However a D&C contract would not have ensured a more innovative solution according to the client. Contractors need an incentive to deliver quality and sustainable or innovative solutions. Without a period of maintenance included into the contract the contractors do not see the benefits of investing in innovations. Only the construction time is not enough to earn their investments back. Innovations earn themselves back over a long period of time, one has to think about life-cycle costs. So in the basis a DBFM is a right contract form for innovations. However according to the interviewee of Rijkswaterstaat maybe a D&C contract would have been more appropriate for this project. The importance of the availability date creates an environment where the scope is fixed and with little room for optimisations. The

sea lock IJmuiden is the first sea lock of this size to realize in the Netherlands, no manuals are created yet. Optimizations during the process are very difficult but maybe needed when doing something new, this would maybe benefit the quality. In this specific case a D&C contract would have maybe been more appropriate.

The award criteria for this project also came down to price playing the most important role. However the EMAT-criteria were valued with high bonuses. According to both the contractor and client it is very important to have clear defined EMAT-criteria. They have to be described in a SMART way so no misunderstandings arise and losing parties will not fight the outcomes.

4.5. Results Dutch case study

The Dutch projects that were reviewed show that the Netherlands is creating more and more room for contractors to contribute to the solution of infrastructure projects with for example developing tender procedures where contractors are involved very early on in the process. However the interviewees of the three cases emphasized that there is also some movement in the other direction of specifying a little more detailed again. Rijkswaterstaat is trying to find the right balance between providing freedom and retraining control.

Contractors seem to value the solution space they receive but also underline the importance of clarity in what the client expects and what the project environment demands. Functional specifications have to be formulated in a SMART way. Otherwise this can form potential risks during the project. At this moment Rijkswaterstaat often already has a clear vision on certain aspects like design and when contractors come up with different ideas that still fit the functional specifications they nevertheless have to be changed to the ideas of the client.

Two line infrastructure projects were studied (A6 and A12) and one object infrastructure project (sea lock IJmuiden). On the basis of the observations and interviews of these three projects, one could say that the contractor receives a great amount of freedom on the process side (construction planning, phasing and the way of constructing) in all three projects. Freedom for other technical/design solutions can be seen more at the object project where there is more actual physical space. These observations are also confirmed by the differences in the received bids. With the sea lock project the bids showed much more differences in the technical design, with the other two road projects the differences were more on the process side. At the A6 Almere project an extra limiting factor on the solution space for the contractor was observed; the fact that the project is part of the bigger umbrella project or program SAA. The interviewees were also asked if they recognise the difference in freedom between line- and object infrastructure from other projects and they confirmed. They stated that with object infrastructure contractors get more physical space to come up with other technical solutions. Line infrastructure projects are already pretty fixed and contractors can differentiate themselves with these projects mainly on price and planning. Also the agreements with the environment prior to the procurement cause a high level of fixation for these kinds of projects.

All three projects were tendered as a DBFM contract and different aspects regarding this contract type were mentioned a lot during the interviews: (1) the involvement of private financiers has an effect on the freedom for the contractor. Banks show a risk adverse attitude, which leaves room for optimizations and proven technology but not for real innovations. (2) The inclusion of the maintenance factor in the contract has the same effect because of the long period of time the contractor remains responsible. They want to have the certainty on the performance of technologies and processes that they will use. However other interviewees emphasised that the use of a for example D&C contract instead would not stimulate more innovations. The contractor would then not have the incentive to deliver a more innovative solution because of the lack of responsibility after completion and the short amount of time to earn the investment back. Contractors need an incentive to deliver quality and sustainable or innovative solutions. (3) Another effect caused by the involvement of the private financiers is a high amount of time pressure. Contractors have to reach the availability date by all means to receive the availability bonus and for the financiers to receive their first payments. The pressure on the contract that comes along with this seems too high at this moment when looking at the reviewed case studies. DBFM contracts were introduced among other things to stimulate early delivery of projects. But according to the interviews the monetary incentive by Rijkswaterstaat is a little too high at this moment. The current pressure could come at the expense of quality and safety.

In all three projects the document analysis as well as the interviewees confirmed the remaining importance of price during the awarding of the contracts. Nevertheless Rijkswaterstaat also involves a lot of quality aspects in their award criteria (EMAT). They value them with high bonuses to make it attractive enough for the contracting parties to invest in creative solutions regarding the quality aspects. The EMAT-criteria have to be described in a SMART way so no misunderstandings arise and losing parties will not be triggered to fight the outcomes. In all three projects one could observe that the project goals were related to the EMAT-criteria.

4.6. Influencing factors derived from the Dutch case

The general information on Dutch infrastructure procedures as well as the three projects reviewed showed different factors that could have influence on the solution space contractors get;

- (1) Track decision; this has great influence on the solution space for contractors. The track decision can be rather elaborated as visible at the A12 and A6 projects. With the sea lock IJmuiden project there is more physical space left for contractors to be creative.
- (2) Norms and regulations; there are a lot of regulations and norms when it comes down to infrastructure projects in the Netherlands. These regulations limit the solution space for contractors.
- (3) Project specifications; this factor also came up during the literature study. The more the client fixates, the less space remains for contractors to contribute to the whole.
- (4) Award-criteria; another returning aspect from the literature study. Award criteria determine how much it is appreciated, by the client, that contractors contribute their

ideas to the project. In the three reviewed projects it could be observed that the client values the qualitative EMAT-criteria quite high and this results in offers which show significant differences.

- (5) Tender procedure; the point of involvement of contractors also determines the degree to which the contractor can contribute to the design of the project. The influence of contractors will be greater if they are involved earlier on in the process.
- (6) Contract type; all three projects concerned a DBFM-contract. According to the interviewees this type of contract can limit the room for technical innovations. Rijkswaterstaat uses standardized contracts for infrastructure projects and share lessons learned for the future projects.
- (7) Project scope; the scope determines a lot of aspects. Does the project concern a road, a tunnel or a sea lock? In the Dutch case study it could be observed that the object project, the sea lock, provided more freedom to the contractor to contribute to the technical solution compared to the two road projects.
- (8) Physical environment; a project in a challenging environment, for example crossing a nature preserve area like the A12 or a lock that has to stay in operation at IJmuiden, can certainly influence the solution space for contractors. Additional regulations can play a role or actual physical barriers.
- (9) Agreements with stakeholders; with complex infrastructure projects one has to deal with a lot of stakeholders. Rijkswaterstaat is very developed in the area of environmental management and tries to reach a lot of consensus with those stakeholders even before the project starts. These agreements cause extra fixations of some project aspects and therefore influence the solution space for contractors.

5. GERMAN CASE STUDY

This chapter displays the second case study for this research; Germany. The gathered information will help in answering the last two sub-questions of this research:

- (4) What sort of integrated contract forms are being used in the Netherlands and Germany within infrastructure projects?
- (5) How does the freedom for contractors look like in actual infrastructure projects in the Netherlands and Germany?
 - a. What sorts of documents are being exchanged between the client and the contractor?
 - b. What is the reasoning behind the differences between the two countries?

5.1. General information

Germany is a large country with almost 81 million inhabitants. Physically the country has approximately 8 times the surface of the Netherlands. The country has a strong federal state system and an overarching Federal Government. There are 16 federal states with their own federal government with corresponding policies and regulations. Large infrastructure projects are a matter of the federal states and therefore they represent the public client in the case of those projects (DIA, n.a.).

5.1.1. German infrastructure procedures

In Germany the track decision procedure (German: Planfeststellungsbeschluss) is similar to the Netherlands. The ministry of traffic and digital infrastructure presents an overall infrastructural plan for the coming years. This is an important planning instrument, but not a financing plan and has no legal character (BMVI, n.a.-a). The difference with the Netherlands lies in the elaboration of these plans. As Rijkswaterstaat in the Netherlands is responsible for big infrastructure projects throughout the whole nation, in Germany everything is mostly organized by the federal states. The highway agencies of these federal states will perform the track decision procedure and later on represent the client when a project goes out to tender (BMVI, 2011).

The track decision procedure in Germany is a means to determine the track of e.g. a new road as well as a permit procedure. All permits needed for the infrastructure project are granted during this track decision procedure (Niedersächsische Landesbehörde für Strassenbau und Verkehr, n.a.). As the client conducts this procedure, this means that the risk of obtaining the permits is on the client side while in the Netherlands most of the risk for obtaining permits is on the contractor side. The consequence of this distinction is the higher level of detail of the design needed already at the track decision stage of the project. For granting the permits, the design already has to be worked out in detail, including a reference design, the impact of the project on the environment and the stakeholders and more (Niedersächsische Landesbehörde für Strassenbau und Verkehr, n.a.). In Germany the

tender procedure traditionally always follows after the track decision, they do not know an interweaving procedure like in the Netherlands.

5.1.2. German integrated contract forms

When thinking of integrated contracts in Germany, they are only in the form of a PPP until now (a DBFM(O) contract form). For infrastructure projects Germany knows three PPP-models: the A-, F- and V-model.

The A-model (expansion model) entails the design, expansion, financing, maintenance and operation of a project. With the A-model the project investment earns itself back through the income of heavy vehicle tolls. The Government forwards this money to the contractor. Additional to these tolls the contractor receives a start-up financing (Via Solutions, n.a.). The goal of the A-model is to create an incentive for the contractor to keep the availability and thereby the quality of the highway as high as possible as they are depended on the income through the usability (ÖPP-Plattform, n.a.).

The F-model (operation model) is comparable with the A-model except for the return model. In this case not only the heavy vehicles pay toll but all road users. The past experience in Germany with this model has not been positive and therefore this model is not used anymore currently (ÖPP-Plattform, n.a.).

The newest model concerns the V-model (availability model), which also concerns the design, construction, financing, maintenance and operation of a project. This model is not based on the amount of users of the project but on the degree of availability. The public client pays a performance related fee that is linked to the availability of the infrastructure (ÖPP-Plattform, n.a.). This model equals the Dutch availability model.

5.1.3. German culture

As culture could also have great influence on the way German clients and contractors proceed with infrastructure projects, this element cannot be left out of this research. Geert Hofstede, a known researcher in the field of cultural differences, works with 6 dimensions to compare cultural preferences. These dimensions are power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence (Hofstede Centre, n.a.-b). The scores for the Netherlands can be viewed in figure 5.1. below.

Germany scores rather low on power distance and indulgence which intends an equal society, a direct and participative way of communicating but also a more restrained attitude and a tendency to pessimism. The long-term orientation receives the highest score that implies the ability to adapt to new situations and willing to invest into the future (Hofstede Centre, n.a.-b). On individualism, masculinity and uncertainty avoidance Germany scores relatively high. A society with an emphasis on the individual, a strong focus on performance, "managers are expected to be decisive and assertive" (Hofstede Centre, n.a.-b), emphasis on deductive approaches, organized, detailed regulations and a strong reliance on expertise.

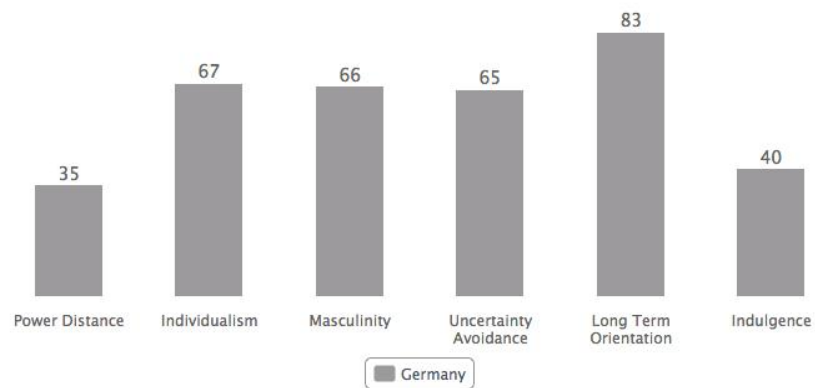


Figure 5.1. Cultural dimensions of Germany (Hofstede Centre, n.a.-b).

5.2. Project A94 München – Pocking

During the document analysis confidential information was reviewed which cannot be made public on request of the providing parties.

The goal of the A94 project is to improve the infrastructural network for the industrial area in the southeast of Bayern to the rest of the München-area. The project concerns the construction of a in total 150-kilometer new highway with a total of 4 lanes (Autobahndirection Südbayern, 2013). The project has been split up into different parts and the bright red parts in figure 4.3. have already been completed. The project analysed for this graduation project concerns the completion of the A94 highway between Pastetten and Heldenstein, a track of approximately 33 kilometers.

Besides the road construction, the project also involves landscaping challenges as well as the construction of a lot of civil structures (Dutch: kunstwerken). In total this comes down to four large bridges (spans over 100m), 24 medium size bridges (spans between 20 m and 100 m), 29 small bridges (spans between 2 m and 20 m) and 22,000 m² noise protection walls. The construction cost lie around 400 million euros and the total project volumes is approximately 1.1 billion euros (Walter, 2017).

The highway agency of the federal state Südbayern (Autobahndirection Südbayern) awarded the DBFMO contract to the Inseltalautobahn GmbH & Co. KG consortium on the first of February 2016. The consortium consists of three contractors; BAM PPP A-Modell Holding GmbH, Berger Bau GmbH and the French EIFFAGE S.A. who are engaged in equal parts (Inseltalautobahn GmbH & Co. KG, 2017). The consortium of the project outsourced the design and building part of the project to the consortium ARGE A94, consisting of four smaller contractors, including Wayss & Freitag Ingenieurbau AG (a subsidiary of BAM). The expected completion date of the project approximates the end of 2019 (Inseltalautobahn GmbH & Co. KG, 2017).



Figure 5.2. A94 München – Pocking project (Autobahndirection Südbayern, 2017)

As the financing component is present in the awarded contract, the project concerns a Public-Private-Partnership. Bringing in private capital ensures a quicker process of project realisation because of the independence of budget constraints (Inseltalautobahn GmbH & Co. KG, 2017). The project will be financed by the consortiums own funds as well as from a consortium of banks. After completion of construction the contractor will get paid on the basis of the availability model (Inseltalautobahn GmbH & Co. KG, 2017) as seen at the A12 and A6 project as well.

Different than in the Netherlands, this project also includes the operation of the new highway. Tasks belonging to the operation phase of the project can be viewed in table 4.1. below. The maintenance included in the contract refers to the bigger structure/construction works (Inseltalautobahn GmbH & Co. KG, 2017).

Part of the contract	Operation	Maintenance
1	Track control	Superstructure (Dutch: bovenbouw)
2	Small reparations	Engineering construction
3	Maintaining the green around the project	Ground construction
4	Maintenance and repair of the road furniture	Drainage
5	Cleaning	Road furniture
6	Operation of parking areas	Buildings on the project
7	Winter services	
8	Safeguarding of accident locations	

Table 5.1. Tasks belonging to the maintenance and operation phase of the contract.

5.2.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

5.2.2. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

The interviews regarding the A94 projects on the client and contractor side confirmed the observations in the document analysis. Freedom for the contractor mainly lies in the phasing of the construction, the execution, maintenance, operation and the hiring of sub contractors. The involvement of private financiers and their risk adverse attitude has influence on the solution space and the degree of innovations. Only proven technology can be used because of the length of the contract and the need for certainty that the quality can be maintained over these years according to the contracting side. The client also emphasized that the innovations are more on the process side. In the A94 project for example the client came up with a new reward- and penalty system to reward earlier delivery of the project. Some other reasons causing the lack of freedom is the fact that the track decision procedure currently is too detailed and there is not enough time to design something different for the contractor. That forms the main reason why the detailed reference design provided by the client is adopted almost entirely in almost all cases.

They also experience a lot of difficulties with the comparability of the offers. Awarding on other criteria than price is still in development. Of course including EMAT-criteria is a European requirement but the client emphasises the difficulty and still insecurity regarding the awarding on more qualitative and subjective criteria. In the past there has been some bad experience with contracting parties who did not win the tender and took this to court.

Moreover, according to the client and contractor civil structures are still tendered in the traditional way; integrated contracts (only PPP in Germany) are only used for line projects like this highway.

5.3. Project A8 Ulm – Augsburg

During the document analysis confidential information was reviewed which cannot be made public on request of the providing parties.

The A8 highway Ulm-Augsburg-Munich is a very important connection through the country. Because of the enormous traffic volume, the current 4-lane capacity has to be increased and adjusted. The road had to deal with a lot of congestions and accidents and the need for renovation and expansion was very high. The project consists of a 41-kilometer section of the A8 between Ulm and Augsburg that had to be widened to 6 lanes. The project also includes the demolishing and construction of 76 bridges, the construction of the 9-kilometer noise protection walls. After completion of the construction phase, the road section also has to be maintained and operated during a contractual period of 30 years (Autobahndirection Südbayern, 2009).

As the project concerns a PPP, private money is involved to finance the construction. During the maintenance and operation phase the financing parties regain their investments by receiving a part of the heavy vehicle tolls as well as a start-up financing from the state. This PPP- model based on the financing dependent on the user numbers should stimulate the contractor to deliver high quality and achieve a high availability of the road (Pansuevia GmbH, n.a.).

After a tender phase of 27 months the contract has been awarded on June 1st 2011 to the consortium Pansuevia GmbH Co. KG consisting of Hochtief PPP Solutions GmbH and Hermann Kirchner Projektgesellschaft GmbH (BMVI, n.a.-b). During the tender phase the

project faced delays because of the fact that the other consortium (A8 mobil) that did not win the tender, disagreed with this decision. After a failed request for a revision of the awarding procedure, A8 mobil took this matter to the Supreme Court. According to the Supreme Court, the evaluation of the tenders was carried out in a proper manner and in compliance with the procurement principals and therefore they decided against the prosecutor A8 mobil. Because of this matter the project got a delay of several months (Auto Motor Sport, 2011; Welt, 2011).

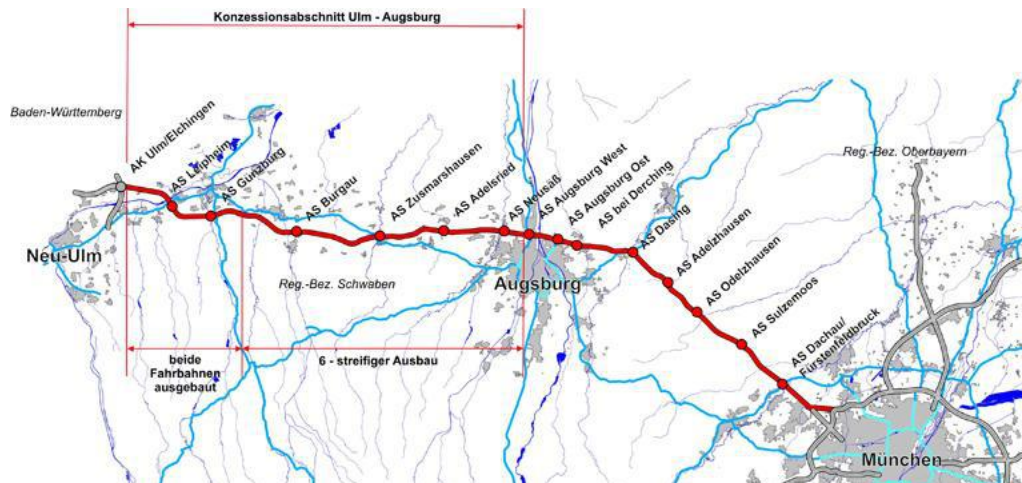


Figure 5.3. Project A8 Ulm-Augsburg (Autobahndirection Südbayern, 2009)

5.3.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

5.3.2. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

The A8 project has the same client as the A94 project, which was reviewed before. The interviews on the client side were therefore combined into one interview and the information displayed at the interview part of the A94 project is also applicable at the A8 project.

At the A94 project it was mentioned that the public client experiences a lot of difficulties with the comparability of tenders on other criteria than price. They are rather cautious because of the fact that losing parties often go to court because they doubt the fairness of rewarding on rather subjective criteria. At the A8 project they experienced this situation, which caused a significant delay. As the A8 project was tendered and executed before the A94 project this had his effect on the tendering of the A94 project. The client was even more cautious then.

Also the extensiveness of the track decision/permit procedure was mentioned at this project and how this affects the freedom for the contractor.

5.4. A4 Thüringen

During the document analysis confidential information was reviewed which cannot be made public on request of the providing parties.

The A4 Thüringen project concerns a road expansion of around 3 kilometers and a new highway part of 22 kilometers that had to be realized. The project also includes the construction of 27 new bridges and the operation and maintenance of 24 more bridges as well as in total a 44,5 kilometers highway track (BMVI, n.a.-c). The project was initiated to reduce the traffic congestion in the area between the border of federal states Hessen/Thüringen and Gotha (Via Solutions, n.a.).



Figure 5.4. Track of the A4 Thüringen project (BMVI, n.a.-c).

The DBFMO contract was awarded by the public client DEGES to Via Solutions GmbH Co. KG, a combination of Hochtief PPP Solutions GmbH (50%) and Vinci Concessions S.A. (50%) in the year 2007. This combination outsourced the work to a combination of Eurovia (33%), Hochtief Construction (33%), Josef Rädlinger (17%) and Strassing-Limes (17%). Appendix E shows a schematised overview of the project organisation. The project was realized under the A-model (German: Ausbau Model).

5.4.1. Document analysis

Due to the confidentiality of the reviewed documents, this information cannot be displayed in the public version of this master thesis.

5.4.2. Interviews

For this project interviews were conducted on both client and contractor side. For the elaborated versions of the interviews please go to appendix B.

The interviewee on the client side of the project confirmed the German process of the client planning a detailed reference design together with an engineering firm which then gets adopted by the client. However the interviewee emphasised that these reference designs in

the past had the level of detail of an execution planning but that currently this is decreasing. The goal is to lower the level of detail and leave the detailed execution planning for the contracting party. The planning regarding phasing of the project is left completely to the client with exceptions when prior agreements have been made with for example the environment (regarding local residents, other construction projects, etc.).

When addressing room for creativity or innovations, the interviewee on the client side states that the functional specifications offers more room for contractors but that this space is not really used by them. An important factor that limits innovation is the involvement of the private financiers. The financing parties are very risk adverse, which results in more optimisations than real innovations according to the interviewees. With civil structures the freedom is very little. Civil structures like bridges and tunnels will be specified with a much higher level of details than the road parts of a project. The same applies to the A4 project where several bridges are part of the contract. The higher level of detail provided by the client has to ensure a certain level of quality.

The overall situation regarding German infrastructure projects is very positive currently according to the interviewees. The project performance has increased with the introduction of integrated contract forms (only PPP in Germany) and also the project processes are running smoothly. However the general reputation of these PPP projects in Germany is not very good in the eye of the public. The very first generation was not a very great success but after the developments over the years and the currently very good results it seems difficult to turn this reputation around.

5.5. Results German case study

The federal state system in Germany has a lot of effects on infrastructure projects; the public client often is the federal state and in every state there can be different regulations and approaches regarding infrastructure projects. Until now in Germany only PPP/DBFM(O) contracts are being used as integrated contracts. Every federal state has their own approach for these types of contracts. This was observed with the A4 project in the federal state Thüringen and the A94 and A8 in Bayern.

When a German road infrastructure project is tendered the client provides a very detailed reference design, planned together with engineering firms, that contractors can adopt. In Bavaria this was even more the case than with the A4 project in Thüringen. With the A4 project the client emphasized that the level of details is declining. In practise it happens almost always that the contractor adopts the reference design completely (or with small changes). Even though this is not mandatory and the project is described in a functional way, quite detailed but still, contractors choose to adopt this reference design and take all risks of this plan upon them. The reasons according to the interviews for this phenomenon are the detailed track decision procedure upfront and the lack of time for contractors to prepare other plans afterwards. The contractors also stated the lack of stimulation or rewarding from the client side to come up with other creative or innovative solutions.

Generally speaking the freedom for the contractor within the three analysed projects lies solely on the process side. This freedom involves the planning, phasing, way of construction, acquisitions the materials and hiring sub contractors. With civil structures the

Germans completely fall back on or stay with the traditional way of procurement; very detailed technical specifications. The higher level of detail provided by the client regarding civil structures has to ensure a certain level of quality according to the interviewees on the client side.

Another important limiting factor on the solution space of contractors named during the research is the involvement of the private financiers. The financing parties are very risk adverse, which results in more optimisations than real innovations according to the interviewees. Only proven technology can be used because of the length of the contract and the need for certainty that the quality can be maintained over these years.

In the awarding procedure of the reviewed project price definitely plays the most important role. EMAT-criteria are being used but not valued very high and only little difference can be observed in the assessment of the bids regarding earned points for these EMAT-criteria. The reasoning why price is still so important in the awarding procedure lays in the difficulties the public clients experience with the comparability of the offers.

The overall project performance has increased with the introduction of the integrated contract forms and also the project processes are running more smoothly. However the general reputation of the PPP projects in Germany is not very good in the eye of the public. The very first generation was not a very great success, however, even after the development over the years and the current positive results of the new generation PPP's it seems difficult to turn this reputation around.

5.6. Influencing factors derived from the German case

The general information on German infrastructure procedures as well as the three projects reviewed showed different factors that could have influence on the solution space contractors get;

- (1) Track decision; this has also in Germany great influence on the solution space for contractors, probably even more than in the Netherlands. Track decision procedures in Germany are very detailed and everything is almost fixed already. At the reviewed documents of the three projects, the track decision contained plans in the smallest detail. What is also different is the public party that is responsible for producing the track decision. In Germany this is done by the federal state, which than later on also represent the client with infrastructure projects.
- (2) Norms and regulations; there are a lot of regulations and norms when it comes down to infrastructure projects in the Germany. These regulations limit the solution space for contractors.
- (3) Project specifications; this factor also came up during the literature study. The more the client fixates, the less space remains for contractors to contribute to the whole. In Germany the client presents a reference design during the tender that is almost completely adopted by contractors. The specifications are functional but the reference design is very detailed and thereby limits the solution space. When it comes down to object infrastructure projects, all interviewees confirmed that these are still specified in a technical way in Germany.

- (4) Award-criteria; another returning aspect from the literature study. Award criteria determine how much it is appreciated, by the client, that contractors contribute their ideas to the project. In the three reviewed projects it could be observed that the emphasis lies on lowest price. Clients still find it hard to compare offers on qualitative criteria.
- (5) Tender procedure; the point of involvement of contractors also determines the degree to which the contractor can contribute to the design of the project. The influence of contractors will be greater if they are involved earlier on in the process. In Germany there are no procedures developed yet like in the Netherlands where contractors are involved very early on in the process.
- (6) Contract type; all three projects concerned a DBFM-contract. According to the interviewees this type of contract can limit the room for technical innovations. In Germany this is the only form of integrated contracts used so far.
- (7) Project scope; the scope determines a lot of aspects. Does the project concern a road or a tunnel? For the German case study only road infrastructure projects were reviewed. The interviewees stated that object infrastructure projects are still procured the traditional way.
- (8) Physical environment; a project in a challenging environment can certainly influence the solution space for contractors. Additional regulations can play a role or actual physical barriers.
- (9) Agreements with stakeholders; with complex infrastructure projects one has to deal with a lot of stakeholders. During the track decision procedure in Germany, a lot of agreements with stakeholders are made already. These agreements cause extra fixations of some project aspects and therefore influence the solution space for contractors.

6. CASE COMPARISON

The aim of this chapter is to compare both countries/cases and answer the last two sub-questions of this research. As a validation step the results of this comparison were discussed with the managing director of a large German construction company who has extensive experience working in both countries on infrastructure projects.

6.1. Case comparison

After reviewing the two cases (Germany and the Netherlands) for this research a lot of differences but also similarities have been observed. First the last two sub-questions will be answered and these will be followed up by some extra observations made during the review of the different projects.

Sub-question 4:

What sort of integrated contract forms are being used in the Netherlands and Germany within infrastructure projects?

In the Netherlands a wide range of different integrated contract forms are being used for infrastructure projects. Rijkswaterstaat mainly uses D&C and DBFM contracts but DBM's are also arising currently. In Germany the only integrated contract form that is being used is a DBFM(O) form or also referred to as PPP.

Sub-question 5:

How does the solution space for contractors look like in actual infrastructure projects in the Netherlands and Germany?

The solution space for contractors in both countries with line infrastructure projects comes down to the process side. Bids will mainly differ on project phasing, the way of construction and planning. With object infrastructure there still seems to be a great difference between both countries. In the Netherlands the solution space for the contractor is bigger in the sea lock project, actual physical freedom is provided to contribute to the realization of the project, with their knowledge and expertise, not only in the process area but also in technical solutions. The interviewees confirmed to see this also in other object projects. In Germany the tendering of civil structures is still traditional with very detailed technical specifications to ensure quality.

In Germany the client, together with an engineering firm, also provides a detailed reference design, which is adopted by the contractor with almost no changes. The contractor is not obliged to adopt this reference design and the projects are specified in a functional way, however at this moment the contractors still choose to adopt this design because of (1) the large amount of regulations, (2) the extensive detailed track decision/permit procedure, (3) too little time to develop alternative plans and (4) no stimulation from the client side to invest in creative or innovative ideas. In the Netherlands

the client often does not even provide a reference design anymore and the contractors get quite a lot of solution space. The engineering firms here work on the side of the contractors to realize a design for the tender of a project.

Contractors need an incentive to be creative/innovative and deliver high quality. This can be done by including a maintenance period but also with valuing the EMAT-criteria high enough. In the Netherlands Rijkswaterstaat is much concerned with these qualitative criteria and these are valued with high bonuses to stimulate the contracting parties. In Germany EMAT-criteria are being used but not valued very high. The public clients experience large difficulties with comparing projects on qualitative criteria and they do not have the awareness yet what extra value can be achieved in a project if the stimulation is higher.

The experience with the involvement of the private investor in DBFM contracts is the same for both countries. The solution space for the contractors gets smaller if private investors are involved. They show a risk adverse attitude and there is only room for proven technology. Also the time pressure and how this maybe can have an effect on quality and safety when it is too high is a common experience.

- a. What is the reasoning behind the differences between the two countries?

As a starter the organisation of both countries is different. The Netherlands has a centralized government whereas Germany is dealing with a federal state system and an overarching Federal Government. This has its effect on the organisation of infrastructure projects. In the Netherlands Rijkswaterstaat has the role of public client where in Germany most clients are represented by the federal states themselves. All federal states have slightly different regulations and approaches regarding infrastructure projects. The second reason for the differences observed is the degree of stimulation from the public clients, which was already mentioned above. Contractors need an incentive to use the solution space and for delivering quality and innovations. Currently this stimulation in Germany is still too low.

6.2. Influencing factors derived from the cases

The influencing factors on the solution space for contractors found in literature were recognized in both cases/countries. The cases even showed additional factors seeming to influence the solution space in the six reviewed projects. The reason why these factors influence the solution space in the cases has already been described at the end of chapter 4 and 5. Chapter 7 will describe how these factors connect and how they can be categorized and organized into a scheme. Below the nine factors are listed again;

- (1) Contract type
- (2) Level of detail of project specifications
- (3) Tender procedure
- (4) Award-criteria
- (5) Track decision
- (6) Norms and regulations
- (7) Project scope
- (8) Physical environment
- (9) Agreements with stakeholders

6.3. Influence of culture

During the interviews it was pointed out by some of the interviewees that culture also has his impact. At the beginning of the Dutch and German case chapters, a little insight into the countries culture was given with the help of the cultural dimensions of Hofstede. But what differences can be recognized, what similarities and does this relate to the information found during the case studies?

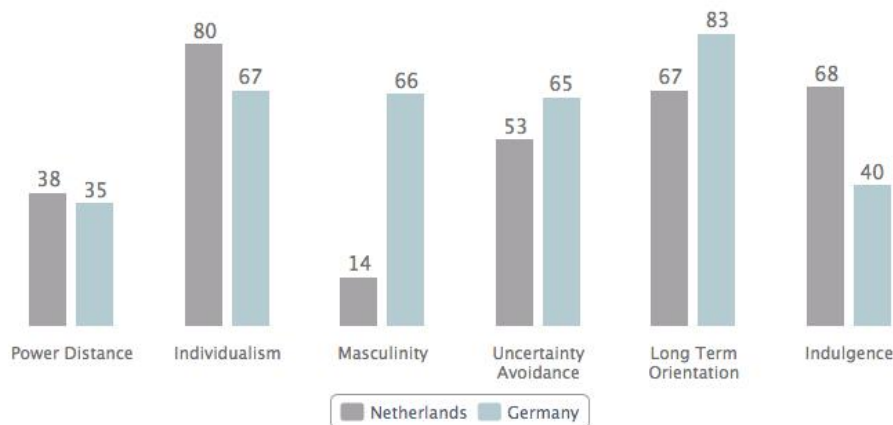


Figure 6.1. Netherlands in comparison with Germany (Hofstede Centre, n.a.-a)

6.3.1. Comparing Germany and the Netherlands on the Hofstede dimensions.

Figure 6.1. shows the comparison of the six cultural dimensions of Hofstede for Germany and the Netherlands. The biggest differences in the cultural dimensions of Hofstede can be viewed in the masculinity and indulgence dimension. The Netherlands shows a much more feminine society than Germany who scores relatively high on masculinity. This difference would express itself in the management style; with a feminine society reaching consensus and equality are very important. Germans seem more "driven by competition, achievement and success".

The difference on the indulgence dimension reflects how Germans show a more restraint, pessimistic and strict attitude whereas the Dutch show a more optimistic and positive attitude. In power distance both countries are scoring almost the same, which means that they both are supporters of an open and accessible management style, equal rights and direct communication.

Furthermore the Germans show a little more risk adverse attitude than the Dutch as well as a more long-term orientation. They seem to be more willing to adapt and invest into the future (Hofstede Centre, n.a.-a).

6.3.2. Observations in the cases

Some of the scores on the six different cultural dimensions were easy to recognize during the case studies and mainly the interviews, however others not really. The more restraint society in Germany was one cultural aspect that became very clear during the cases. The German system regarding infrastructure projects is one with an extensive amount of regulations. The contractors also emphasized this as the main reason why they do not get

the space to contribute. Everything is already fixed. This could also be caused by the higher score for the uncertainty avoidance dimension; the preference of keeping in control.

However the Germans score higher on long-term orientation than the Dutch, this was something that did not come forward during this research. In the construction industry the Germans show more reserve in following the developments towards a bigger solution space for contractors. The other dimensions did not clearly come forward during the cases which makes it hard to draw any conclusions.

6.4. Validation

During an expert meeting, the observations made during the case studies were discussed in detail. The expert shared his opinion and interpretations of these observations. The elaborated version of the meeting can be found in appendix D. For this meeting an expert (name) was chosen who has extensive experience working with infrastructure projects in both countries. During the meeting the following subjects were discussed: (1) the difference in governance and regulations, (2) cultural impact, (3) contract forms and of course (4) the solution space for contractors.

The governance in Germany indeed varies a lot between the federal states. Rijkswaterstaat puts a lot of effort in evaluating and sharing gained knowledge/past experiences or lessons learned between the projects and within the organisation. In Germany there is not much knowledge sharing between the different federal states regarding experiences and approaches for the integrated contracts within infrastructure projects. Every federal state evaluates his PPP projects separately.

Culture is an important aspect in this whole discussion according to the expert; in Germany traditions are very important. The strategy that is handled by Rijkswaterstaat ("market unless") is not yet commonly used in Germany. Here, the government mainly makes use of in-house expertise. The Netherlands is also a less strict regarding regulation. Another important influencing factor are the engineering firms. Currently, they are not used to working on the contractors side. Nevertheless, some development in the field is already visible.

Moreover, in the Netherlands there still is some room left for more technical solution space within infrastructure projects. On the other hand, as in Germany civil structures are still tendered in a traditional way, one can observe significantly fewer innovations within infrastructure projects. In the Netherlands, Rijkswaterstaat has a good balance between price and quality within the awarding that stimulates the contractors. In Germany, however, price continues to be the main component.

The expert also confirmed the observed influence of the private finance component within integrated contracts. Banks are risk adverse, however the private finance component also is an incentive for delivering quality. The contractor presents a plan that they have to believe in. Sometimes the shares of a DBFM are resold to, for example, a pension fund. At this point, the original plans get reviewed (due diligence) and if everything went like planned a good price will be negotiated.

7. MODEL DESCRIPTION

During the literature reviews and the case studies a lot of factors were found that influence the solution space of the contractor. All factors identified during the literature research were also identified as influencing on the solution space during the cases. However the cases also showed five additional factors that influenced the solution space in the six projects that were reviewed.

The factors derived from literature were:

- (1) Contract type
- (2) Level of detail of project specifications
- (3) Tender procedure
- (4) Award criteria

The additional factors derived from the cases were:

- (5) Track decision
- (6) Norms and regulations
- (7) Project scope
- (8) Physical environment
- (9) Agreements with stakeholders

Many of these factors are determined by the same actor or aspect and can be categorized into one of these three categories: public policy, project context and public client. The next paragraph will explain the categorizing, the background and link between the different factors found during the literature study and cases.

7.1. Influencing factors on the solution space for contractors

In both countries it starts with public policy; the rules regarding tendering (by the European Commission), infrastructure project related procedures like the track decision and the governance organisation in general. In Germany the construction industry has to deal with the overarching federal government, as well as the federals state policy makers. These federal states can be seen as little "islands". Every island has its own approaches regarding integrated contracts for infrastructure projects and not much knowledge or experience is shared between them. In the Netherlands the Ministry of Infrastructure and Environment determines the policies and Rijkswaterstaat executes them. Rijkswaterstaat puts great effort into reviewing past tenders and the sharing lessons that they have learned.

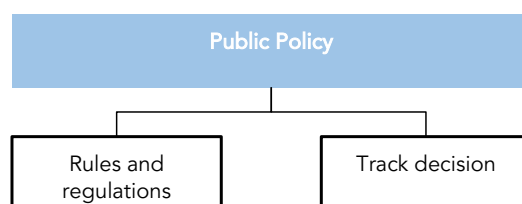


Figure 7.1. Public policy factor

An infrastructure project can be seen as an integral system, which is part of an even bigger system: the project context. This context consists of (1) *the project scope*; does the project concern line infra structure, a civil structure or maybe both? During the cases it was observed that the solution space for contractors in both countries within line infrastructure projects comes down to the process side. Within object infrastructure projects however, there still seems to be a great difference between both countries. In sea lock case, the solution space for the contractor is bigger and more actual physical freedom is present to contribute to the solution of the project. Not only in the process area but also in technical solutions. In Germany on the other hand, the tendering of civil structures is still rather traditional, with very detailed technical specifications to ensure quality.

Another influencing factor is the (2) *physical environment*. In a nature reserve area, freedom for contractors is for example more limited due to the additional regulations that have to be considered. The effects are illustrated by projects such as the A12.

Within the physical environment it could be the case that one moreover has to deal with (3) *other stakeholders* such as local inhabitants, other projects or third parties like an airport. Managing these stakeholders will result into agreements, which will also influence the solution space of the contractor.

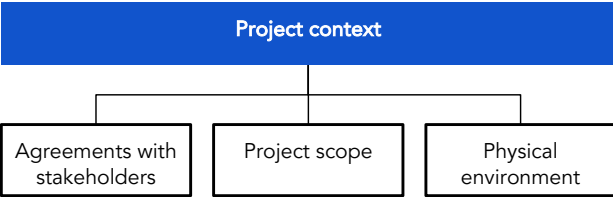


Figure 7.2. Public context factor

When policy is determined and the project context is clear, the public client takes over. In Germany, this is mostly the highway agency of the different federal states. In the Netherlands, this is Rijkswaterstaat when concerning infrastructure projects. These public clients determine among other things the (1) *contract type*, (2) *type of tender procedure*, (3) *the level of detail of the project specifications* and (4) *the award criteria*.

Firstly, the contract type; this does seem to have influence on the freedom for contractors, as for example the involvement of private financiers can limit the technical solution space because of their risk adverse attitude. The inclusion of maintenance can also be seen as an incentive for contractors to use the solution space and be creative.

Secondly, the type of tender procedure can have an influence on the solution space that contractors receive. This applies mainly to the Netherlands; in Germany they do not use tender procedures (yet) that stimulate earlier contractor involvement like they do in the Netherlands.

The third factor mentioned is the level of detail of the functional specifications. This primarily determines the freedom the contractor receives. In Germany it was observed that civil structures, autonomously or part of a project track, are still specified in a technical way with a high level of details (more traditional approach).

The fourth and last factor named, is the awarding of the contract. The award criteria do not actually provide physical space, but they determine to what degree contractors can

use the solutions space they get. If price is the main component, like observed in the German projects, contractors are not stimulated to deliver high quality and deliver creative or innovative ideas. In the Netherlands, Rijkswaterstaat manages a better balance between price and quality criteria.

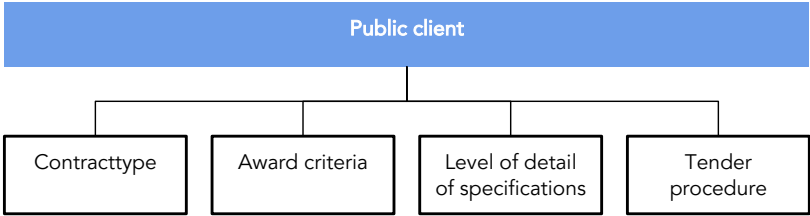


Figure 7.3. Public client factor

In the end the decision on the amount of freedom for contractors during the tender phase of a project represents a constant balance between providing freedom for contractors and maintaining control for the client. The conducted research shows that the public clients often experience that keeping control is safer than shifting the risks to the contractor by providing more freedom. This was stronger visible in the German than in the Netherlands.

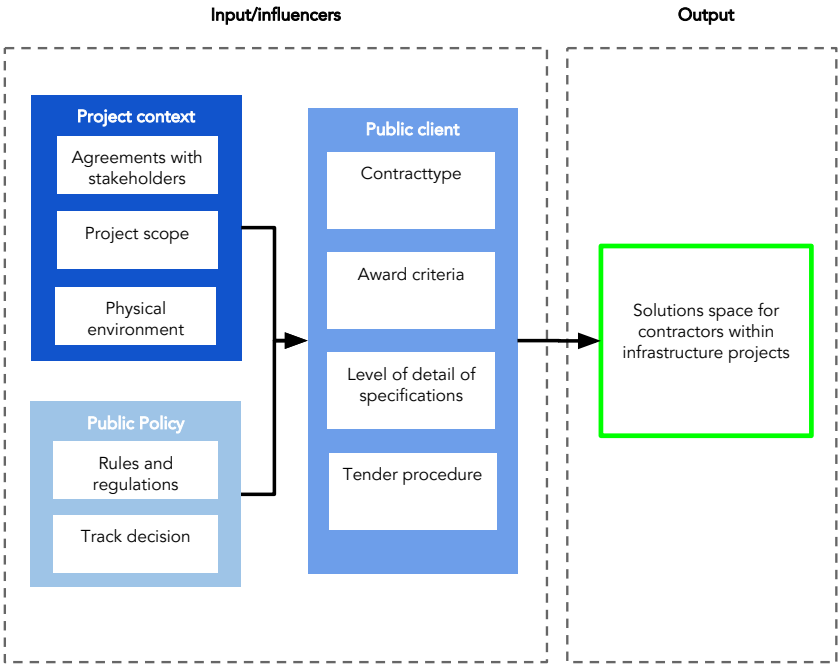


Figure 7.4. Schematized overview of the conclusions

7.2. Consequences of a bigger solution space for contractors

7.2.1. Risk division

During the literature research and the review of the Dutch and Germany case, also the consequences of a certain degree of freedom for contractors became visible. For a starter the amount of freedom the contractors receive is also linked to the division of risks. When a

contractor receives a bigger solution space he will also have to bear the risks. The contractor carries the responsibility to deliver a long-term integral solution (Leendertse et al., 2012; S. Lenferink, 2013; Nyström et al., 2016). However, some articles express their concerns on the shift of risks to the contractor side.

Shifting all the risks to one party based on a certain contracting model like DFBM(O) is incorrect according to de Ridder (2009). Regarding the division of risk, one should look at which party can best bear the risks: "some risks maybe can be less expensively borne by the owner" (Gordon, 1994, p. 203). The ability to handle risks has everything to do with control. As a shift of risks is linked to the amount of freedom that is given to the market and gaining or losing control (Chao-Duivis, 2013a). Determining the right amount of freedom is part of a balance between the desire for an effective/efficient or innovative solution and staying in control.

7.2.2. Project efficiency

Besides making the contractor responsible for the project and thereby providing an incentive to deliver quality, a bigger solution space can also contribute to the efficiency of a project. Because different project stages are integrated into one contract and thus responsibility of one party; the different interphases can also be managed more efficiently.

Moreover, according to ter Huerne and de Ridder (2007) in traditional contracts, the contractor has to redo a part of the design work presented by the client to check and actually being able to build the requested. This is double work and inefficient. Functional specifications were initiated to prevent this inefficiency and stimulate innovation (Rijksoverheid, 2013; ter Huerne et al., 2006). This is in line with the systems-engineering movement, which strives for a complete integration of the process to prevent unnecessary redesign cycles and therefore extra costs (ter Huerne et al., 2006).

7.2.3. Added value

In the infrastructure sector, contractors are very depended on the few clients existing. However, as projects are getting more and more complex, the number of contractors capable of executing the projects is also small. This creates a mutual dependence. The public parties used this dependence of contractors to create added value to their projects by changing the procurement procedures and create a bigger solution space (Leendertse et al., 2016). As contractors have to deviate themselves from the competition, they have to add value and be unique. Having creative skills in-house therefore is a very important aspect for the contractors (Treacy & Wiersema, 2007). It is important that the added value can be appreciated proportional by the client in a monetary way, this is needed to create an investment fund (Sanchez & Heene, 2010).

Besides smarter solutions, a bigger solution space can also decrease the total project costs. This was clearly visible in the sea lock case where the project price turned out a lot lower than Rijkswaterstaat predicted it to be. Literature on DFBM(O) contracts also confirmed this with other past Dutch projects like the A15 MaVa (Franken, 2010) or the highway A95 (Roohé, 2007).

Figure 7.5. displays the complete scheme with the factors that influence the solution space for contractors within infrastructure projects, grouped into three categories, with the consequences discussed above.

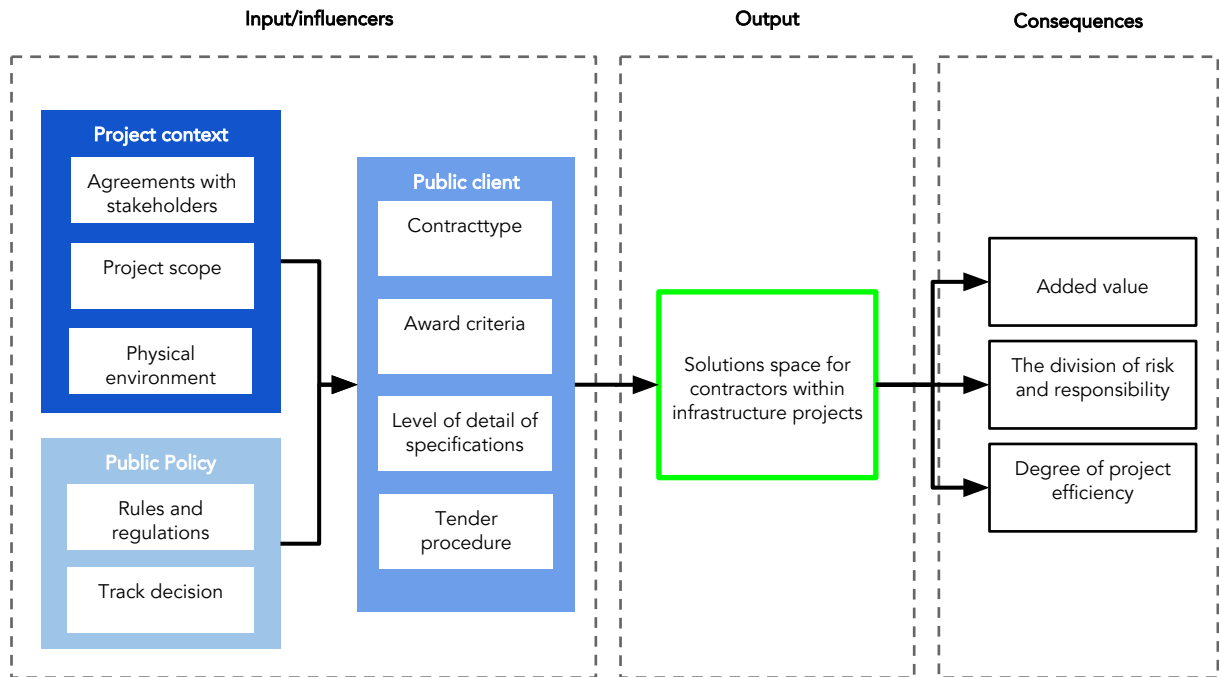


Figure 7.5. Complete schematic representations of influencing factors on the solution space (own figure)

8. CONCLUSIONS

This research was initiated to create greater insight into the existing barriers when contracting parties want to compete in tender procedures of infrastructure projects in other European countries. Germany and the Netherlands were used to identify possible differences regarding the solution space for contractors within integrated contracts. Identifying the existing barriers and differences will help in stimulating cross-border contracting, which can boost the construction market. The main research question for this research entailed;

“What factors, related to the design of the tender phase defined by the client, influence the decision on the degree to which contractors can contribute to the design of the realization of an infrastructure project with an integrated contract in Germany and the Netherlands?”

Sufficient solution space for contractors showed to be important according to literature because it can provide projects with smarter solutions for a lower price. Contractors are given an incentive to differentiate themselves from the competition and create added value. Another benefit is that they become responsible for the integrated project parts and can be held accountable for it. Different factors can influence the solution space a contractor receives. The factors were found in the literature and the evaluated infrastructure projects that were reviewed in the two countries.

The first category that was identified is *public policy*, which consists of regulations and the track decision. These can influence the solution space because of the level of fixation of the plans they can cause. The more elaborated the regulations and track decision will be, the smaller the solution space will become. Especially in five of the six road projects reviewed during this research, it showed that the track decision is related to an extensive amount of norms, guidelines and regulations. Consequently, the technical solution space becomes very small. In these projects, the contractor typically could only contribute to the process side like planning, project management plan and phasing of the execution.

The second category that was identified entails the influence of the *public client*, which consists of the choice in contract, tender procedure, project specifications, and award criteria. With these four aspects the client can have great influence on the solution space. First of all the choice for an integrated contract is the basis. In traditional contracts the contractor has non-to very limited solution space. This research focussed on the maximal integrated form; the DBFM(O) contracts. One would expect that this contract is providing the contractor with the biggest solution space as all project phases are integrated. The literature and cases actually showed that this is not entirely true. The contract does provide the contractor with influence throughout the whole project life cycle, which enables him to optimize the project and significantly lower the total project costs. It provides room to the contractor to come up with smarter solutions with existing/proven technologies. For real technical innovations will be less room because of the risk adverse attitude of the private financing parties that are involved according to the cases. Besides their risk adverseness, the involvement of private financiers also creates a high time and money pressure on the

project, which results in a very fixed scope from the start. This limits the degree to which contractors can contribute to the solution. The involvement of the maintenance component on the other side forms an incentive for contractors to think long-term, as they also carry the responsibility. With a D&B contract for example, it is not unthinkable that public clients would have a greater tendency to remain in control, as the contractor is not responsible for the period afterwards. To ensure a certain quality level, clients will maybe try to fix the project more beforehand, which will limit the solution space for the contractors. But further research will be necessary into the risk attitude of the client to draw any conclusion in this matter.

The tender procedure is another choice for the public client, which can influence the solution space for contractors. Some procedures are more open and leave more room for contractors to provide input than others. The same goes for the project specifications; if the project demands are specified in a technical and detailed way, there is not much room left for contractors to use their expertise to contribute to the project. The way contractors will, or can, use the solution space is greatly determined by the award criteria. Contractors can get all the space there is, but if the extra input is not rewarded they won't feel motivated to put in that additional effort. Therefore, it is critical that the client appreciates the added value proportionally in a monetary way, and as such creates an investment fund. Otherwise, the risks for the contractor will be too high.

The third and last category influencing the solution space for contractors is the *project context*. This category consists of agreements with stakeholders, the physical environment, and project scope. When the client comes to an agreement with the stakeholders before contract close, this will limit the solution space for contractors. The physical environment can limit the solution space when, like with the A12 project, the highway has to cross a nature reserve area where extra regulations have to be taken into account. Also, the project scope can have this same limiting effect. The five road projects (line infrastructure) of the six cases that were reviewed, showed that the solution space for contractors in those projects is limited to the process side. There is very little room left for contractors to contribute to the technical solution. The sea lock (object infrastructure) project showed much more technical solution space for the contractor. The interviewees also mentioned that they noticed this in other object infrastructure projects. To confirm this statement, further research to compare line- and object infrastructure is necessary.

Furthermore, when contractors are interested in competing in tenders for infrastructure projects with cross-border integrated contracts, they will have to be aware of some of the existing barriers that can complicate the process. In the introduction, possible differences in legislation, culture, language, and organisational barriers were mentioned. This was confirmed in the two cases, Germany and the Netherlands. They each showed significant differences in how they dealt with DBFM(O) contracts in infrastructure projects. For starters, it is good to know that in Germany DBFM(O) is the only integrated contract form used until this moment.

Germany is also organised very differently than the Netherlands. They first of all have a federal state system as apposed to a centralized government. Germany consists of 16 federal states; each with their own federal government and corresponding policies and regulations. Large infrastructure projects are managed by the federal states, which thus represent the (public) client. These federal states however do not share their knowledge

when it comes to large infrastructure project with DBFM(O) contracts; each federal state approaches the projects a little differently. In the Netherlands, Rijkswaterstaat is very concerned with standardizing contracts and evaluating past projects to gain knowledge for the future. When it comes down to the six projects that were reviewed for this research, it can generally be concluded that Rijkswaterstaat puts in a greater effort to stimulate and provide a bigger solution space for contractors than the highway agencies in Germany. Even though the five road projects showed that the freedom is mostly concentrated on the process side in both countries, the public clients in Germany are not very aware yet of the opportunities a bigger solution space has to offer. This is also visible with the object infrastructure projects in Germany, which are still procured in a traditional way with detailed technical specifications.

The lack of stimulation of a bigger solution space is also visible in the awarding of the contracts. When a German road infrastructure project is tendered, the client provides a very detailed reference design that was planned together with engineering firms, for contractors to adopt. In practise, contractors almost always adopt the suggested reference design completely. Even though this is not mandatory and the project is described in a functional way, contractors often choose to entirely adopt this reference design (including the risks). The main reasons, according to the interviews, for this phenomenon are the detailed track decision procedure upfront and the lack of stimulation or rewarding from the client side to come up with other creative solutions. The contracts are still awarded predominantly on price and the EMAT-criteria are not weighted high enough. The contractors therefore currently do not receive an incentive to use all space available. Besides the more substantive differences, there is also the language barrier. Both in the Netherlands and in Germany most tender documents and contracts are in their own language, which makes it hard for contractors to engage in cross-border contracting.

In conclusion, it can be stated that there are definitely existing differences or barriers when comparing Dutch or German infrastructure projects. The question remains if these differences are related to the existing cultural differences. Some of the scores on Hofstede's six cultural dimensions were easy to recognize during the case studies and interviews, but others were not. The more restraint society in Germany was one cultural aspect that became very clear during the cases. The German system regarding infrastructure projects is one with an extensive amount of regulations. The contractors also emphasized this as the main reason why they do not get more space to contribute. However, Germany scores higher on long-term orientation than the Netherlands, which was something that did not come forward during this research. In the construction industry Germans seem to show a more reserved attitude in following the developments towards a bigger solution space for contractors. Further research will be needed to find out why exactly the Germans are relatively behind on following this movement.

9. RECOMMENDATIONS

The recommendations that are presented below represent the outcome of the observations that were made during the literature study as well as the review of the two cases; Germany and the Netherlands.

If public clients would like to benefit more from the opportunities a bigger solution space for contractors can offer, it will be recommended to take the following aspects into account:

- (1) It starts with the determination of public policy. If there are too many regulations or a track decision that is already very fixed, contractors will not have enough space to use their expertise and optimize the project. If market parties can prove their experience with for example references of past projects, the public authorities should have more faith in the knowledge of the market and loosen the regulations to some extent.
- (2) The same goes for the factors that influence the solution space that are determined by the client. To increase the solution space, the project specifications should not be too detailed. Even though the projects are specified in a functional way, the specifications currently use so many norms and guidelines, that the solution space stays limited. Public clients should be careful not to use these norms and regulations to deal with their uncertainty. Since the responsibility is now transferred to the contractor, an incentive is created to deliver high quality. Another important factor is the awarding of the tender bids. It is very important for clients to put a high (monetary) incentive on quality aspects to stimulate the use of the solution space for contractors within a project. Otherwise it will not be attractive for contractors to use the given solution space and invest into delivering high quality. In the Netherlands, it was observed that Rijkswaterstaat is very active in formulating SMART qualitative criteria. Furthermore, the monetary incentives proved high enough for contractors to invest in creative and innovative ideas. The bids show significant differences; the contractors put a lot of effort into the quality aspects defined in the EMAT criteria. In Germany, however, the public clients are not yet aware of the benefits that can be achieved with qualitative measures. They are still insecure when it comes down to comparing offers on qualitative aspects. It is recommended that they would formulate the aspects in a SMART way and moreover install a jury to evaluate these qualitative aspects. Therefore, cross-border contracting would be the ideal solution, since both countries will benefit.
- (3) When a real big technical solution space is requested to for example innovate within a project, the financing component seems to be a limiting factor. However, the most integrated contract form DBFM(O) with the inclusion of maintenance is also a stimulation for the client to provide a bigger solution space. As the inclusion of private investors is preferable for a lot of reasons, a solution needs to be found were private investors are involved and at the same time more room for innovation is

created. Further research on more of these projects will be needed into the drivers of the financiers to work on this solution.

Furthermore, when contractors consider cross-border contracting they are still facing some existing barriers as identified during this study. Reducing or even removing these barriers will create opportunities for other market parties and increase the competition on the market. The following will be generally recommended to make it easier for contractors to compete in tenders within other European countries:

- (4) Currently most of the tenders are published in the countries own language. This creates a barrier for contractors from other countries to compete. It would make it easier if all European tenders would be in for example English. Appendix F for now offers a small help with a list of translations of construction related terminology.
- (5) The same goes for the differences in contracts. Maybe it would help if the European union would develop a European norm for contracts. Further research would be needed into the effects of standardized contracts with infrastructure projects throughout Europe.
- (6) Another solution could be to establish an institution that will help foreign contractors with understanding local regularities and the state of affairs.

Besides the general observations on the barriers for cross-border contract, the research objectives also entailed to identify the opportunities for Dutch contractors in Germany.

- (7) The Dutch could help by sharing their knowledge on the use of integrated contract forms with infrastructure projects and especially how the projects are being evaluated and learned from. Rijkswaterstaat is very strong in reviewing tenders and using knowledge from past projects for future ones. Because of the federal state system in Germany and the fact that all different federal states evaluate their PPP experiences by themselves, not many lessons that are learned are actually shared. The "island" culture in Germany slows down the developments in the field of tendering infrastructure projects. To solve this problem it would be recommended installing an overarching organisation that monitors all PPP projects and moreover communicates knowledge between the different states. Eventually this could evolve into a "federal wide policy" regarding the tendering of integrated contract forms. This would stimulate the developments in the construction sectors and improve the reputation of PPP's.

10. DISCUSSION

The conclusion and recommendations of the research are based on a literature review and two case studies of Germany and the Netherlands. The choice for these two countries was made because of their Geographical location relative to each other and the opportunities both countries can create for one another. When addressing the issue of cross-border contracting within Europe, further research would be needed into the situations of other European countries to get a more complete overview of the existing barriers.

Moreover, within the two countries, six infrastructure projects were reviewed with a document analysis and interviews. Five of these projects concerned a road construction and one a sea lock. This amount of cases is not enough to draw any general conclusions. However, if interesting influencing factors on the solution space were identified, interviewees were also asked if they could recognise the phenomena in other projects they worked on. In the future it would be interesting to test the found factors and the size of the solution space in more infrastructure projects and also in other countries like mentioned earlier.

The six projects within the cases were also not picked randomly. Because of the confidentiality of a lot of the information needed, the research was dependent on the clients and contractors that were willing to provide this information. It would have been valuable to look at other object infrastructure projects in addition to the sea lock project. Now it seemed that the sea lock projects provided a bigger solution space for contractors compared to the five road projects, however, more projects will need to be reviewed to really draw this conclusion.

The focus of this research was on DBFM(O) contracts. It also would be interesting to find what influences the solution space in other contracts. Some interviewees already mentioned that a D&C contract could be a better choice for very complex infrastructure projects like the sea lock. The scope of the DBFM(O) contract is rather fixed it offers not enough space for optimizations. As infrastructure projects are very complex with a high level of uncertainty, DBFM(O) would maybe not be the right contract. On the contrary, in Germany, were a lot of projects are still procured in a traditional way, one would expect more innovations. This was not observed in German cases. Also the expert with experience in both countries confirmed to seeing more innovations within the Dutch projects, than in the German ones.

It would be ideal if a situation could be created were private investors can be involved without limiting the solution space too much as already mentioned in the recommendations. The public client could maybe come up with an incentive for the financiers, some kind of subsidy for example, if innovative/sustainable ideas are incorporated into the project. Or offering an accelerated procedure with less regulation that will make it easier and less time consuming to set up a project. Obviously these ideas will need a lot of further research for this complex issue.

The research also showed how Germany seems to be a little behind in the development of providing more solution space for the contractor. The reason for this did not become

completely clear during this research. The interviewees blamed the extensiveness of regulations present, however, regulations also can be adapted or changed. It would have been interesting to speak to the central policy makers in Germany to hear why not more solution space to contractors is being stimulated. Unfortunately it turned out not to be possible to arrange such meeting in the time frame of this research. The federal state system was also mentioned in the research as being a limiting factor in the developments towards more freedom for the contractor. As not much knowledge is shared, every state has to learn by itself and this will probably go more slow than if experiences would be shared.

When looking to other industries in Germany, like energy, the country seems to be ahead of others. What incentive would the German government need to start stimulating bigger solution space for contractors? Or do they have particularly reasons to stay with the traditional approach. On the other hand all the documentation confirmed the development towards integrated contracts, only the focus remains mainly on the lowering of cost of the projects instead of also wanting to stimulate smarter solutions. If contractors would get the freedom to contribute more, a lot of changes will be needed in the organisation of the projects as well.

At this moment engineering firms in Germany are used to operate on the client side of the project. The interviews confirmed the current unwillingness of these firms to go along with the developments towards more freedom for contractors. However, if engineering firms operate on the side of the contractors; this allows them to design a plan that is customized to the possibilities of that specific market, and thus also more cost-efficient. The resulting higher level of differentiation between the parties then increases the competition on the market, which will benefit the delivered quality. In the Netherlands, this development has already taken place. For the engineering firms this could also be an opportunity. For every project there is only one public client, but at least three different contractors in need of engineering firms to design their plans.

Furthermore as this research focussed on the solution space within the integrated contracts, not all disadvantages like higher transaction cost and maybe loss of professionalism of the public clients could be incorporated into the cases. As mentioned in the literature study, the transaction costs are higher compared to traditional contracting. Preparing a bid for a DBFM(O) contract costs a lot of time and money for the contractors and only one market party will win in the end. Also with privatising more and more, public clients lose a lot of in-house expertise and a risk could be that it will be harder for them to manage or control complex infrastructure project. Currently a lot of expertise is hired from for example consultant but this is also an expensive solution. A balance needs to be found and public clients need to stay professional enough to be in the position to control.

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