Flexibility of integrated contracts

Impact of contract changes in Dutch DBFM and UAC-IC 2005 based infrastructure projects

N.A. (Nikki) van Leeuwen | Master Thesis
FLEXIBILITY OF INTEGRATED CONTRACTS

Impact of contract changes in Dutch DBFM and UAC-IC 2005 based infrastructure projects

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21 August 2015

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This master thesis about the flexibility of integrated contracts is written as a part of my graduation project for the Technical University of Delft. During my master program Construction Management and Engineering, I did an internship at the DBFM project SAAone in the contract management department. Here, I learned a lot about integrated contracts and contract changes, and got insight in the actuality of flexibility of integrated contracts. This inspired me to go into this topic, and I am very glad that I got the opportunity to study this topic at VolkerInfra, and to get an insight in the world of Dutch DBFM and D&C infrastructure projects.

I would like to thank those that have contributed to this research both directly and indirectly. First of all, Rogier, thank you for guiding me throughout the entire process. Once in a while I was lost in my own research, but you were able to bring me back on the road, which resulted in a better and more structured thesis in the end. Monika, your knowledge of contract law helped me to understand this quite unknown terrain, and this offered me the opportunity to focus on the legal side of the topic as well. And Leon, due to your challenging questions about the flexibility of agreements, I was able to obtain the clear scope of this research. Ivo, thanks for all your support during the entire process. Also during hard moments you were able to cheer me up and bring me back on track. For all of you, your challenging questions and personal interest helped me to reach my end goal and write this thesis.

Further, I would like to thank all the participants to my research of VolkerInfra and other contractors. I am very grateful that you have made available all data, and I enjoyed the discussions with you about the topic. Without you it was not possible to carry out this study, anyway.

Last but not least, I want to thank my family and friends for all their support and unconditional trust in a good outcome!

Enjoy reading,

Nikki van Leeuwen
Delft, August 2015
Introduction

Integrated contracts\(^1\) are currently the standard and widely implemented for Dutch infrastructure projects. These integrated contracts do have a longer contract duration than traditional contracts because more obligations of a contractor are integrated in one contract. The integration of these obligations results in advantages, such as more design and life-cycle optimisation (Eversdijk & Korsten, 2009, p. 6). However, integrated contracts are often perceived as inflexible (Eversdijk & Korsten, 2009, p. 8; National Audit Office, 2011, p. 13). This is especially the case for DBFM contracts, which have a contract duration of twenty or even up till thirty years (Koster et al., 2008, p. 25). It is obvious that during these long periods things will occur in conflict with the agreement\(^2\), varying from changing circumstances within the field of law, technology, user, asset owner and service contractor demands. In all probability, these circumstances will require adjustments to the actual agreement, which are called contract changes. In this research, flexibility of an agreement is defined as ‘the ease of adjusting the agreement, measured by the process time of contract changes and by the impact of contract changes in time and costs, to accommodate changing circumstances within the context of the agreement.’

Theoretically, the actual change procedures of the current integrated contracts should be able to facilitate contract changes in a flexible manner (Roosjen, 2013, p. 64). However in practice, these procedures are considered to be ineffective and inefficient (Hamdan, 2011, p. 15). Furthermore, the final results of the contract changes are ‘experienced’ to be expensive (Eversdijk & Korsten, 2009, p. 8). In order to study the actual flexibility provide by integrated contracts, the following research question is subject to this Master research project: ‘To what extent do integrated contracts provide flexibility for legally accommodating changing project circumstances, within the actual DBFM and UAC-IC 2005 based agreements in the Dutch infrastructure sector?’

The research question is studied by gathering and analysing data of approved contract changes of fifteen Dutch infrastructure projects. The definition of flexibility is expressed in the following suppositions, which are used to analyse the gathered data:

\[ S1: \text{Contract changes with a long process time are a result of an inflexible agreement} \]
\[ S2: \text{Contract changes with a high impact in costs are a result of an inflexible agreement} \]
\[ S3: \text{Contract changes resulting in a critical time delay are a result of an inflexible agreement} \]

Figure 1  Flexibility scores divided into process time (S1), cost impact (S2) and time impact (S3)

\(^1\) Integrated contract: contract models studied in this research are the DBFM Model Agreement version 4.1 and UAC-IC 2005 contract
\(^2\) Agreement: actual contract between two or more parties
Each of the suppositions is expressed into a scoring model. In this way, the average process time of handling a contract change, and the total relative cost and time impact of contract changes is scored from one to five for all these fifteen projects. Together, the individual scores form the flexibility score appointed to an agreement as illustrated in figure 1. Apart from the flexibility scores, also data is gathered characterising the complexity of the projects, the change events and the actual change procedure as used in the projects. These context parameters are used to explain the differences in flexibility scores of the studied agreements.

Results and conclusions
By analysing the flexibility scores of the fifteen projects and the individual contract changes per project, some observations are made regarding the flexibility of an agreement. The observations are grouped per supposition.

The first group of observations concerns the process time of a contract change (S1). First of all, it is observed that the process time vary substantially per project and per contract change. This is attributed to the fact there is no real uniformity in the ‘official’ initiation moment of a contract change. Therefore, an objective comparison of the process time is in any case rather difficult. However, by testing the average process time of contract changes per project, 40% of the projects exceeds the flexibility indicator (15% of the design and construction phase) on this element, which indicates possible inflexibility of the agreement. Moreover, the deadlines set in the change procedure are not reached in all cases, because there is no management towards meeting the deadlines as mentioned by interviewed contract managers. Furthermore, the actual process time of a contract change is only partly affected by the contractual change procedure; also the handling of the agreement is decisive. At last, there are reasons appointed to expect that internal processes such as the mandate of the contracting parties or the formality of the inter-organisational collaboration influence the process time of a contract change.

The second group of observations regards the cost impact of a contract change (S2). First, it is observed that the total cost impact of contract changes exceed for about 85% of the studied projects the flexibility indicator (10% of the weighted contract value) of the cost impact scoring model. However, by analysing the individual contract changes it is observed that the total cost impact is in approximately 65% of the projects influenced by only one contract change with an extreme cost impact. These contract changes are caused by either changes in law or regulation initiated by a stakeholder to the project, or by scope changes initiated by a member of the project organisation due to incorrect assumptions. The latter only apply to UAC-IC based agreements, as the risks of incorrect assumptions is allocated to the contractor in DBFM agreements. The high impact of contract changes caused by changes in law or regulations is attributed to the fact that these changes are political decisions, made by parties not directly involved in the project. As a result, the impact is hard to control by the contracting parties. At last, all other contract changes are observed to have a cost impact below 10% of the weighted contract value, by which they are perceived to be flexible.

The third group of observations is related to the time impact (S3). At first, it is observed that there is a time impact due to a contract change in 60% of the studied projects. However, the time impact is related to one or up till three contract changes per studied agreement. Also in this case, these contract changes are caused by changes in law or regulation or internal scope changes. This indicates a strong relation between the time and cost impact of a contract change. The reason for changes in law or regulation is equal to the reason by the contract changes with high cost impact. Further, the other contract changes in an agreement are adjusted within the context of the agreement considering the time aspect, by which they are perceived to be flexible.

Overall, the integrated contracts only contribute in a limited way to the flexible process of a contract change, as the process time is also defined by the handling of the actual agreement. Furthermore, both the DBFM Model Agreement and the UAC-IC 2005 are inflexible towards changes in law or regulation, despite the

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3 Process time is related to design and construction phase of a project (contract date to completion date)
4 Weighted contract value is the initial contract value logarithmic related to the project progress
allocation of the risk to the contracting authority or employer. The UAC-IC 2005 is also inflexible towards scope changes due to incorrect assumptions. In the DBFM Model Agreement, the risk of incorrect assumptions is allocated to the contractor, by which the risk is better controlled. For all the remaining contract changes, both integrated contracts provide sufficient flexibility.

Recommendations

This research has been limited in time and scope, by which not all aspects of flexibility of integrated contracts are studied yet. However, already some practical recommendations are drawn, in order to improve the current contractual change procedures, and thereby the flexibility of integrated contracts.

- Changes in law or regulation can have a large impact on the agreement. In the current contract models, the risk of a change in law is allocated to the employer or contracting authority. The risk can be relocated to the contractor, but they cannot control the risk of changes in law; they only can control the impact of the contract change. Therefore, it is recommended to control the risk together by both contracting parties. First the employer have to control the political influence and thereafter, the contractor is responsible for the best possible implementation of the contract change.

- The UAC-IC 2005 is inflexible towards scope changes due to incorrect assumptions. In the DBFM Model Agreement, the risk of these incorrect assumptions is allocated to the contractor. It can be a solution to transfer the risk of incorrect assumptions to the contractor in the UAC-IC 2005 as well. However, the employer has the information regarding the technical conditions and the soil conditions. Therefore, it is recommended to share this information in the pre-award phase and thereafter the responsibility of incorrect assumptions can be allocated to the contractor.

- The integrated contracts do not provide sufficient flexibility for small contract changes without time and cost impact. These contract changes often concern additional arrangements between contracting parties. There is need to capture these arrangements in order to avoid discussion in a later phase of the project. Therefore, it is recommended to adjust the current division of contract changes. The new division should be: small contract changes without cost and time impact, and other contract changes with cost and time impact.

In order to further substantiate the conclusions of this research, the following subjects are proposed for further research:

- **Track results of contract changes in integrated contracts**: The conclusion of this research is based on a relatively small data set of projects, of which most of the projects are not completed yet. In order to generalise the outcomes of this research, more preferably completed projects need to be analysed in the same way.

- **Experiences and results abroad**: This research is limited to the Dutch situation, but comparable contract models are used in surrounding countries. As the cultural backgrounds and the legal context are different in these countries, it would be interesting to study the impact of these differences on the flexibility of the contract models.

- **Grounds of refusal of withdrawn contract changes are unknown**: In this research only approved contract changes are analysed in depth, but there are also withdrawn or refused contract changes observed. Further research to these withdrawn contract changes and the grounds of refusal may probably lead to knowledge about certain contract changes that under no circumstances can be processed in the agreement. This also provides knowledge about the extent of flexibility provided by integrated contracts.

- **The decision process in the actual projects**: The process time is influenced by both the contractual change procedure and the decision process in a project. The latter is yet not studied in this research, but should be studied by focusing on: the decisiveness of project managers; the trust between the contracting parties; and the flexibility of the project itself towards the end of the project.
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<td>CAC</td>
<td>Contracting Authority Change (Dutch: Wijziging Opdrachtgever (WOG))</td>
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<td>DBFM</td>
<td>Design, Build, Finance, Maintain contract</td>
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<td>DCC</td>
<td>Dutch Civil Code (Dutch: Burgelijk Wetboek (BW))</td>
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<td>EPC</td>
<td>Engineering Procurement and Construct</td>
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<td>HR</td>
<td>Supreme Court (Dutch: Hoge Raad)</td>
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<td>IA</td>
<td>Implementation Agreement (Dutch: Uitvoeringsovereenkomst (UVO))</td>
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<td>PFI</td>
<td>Private Finance Initiative</td>
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<td>RvA</td>
<td>Arbitration Board for the building industry (Dutch: Raad van Arbitrage voor de Bouw)</td>
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<td>SPC</td>
<td>Special Purpose Company</td>
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<td>UAC</td>
<td>Uniform Administrative Conditions for the Execution of Works 2012 (Dutch: Uniforme Algemene Voorwaarden 2012 (UAV 2012))</td>
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### NOTES

- ‘contracting authority’ is the term used in procurement law, but in the context of this research it is used interchangeably with the contractual term ‘employer’
- Judgements by the RvA and HR are publicly available by searching their case number
- Reports by the Dutch Parliament (Kamerstukken I & II and Handelingen I & II) are publicly available by searching their report number
1 Introduction

Integrated contracts are often named inflexible, especially DBFM agreements (Eversdijk & Korsten, 2009, p. 8). But are they as inflexible as it seems, and what can be seen as flexibility in terms of an agreement? This research will give answers to these questions on the basis of data gathered from actual projects, and will try to give more insight into the processing of the agreement in changing circumstances.

1.1 Introduction to the subject

In the contracting of large infrastructure projects, four trends can be recognized (Altamirano, 2010, p. 6): combined or integrated contracts, a shift from technical requirements to functional or even performance based specifications, indirect financing of projects, long term contracts and alternative awarding criteria besides price.

Traditionally, the employer prepares a contract, in which all requirements are specified up to the technical details. The contract including these technical details is awarded to a contractor. He is responsible for the execution of the work. As basis for this type of agreement, the Uniform Administrative Conditions for the Execution of Works 2012 (UAC) are often used.

Since 2000, the so called integrated contract model is used in the Netherlands. Actually this is an umbrella term for many forms of this contract model (Chao-Duivis, 2013b, p. 26). All forms have in common that the contractor has more tasks and therefore bears more responsibilities than the contracting authority\(^5\) during the execution of the project. These responsibilities can be limited to the design and construction works of the project, but they can also be extended to the maintenance and exploitation of the project. In the Netherlands, this contract form is often subject to the Uniform Administrative Conditions for integrated contracts 2005, which is mainly employed for infrastructural works (Koning, 2013, p. 100).

In 2007, the Dutch government articulated his ambition on more structural application of public-private partnerships (PPP) in any form for new infrastructure projects\(^6\). This ambition is also recommended by the

\(^5\) ‘contracting authority’ is the legal term used in procurement law, but in the context of this research it is used interchangeably with the contractual term ‘employer’

\(^6\) Kamerstukken II 2007/08, 28 753, nr. 11, p. 1
committee ‘Private Financiering van Infrastructuur’, who advises to apply public-private partnerships for the realisation of publicly financed road and railway infrastructure (Ruding et al., 2008, p. 11). The commission of Ruding focuses its opinion on the DBFM contract model, but the Dutch government also gained experience with other forms of PPP such as alliances and so called ‘interweaving’.

A DBFM agreement is an extended version of the integrated contract, in which the contractor is responsible for the design, building, financing and maintenance of the project. This contract form is based on the Private Finance Initiative (PFI) in the United Kingdom (Koster et al., 2008, p. 9). In the last progress report on DBFM(O) from the Dutch government (Ministerie van Financiën, 2014), the Ministry of Infrastructure and Environment appoints that the ambition to intensify the use of DBFM projects will be visible in 2015 and 2016 by many tenders. The focus for the next years is on standardisation of the contract model, which indicates that the DBFM contract model is still under development in the Netherlands.

1.2 Definition of the problem

Integrated contracts are named inflexible in both the UK and the Netherlands (Eversdijk & Korsten, 2009, p. 8; National Audit Office, 2011, p. 13). This is especially the case for DBFM contracts, which have a contract duration of twenty or even up till thirty years (Koster et al., 2008, p. 25). During these long periods things will occur in conflict with the agreement, varying from changing circumstances within the field of law, technology, user, asset owner and or service contractor demands. In all probability, these circumstances will require adjustments to the actual agreement. In the integrated contract models, a change procedure is included in order to legally accommodate the changing circumstances. However, the change procedure is characterised as ineffective and inefficient by practitioners (Hamdan, 2011, p. 15). Furthermore, the adjustments to the agreement are ‘experienced’ to be more expensive as a result of the inflexibility of the agreement (Eversdijk & Korsten, 2009, p. 8).

1.2.1 For whom and why is it a problem?

The inflexibility of an agreement of a project is a problem for both parties involved in the agreement. The contracting authority chooses to use an integrated contract model in order to minimise coordination issues, and to make use of the innovation of the market (Jansen, 2009, p. 77). More obligations of a contractor are integrated in one contract. The integration of these obligations result in advantages, such as more design and life-cycle optimisation, which may result in cost reduction for the contracting authority and in the end ‘value for money’ (Eversdijk & Korsten, 2009, p. 6). An inflexible agreement makes it harder to reach ‘value for money’, as adjustments to the agreement are ‘experienced’ to be more expensive in an inflexible agreement (Eversdijk & Korsten, 2009, p. 8).

For the contractor, the inflexibility of the agreement has a negative influence on the project result. In order to execute the project within time and budget, the labour productivity needs to be maintained (Ibbs, Nguyen, & Lee, 2007, p. 46). One of the consequences of an inflexible agreement is the long time to process a change, due to a slow decision making process (Hamdan, 2011, p. 49). This will affect the labour productivity (Ibbs et al., 2007, p. 45). It is expected that this will be less in a flexible agreement.

1.2.2 What do we know about the problem?

Due to the long contract duration, changing circumstances will occur in the environment of the project, but the occurrence and scope of the change events are uncertain. Collingridge (1983, p. 161) mentions two strategies to deal with uncertainty in general: “hedging and flexing”. The hedging strategy focuses on minimising the risks by giving more information, details and restrictions. In contrast, “the rational decision maker should favour..."
flexible options which can be revised if they are found to be in error” (Collingridge, 1983, p. 162). The central idea of Collingridge (1983, p. 162) is that “no decision made under conditions of ignorance [uncertainty, red.] can be known to be correct.” So, flexibility is preferred in a project with uncertainties in the environment of the project.

From a project management point of view, changes and extension of the scope are identified as the most common way to create flexibility (Olsson, 2006, p. 70). These changes have to be processed in the actual agreement with minimum cost and disturbance for the project. At the moment, a change procedure is included in the contract models of integrated contracts. This procedure is used to process changes and extensions of the scope or additional arrangements which have an impact on the actual agreement. Roosjen (2013) researched which flexibility is offered by the change procedure in the DBFM Model Agreement10. She concluded there is flexibility in the DBFM agreement for minor changes, with an economical value below a predefined threshold. For major changes the flexibility is still unknown.

Further, the flexibility of a DBFM agreement also depends on interpersonal flexibility and the perspective of flexibility by the contracting parties (Roosjen, 2013, p. 65). So, the flexibility of the agreement is not only a result of the flexibility provided by the contractual provisions, but also a result of the flexibility of the people handling the actual agreement.

1.2.3 Definition of flexibility

Before the problem further can be defined, more clearness is needed about the term ‘flexibility’. Previous research on flexibility has demonstrated that it is a broad concept with not just a single definition, because it is used in various contexts (De Haan, Kwakkel, Walker, Spirco, & Thissen, 2011; Golden & Powell, 2000; Saleh, Mark, & Jordan, 2009). Moreover, there are several related concepts of similar meaning, like robustness, resilience and adaptability (De Haan et al., 2011, p. 925). For example, robustness of a system can be defined as follows: robustness of a system is the property of a system to accommodate disruptions in the system despite changes in the environment or within the system by keeping the same function (combination of (Saleh et al., 2009, p. 316; Snelder, Schrijver, & Immers, 2009, p. 4)). Applied to an actual agreement, robustness of an agreement means that all changes in the environment can be accommodated within the agreement without changing the actual agreement itself. In other words, the actual agreement do not have to be changed, as the requirements in the agreement are broad enough to accommodate the changing circumstances.

In contrast to robustness, flexibility is based on adjustment of the agreement. The same applies to the terms adaptability and resilience, there are only minor differences: adaptability defines changing in general; and resilience defines a temporary change (De Haan et al., 2011, p. 926). Flexibility defines adjustment of a system within a certain context. Applied to an actual agreement, this explanation will result in the following definition of flexibility:

_**Flexibility of an agreement is the ease of adjusting the agreement to accommodate future consequences of changing circumstances within the context of the agreement**_

1.2.4 The problem statement – what do we not yet know about the problem?

Theoretically, the actual change procedures of the current integrated contracts should be able to facilitate contract changes in a flexible manner. However, practitioners indicate that the change procedures are inefficient and ineffective (Hamdan, 2011, p. 15). This statement is based on qualitative research. In order to substantiate or nuance this statement, the combination of contract changes and the impact of these changes on the agreement need to be studied in a quantified manner. Roosjen (2013) has researched this combination, but only in a qualitative manner. So, the actual flexibility provided by the integrated contracts is yet not factual known.

10 ‘DBFM Model Overeenkomst’ of the Dutch Ministry of Infrastructure and Environment
1.3 Research object

The flexibility of integrated contracts can be studied on two levels: (1) the level of the contract models, or (2) the level of the actual agreements between contracting parties. The impact of contract changes can only be measured at the level of the agreement between contracting parties. Therefore, the research object of the research will be the actual agreement between contracting parties. Consequently, the scope of this research is limited to contract law, case law, general terms and conditions, contract models and project specific elements.

1.4 Research objective

In order to analyse the flexibility of integrated contracts, actual agreements based on the DBFM Model Agreement and on the UAC-IC 2005 contract model will be studied and compared. The use of DBFM contracts is relatively new in the Netherlands. The first version of the DBFM Model Agreement is used for the DBFM project ‘Tweede Coentunnel’ in 2005 (Rijkswaterstaat, n.d.). Until now, this model is adjusted several times through insight gained from other projects. Last year, the sixth version is released: version 4.1 (Rijksoverheid, 2014). The UAC-IC is already used for a longer period in the Netherlands, as the first version of the UAC-IC dates back to the year 2000.

In the scientific literature, there is a deficit of knowledge on the actual flexibility provided by the integrated contracts. The combination of contract changes and the impact of these changes on the actual agreement between contracting parties need to be studied in a quantitative way. Based on the method of Verschuren and Doorewaard (2010, p. 38) the following research objective is formulated:

The research objective is to fill the gap of knowledge about the actual extent of flexibility provided in integrated contracts for legally accommodating changing project circumstances in order to propose recommendations for improving the flexibility of integrated contracts. This objective will be achieved by quantitatively analysing the contract changes and the impact of these changes on the actual DBFM and UAC-IC 2005 based agreements.

1.5 Research question

In order to achieve the research objective, the following research question is formulated:

To what extent do integrated contracts provide flexibility for legally accommodating changing project circumstances, within the actual DBFM and UAC-IC 2005 based agreements in the Dutch infrastructure sector?

The research question is split up into several sub-questions, which together lead to an answer to the research question:

1. Which legal frameworks apply to integrated contracts and specifically to adjusting an actual agreement?
2. Which project specific elements need to be taken into account in defining the flexibility of an agreement?
3. By which elements can contract changes and the actual contractual change procedures be characterised?
1.6 Framework of flexibility

Based on preliminary research, three suppositions are recognised. These suppositions form together a framework of flexibility (figure 4), whereby they become a practical expression of the definition of flexibility.

S1: Contract changes with a long process time are a result of an inflexible agreement
S2: Contract changes with a high impact in costs are a result of an inflexible agreement
S3: Contract changes resulting in a critical time delay are a result of an inflexible agreement

The first supposition is related to the necessary process time to come to a contract change. A contract change with a long process time is seen as a result of an inflexible agreement (Hamdan, 2011, p. 49). The other two suppositions are related to the impact of contract changes. Cost and time overruns of projects are often a result of changes in the environment (Sun & Meng, 2009, p. 560). In addition, changing a DBFM agreement is perceived as expensive, and therefore a DBFM agreement seems to be inflexible (Eversdijk & Korsten, 2009, p. 5). Consequently, the second and third supposition read as follows: a high cost impact is a result of an inflexible agreement; and contract changes resulting in a critical time delay are a result of an inflexible agreement. Overall, these three suppositions are recognized by practitioners, but they are not substantiated by quantitative research. Therefore, these suppositions will be the basis throughout the remainder of this thesis.

1.7 Relevance of the research

In the Netherlands, the flexibility of integrated contracts is still attracting attention of practitioners and the Dutch government. In 2012, the flexibility of DBFM contracts was discussed at the conference ‘PPS werkt!’ (Rijksoverheid, 2012). The perceptions of flexibility differed in this discussion, with no clear outcome. In 2013, the ‘Algemene Rekenkamer’ 11 studied contract management of DBFM(O) contracts12, commissioned by the government. One of the conclusions is that flexibility is important in long term contracts. Recently, platform ‘Verkeerskunde’ published a dossier about DBFM in the road construction sector (Verhees, 2015). Several experts named the flexibility of DBFM contracts as a matter of concern (Van den Hof et al., 2015). This indicates that the discussion is still relevant.

1.8 Research design

The design of the research is based on the sub-questions, research question and research objective and is divided into three phases. In figure 5 the framework of the research is illustrated.

1.8.1 Phase 1 – Analytical framework

In the first phase, a literature study and desk research will be conducted on the context of an actual agreement. Eventually, this will result in hypotheses in order to qualitatively test the suppositions defined in the preliminary research. All together, this will form the analytical framework and will give answers to the three sub-questions.

11 The Dutch National Audit Office
12 Kamerstukken II 2012/13, 33 639, nr. 2
In the second phase, the variables resulting from the analytical framework will be used to gather data from various infrastructure project in the Netherlands. A data sheet will be created, which can be used to actually gather the data. Based on the framework of flexibility, scoring models will be established in order to allocate flexibility scores to the various projects. Once the data is returned, this will be analysed based on the scoring models and reflected to the hypotheses.

1.8.3 Phase 3 – Conclusions and recommendations

In the last phase, conclusions are drawn based on the conclusions from the analytical framework and from the results of actual projects. Thereafter, recommendations are made on possible adjustments of the integrated contracts in order to improve the flexibility.

1.9 Thesis outline

The thesis has been organised in the following way. Chapter 2 reflects on the theoretical background of this research. In this chapter, the three sub questions are addressed. Thereafter, chapter 3 describes the research method and the data gathered from actual projects. In addition, this chapter focuses on the analysis of the gathered data resulting in a flexibility score for every project and observations regarding the suppositions. In chapter 4, the overall conclusion of the research is drawn, and a reflection on the research is made in a broader sense. At last, chapter 5 describes recommendations for further research and practical improvements of integrated contracts.
2 Analytical framework

As described in paragraph 1.2.2, changes and extensions of scope are the most common way to create flexibility in a project. The change procedure included in the contract models is used to process these changes and extensions of scope into a contract change. In order to define the actual flexibility provided in integrated contracts, more background information is needed about contract law, project specific elements and the change procedures. This chapter will deal extensively with these concepts in order to substantiate the framework of flexibility in a theoretical way.

First, the contract models, contract law and cases are studied more in detail. Thereafter, projects are characterised in order to better understand the project complexity. Thirdly, contract changes, change events, change procedures and impact of contract changes are analysed, based on literature and desk study. At last, hypotheses are formed about the behaviour of contract changes in actual agreements. These hypotheses support the suppositions as recognised in the introduction.

2.1 Contracts

Contracts are used to capture an agreement between two or more parties. The official definition of a contract, as used in the Dutch Civil Code (DCC), reads as follows: “an agreement in the meaning of this title is a multilateral juristic act whereby one or more parties enter into an obligation towards one or more other parties” (article 6:213 paragraph 1 DCC). In this research, a division is made into the reference to contracts, as two levels of contracts do apply to this research. The term ‘contract models’ is used to refer to the standardised model agreements, in which the basic rules of an actual contract are pointed out: UAC-IC 2005 and DBFM Model Agreement. An actual contract between two or more parties will be denoted by the term ‘agreement’. Consequently, a contract model belongs to the context of an agreement.

This section will elaborate on the contract models and the applicable Dutch law in order to find an answer to the following sub question:

\[ \text{Which legal frameworks apply to integrated contracts and specifically to adjusting the actual agreement?} \]

2.1.1 UAC-IC 2005

As mentioned in the introduction (section 1.1), integrated contracts are the standard for infrastructure projects in the Netherlands. As this contract model is used so often, there is a set of general terms and conditions developed for it: the Uniform Administrative Conditions for integrated contracts 2005 or UAC-IC 2005 (from now on: UAC-IC) (Koning, 2013, p. 100). The integrated contract consists of a Model Basic Agreement and UAC-IC general terms and conditions. In the Model Basic Agreement, only specific data about the project has to be
entered to complete the agreement. In this part, more project specific elements are described, while the UAC-IC describes more process related elements of the contract. So, the UAC-IC and the Model Basic Agreement are complementary to each other.

Figure 6 shows the structure of an integrated contract. The agreement between the employer and the contractor is subject to the UAC-IC. In this agreement, the contractor may execute the design himself, or he may award the design to a consultant or architect. For contracting a designer or consultant, it can be useful the use The New Rules 2011, which are the general conditions for an agreement between an employer and an architect or consultant (Koning, 2013, p. 99). These general conditions are beyond the scope of this thesis. Sometimes a contractor needs a subcontractor or consultant to execute a part of the work. These agreements are treated in the UAC-IC clause 6.

![Figure 6 Structure of a UAC-IC contract (Koning, 2013, p. 99)](image)

2.1.2 DBFM Model Agreement

As mentioned in the introduction, a DBFM agreement is an extended version of the integrated contract. However, instead of making use of the UAC-IC 2005, a separate Model Agreement is created for DBFM agreements. The general terms and conditions are included in this contract model, instead of added in a separate document like in the UAC-IC based agreements. The DBFM Model Agreement is developed in order to standardise the use of DBFM, and to make use of the knowledge and experience gained in other projects (Koster et al., 2008, p. 4). Currently, there are two types of DBFM(O) Model Agreements: one focused on housing (DBFMO) and one focused on infrastructure (DBFM) (Rijksoverheid, n.d.). As this thesis focuses on infrastructure, from now only the DBFM Model Agreement Infrastructure will be discussed.

The Dutch DBFM Model Agreement is based on the Anglo-Saxon contracts (Koster et al., 2008, p. 9). The Anglo-Saxon legal culture has no legally defined framework for contracts, such as the Dutch Civil Code. Therefore, all effects of eventualities need to be specified in advance. Otherwise, parties are given room for their own interpretations. As a manner of speech, an English contract is ten times more elaborate than a continental contract (Van Dunné, 1998, p. 10). As a result, the DBFM Model Agreement includes very detailed specifications and it is quite voluminous in comparison with Model Basic Agreement and the UAC-IC together.

In a sense, the structure of a DBFM agreement (figure 7) is comparable to the structure of an UAC-IC based agreement. There is a direct relationship between the contracting authority and the special purpose company, and this relationship is subject to the DBFM agreement. The special purpose company (SPC) is specially founded by the shareholders of the consortium for the purpose of the project (Bregman & de Win, 2005, p. 411; Oostveen, 2013, p. 19). In order to execute the work a ‘design and build’ and a ‘maintenance’ contractor are contracted. As a rule, the ‘design and build’ and ‘maintenance’ contractors are the same as the shareholders or related companies (Oostveen, 2013, p. 19). The ‘design and build’ contractor is often denoted

Reminder: ‘contracting authority’ is the legal term used in procurement law, but in the context of this research it is used interchangeably with the contractual term ‘employer’
by EPC, which stands for Engineering Procurement and Construct, and he is responsible for the design and construction of the project for a fixed price. The ‘maintenance’ contractor is responsible for the operation and maintenance in the exploitation phase of the project, and is often denoted by M-Company or M-Co (Oostveen, 2013, p. 20). The agreements between the EPC and M-Company on the one hand, and the SPC on the other hand, are not based on standard models like the UAC-IC. In principle, these agreements have one purpose: the tasks and risks resulting from the DBFM agreement have to be contracted one-to-one to both subcontractors (Oostveen, 2013, p. 19). An exception is the obligation of the SPC to finance the project, which will continue to be a responsibility of the SPC.

![Diagram of DBFM agreement](image)

**Figure 7** Structure of a DBFM agreement (Oostveen, 2013, p. 20)

### 2.1.3 Dutch contract law

In the Netherlands, there is a legally defined framework, the Dutch Civil Code (DCC). Both the UAC-IC (clause 48) and the DBFM Model Agreement (clause 24.1) are subject to Dutch law. In the Model Basis Agreement (complementary to the UAC-IC), the parties declare that they regard the agreement as a contract for work on goods as referred to in Book 7, Title 12 Section 1 Civil Code (clause 1.1). In the DBFM Model Agreement, the articles of Book 7, Title 12, Section 1 are explicitly excluded from the agreement, even as the Articles 7:400 to 7:413 (clause 24.2). Furthermore, Book 6 is applicable to both contract models, as this book describes contract law. The following three articles of the DCC are identified as specific articles applicable to adjusting an actual agreement. Therefore, these articles are studied more in detail, and case law related to these articles is analysed.

- Article 6:258, paragraph 1 and 2, DCC: Unforeseen circumstances
- Article 7:753 DCC: Cost increasing circumstances (not applicable to DBFM agreements)
- Article 6:248, paragraph 2, DCC: Reasonableness and fairness

#### 2.1.3.1 Unforeseen circumstances (Article 6:258 DCC)

In the DCC, there are provisions included about unforeseen circumstances. In juridical terms, unforeseen circumstances are circumstances that are not provided for in the agreement, and they are not circumstances that were not foreseen or foreseeable (Bakker & de Groot, 2009, p. 369). In the text box below, the provisions are described. Van Dunné (1998) has written a preliminary advice about unforeseen circumstances in building law. In this advice, he is looking for the boundaries of a contractual partner, that apply if this partner is not able to execute the agreement as agreed upon, due to circumstances beyond his control.
Not every circumstance that is not provided for in the agreement will lead to a going to court in order to adjust the agreement. The actual agreement only may be adjusted if the non-adjustment of the agreement will lead to an unacceptable situation, taking into account the criteria of reasonableness and fairness (Chao-Duivis, 2013b, p. 8). Another prerequisite for appeal is that the reason for appeal by one party is not attributable to his own act or omission in more than a negligible extent (article 6:258 paragraph 2).

Further, Van Dunné (1998, p. 71) states that article 6:258 implies that only the court is authorised to adjust the agreement based on this article, and not the parties themselves. This can be derived from the first part of article 6:258, paragraph 1: “On application by one of the parties”. In contrast, Hijma (2013, p. 24) argues that also the contracting parties themselves may adjust the agreement based on article 6:258. Both parties may expect that the best possible outcome will be reached by mutual agreement. This is a result of the principle of reasonableness and fairness (article 6:248; elaborated in subparagraph 2.1.3.3), which can be seen as complementary to article 6:258 (Hijma, 2013, p. 24). Following the reasoning of Hijma (2013), first the parties themselves have to negotiate about a possible adjustment. If they cannot reach an agreement, they may invoke the court which may decided upon the disagreement.

In the DBFM Model Agreement of Rijkswaterstaat (2013), an article about unforeseen circumstances is included in the main agreement (Clause 24.8 ‘Unforeseen circumstances’, see text box below). Due to this provision, the parties declare there is no room for application of article 6:258 DCC (Koster et al., 2008, p. 35). The idea is that the responsibility for the management of risks and for the consequences of the remaining risks are divided between the contracting parties, so unforeseen circumstance can hardly happen (Van Wassenaer, 2009, p. 216). In principle, the contractor is responsible for all risks, unless there is a so-called delay event, compensation event or force majeure event, as mentioned in clause 9 ‘Supervening events’. However, according to article 6:250 DCC, the article of unforeseen circumstances is mandatory law, and therefore it is not possible to exclude this article (Bakker & de Groot, 2009, p. 369). So, by extensively describing the supervening events, the influence of article 6:258 is only decreased, as they become foreseen. As far as known by the researcher, there are no cases in which one of the contracting parties of a DBFM agreement has invoked article 6:258 DCC.

**DBFM Model Agreement - Clause 24.8 Unforeseen circumstances**

With respect to the occurrence of unforeseen circumstances the Parties agree that they have willingly and wittingly entered into this long-term Agreement and that the mechanisms that are included in this Agreement are already intended to deal with the consequences of any possible unforeseen circumstance that may arise. (Rijkswaterstaat, 2014a)

Instead of describing possible circumstances extensively as in the DBFM Model Agreement, the UAC-IC describes in clause 44-1(c) how to act in case of an occurring unforeseen circumstance:

"the Contractor shall be entitled to cost compensation and/or extension of time only if an unforeseen circumstance arises the nature of which is such that, according to the standards of reasonableness and fairness, the Employer cannot expect the Contract to be maintained unaltered."
In the explanatory document of the UAC-IC, the minority of the differences between UAC-IC clause 44-1 (c) and article 6:258 DCC is emphasised (CROW, 2005b, p. 98). However, Van Dunné (1998, p. 16) states that UAC 1989 clause 47 differs on some points from the general clause of article 6:258 DCC, and clause 44-1 (c) is based on the UAC 1989 clause 47 (Bleeker, 2014b, p. 714). The UAC 1989 clause 47 concerns cost-increasing circumstances and a cost increase of 5% of the contract value can already give rise to additional payment by the employer (Van Dunné, 1998, p. 140). By way of contrast, such an increase in costs will not lead to adjustment of the agreement by applying article 6:258 DCC, because this article is written for a situation in which there is a dramatic change in costs (Van Dunné, 1998, p. 70).

For both the UAC-IC and the UAC, there are a number of judgements, which will give more insight into the use of the general article 6:258 and the specified clauses (UAC-IC clause 44-1 (c), and UAC clause 47) in the contract models. The remainder of this subparagraph describes relevant case law, from which can be learned in relation to the flexibility of an actual agreement. Before the case law is studied more in detail, a remark have to be made about article 6:258. In the case ‘Nationale Volksbank – Helder’ in 1984, the Supreme Court has stated that ‘restraint should be exercised’ by the court in case of acceptance of an appeal to unforeseen circumstances (Van Dunné, 1998, p. 63).

The available judgements of the courts can be classified by subject. The judgements often have to do with undesirable consequences of an agreement or economical or social developments (Bakker & de Groot, 2009, p. 372). Each of these subjects will be analysed further with an appropriate example of case law.

The first example is about undesirable consequences of an agreement. Case law on 6:258 DCC and clause 47 of the UAC is often about the natural soil conditions that were not as expected, or about obstacles that had been found in the soil and which were not expected (Van Dunné, 1998, p. 110). In the UAC, the risk for these soil defects was situated with the employer. However, in the UAC-IC (clause 13.1), the premise can be found that delay, defects or damage resulting from the coordination of the work on the ground conditions are the responsibility of the contractor. Especially in the infrastructure sector, this premise leads to resistance, as this is a sector in which assumptions are made regarding the situation below ground level (Bleeker, 2014a, p. 611). In a judgement of March 30, 2010, the arbitrator ruled that the presence of obstacles in the ground cannot be ranked under ‘soil conditions’. So, it can be assumed that the risk for such obstacles lies with the employer. A similar judgement is been made in February 22, 2008, which states that the contractor had no need to consider undetonated explosives in the soil. As a result, case law has showed that also under UAC-IC, the soil needs to be seen as a good that is made available by the employer, and therefore the risk of unforeseen obstacles in the ground is allocated to the employer.

Economical developments can be another reason to invoke article 6:258. There are several examples of cases about price increases in the UAC, like increases of steel prices, in which parties invoke article 6:258. As far as known by the researcher, there are no cases about unforeseen price increases related to the UAC-IC. Further, the judge has taken cases into consideration in which the recent credit crisis was invoked as unforeseen circumstance. These cases were mainly related to the real estate sector, and therefore out of scope for this thesis. Based on judgements in other cases about unforeseen economical developments, the following general conclusions can be drawn. In general, economical developments do not qualify as unforeseen circumstances, as they belong to the economic risk of a contractor (Bakker & de Groot, 2009, p. 374; Snijders & De Tavernier, 2013, p. 10). However, there may be exceptional circumstances, that justify an adjustment of the agreement, like exceptional increases of steel prices.

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14 HR April 27, 1984, NJ 1984, 769
15 RvA March 30, 2010, No. 31.703, r.o. 30
16 RvA February 22, 2008, No. 28.942, r.o. 20-22
17 RvA May 6, 2008, No. 28276, r.o. 5e-g
In summary, law gives room for dealing with circumstances that are not provided for in the agreement by article 6:258 BW. But invoking article 6:258 can only be done in case non adjustment of the agreement leads to an unacceptable situation. The UAC-IC contract model leaves more room for invoking article 6:258 than the DBFM Model Agreement, because in the DBFM Model Agreement circumstances are more extensively described. In case parties cannot reach agreement about an unforeseen circumstance, they can request the court to decide upon the best possible outcome. Reasonableness and fairness will prevail in this judgement, and restraint have to be exercised.

2.1.3.2 Cost increasing circumstances (Article 7:753 DCC)
The DCC provides a legislation for contracted work in Book 7, Title 12. As mentioned in the introduction of this paragraph (2.1.3), articles 7:400-413 and 7:750-769 DCC are excluded from the DBFM Model Agreement (clause 24.2). However, these articles are still applicable to the UAC-IC. Execution costs of a project can become higher due to circumstances that were not foreseen on beforehand. Article 7:753 DCC foresees in cost-increasing circumstances, and can be seen as a clarification of article 6:258 for circumstances that arise after conclusion of the agreement (Bleeker, 2014b, p. 714; van den Berg, 2013, p. 324). At request of the contractor, the court can decide to adjust the agreed price entirely or partially in proportion to the cost increase (van den Berg, 2013, p. 325). However, the contractor needs to warn the employer as soon as possible, in order to retain the use of article 7:753. The only remarkable difference with article 6:258 is the missing of the word ‘substantial’ in article 7:753, whereby article 7:753 is less rigid than 6:258 (Bleeker, 2014b, p. 714).

**Article 7:753 DCC**

1. Where, after entry into the contract, circumstances arise or become apparent that increase costs and that are not attributable to the contractor, the court may, upon the demand of the contractor, adjust the stipulated price to the cost increase in whole or in part, provided that the contractor, in setting the prices, was not obliged to take the likelihood of such circumstances into account.
2. The contractor may adjust the price without judicial intervention, if the cost increases is the result of incorrect data provided by the client, which are relevant for the setting of the price, unless the contractor should have discovered the inaccuracy of the data before the determination of the price.
3. The provision of paragraph 1 and 2 apply only if the contractor has warned the principle as soon as possible of a price increase, so that the latter can exercise in good time the right to which he is entitled under Article 7:764 or make a proposal to limit or simplify the works. (Warendorf et al., 2009, p. 891)

2.1.3.3 Reasonableness and fairness (Article 6:248 DCC)
Reasonableness and fairness is an often mentioned term in contract law (Smits, 1995, p. 81). Actually, this term refers to unwritten law, and therefore, it is hard to give a practical definition. In literature is referred to it as an open or vague term (Smits, 1995, p. 82; Valk, 2010, p. 299). In article 3:12 DCC some views are given, which should be taken into account in determining this term. Reasonableness and fairness are: generally recognised principles of law, prevailing Dutch legal positions and relevant social and personal interests (article 3:12 DCC). The importance of these views will be determined case by case. This is also a downside of this open term; the court or arbitrator will apply the general views of reasonableness and fairness to the case, but also the circumstance of the case are of interest. This makes the outcome of an invoke on the term uncertain (Smits, 1995, p. 82). Because the outcome differs from case to case, the description of the term reasonableness and fairness in this subparagraph gives general areas of concern, in order to explain the application of the term in the context of this thesis.

The field of application of reasonableness and fairness can be distinguished into the type of relationships to which reasonableness and fairness apply, and into the meaning of the term within those relationships (Smits, 1995, p. 88). In principle, the term reasonableness and fairness does not only apply to contract law, but actually to every legal relationship (Hartkamp & Sieburgh, 2010, p. 336). Within these relationships, the court should always try to obtain a fair outcome. In other words, a contractual or legal provision may not prevent a fair
outcome (Smits, 1995, p. 88). Besides an instrument for court, the term reasonableness and fairness also indicates a behavioural standard (Smits, 1995, p. 94).

In article 6:248 DCC, the two effects of reasonableness and fairness are described. In first place, these effects have no direct impact on determination of a legal relationship (Smits, 1995, p. 85). The effects will only be considered, if the established rights and obligations of the relationship are not adequate (Smits, 1995, p. 86). The first effect is the additional effect (Hijma, 2013, p. 18). In case there are parts not regulated in an agreement, the court is authorised to add rules, while the rest of the agreement will be maintained (Valk, 2010, p. 300). The other effect is the restrictive effect, which is described in 6:248, paragraph 2. By this effect, the law leaves room for setting aside an agreement either fully or partially, given the consequences of the case (Chao-Duivis, 2013b, p. 2; Valk, 2010, p. 300). For the restricted effect, reluctance should be preserved. Initially, the term requires fidelity to the given word and only in an unacceptable situation arising from the law or agreement, the restricted effect can be applied (Valk, 2010, p. 300).

**Article 6:248 DCC**

1. A contract not only has the juridical effects agreed to by the parties, but also those which, according to the nature of the contract, apply by virtue of law, usage or the requirements of reasonableness and fairness.
2. A rule binding upon the parties as a result of the contract does not apply to the extent that, in the given circumstances, this would be unacceptable according to standards of reasonableness and fairness. (Warendorf, Thomas, & Curry-Summer, 2009, p. 711)

In the UAC-IC the term is mentioned several times. First, the term can be a ground of refusal of a contract change, which was entrusted by the employer (clause 6-b). Still, it is an open term, so the exact ground of refusal is unknown (Bleeker, 2014b, p. 711). A decisive answer can be given by arbitrators, but the contracting parties first have to try to reach agreement by themselves. The same applies to clauses in which the contractor is obliged to comply with a request, within the boundaries of reasonableness and fairness (clause 4-5, 4-7, 44-7, 45-5). At last, the term is associated with unforeseen circumstances in clause 44-1 (c) of the UAC-IC. Here, the term indicates that the consequences of the unforeseen circumstance have to be unacceptable in an objective sense, and not ‘according to the subjective opinion of the court’ (Chao-Duivis, 2013b, p. 24).

In contrast to the UAC-IC, reasonableness and fairness is not mentioned as pair of concepts in the DBFM Model Agreement, neither is good faith. This can be attributed to the origin of the contract. In the UK, they are not familiar with good faith as a general rule of contract law (Van Dunné, 2015, p. 3). However, this has no consequences for the applicability of the terms and article 6:248, because this article applies to all legal relationships.

Based on article 6:248 and the given circumstances of the case, the court can decide to adjust the agreement. But more important, reasonableness and fairness also indicates a behavioural standard, which among others apply to contractual relationships. Therefore, this standard already needs to be taken into account during negotiations of an adjustment of the agreement by both contracting parties.

### 2.1.4 Preliminary conclusion

This section leads to an answer to the first sub question: ‘Which legal frameworks apply to integrated contracts and specifically to adjusting an actual agreement?’

This thesis focuses on the following contract models: UAC-IC 2005 and DBFM Model Agreement 4.1. These contract models define the applicability of the legal frameworks. How they deal with changing project circumstances will be studied more in detail in section 2.3.

Dutch contract law foresees in some provisions that are related to adjusting an actual agreement. First of all, there is the article about unforeseen circumstances (6:258). Both contract models describe how to deal with
these circumstances. The DBFM Model Agreement describes possible circumstances extensively, and UAC-IC only describes how to act in case of occurring unforeseen circumstances. Eventually, article 6:258 will only be invoked in exceptional conditions, but may then provide for adjustment or termination of the agreement.

Second, there is a clarification of article 6:258 specifically for contracted work regarding cost-increasing circumstances, article 7:753. This article is excluded from the DBFM Model Agreement, but is still applicable to the UAC-IC. Most remarkable is that this article is less rigid than article 6:258.

At last, there is the term reasonableness and fairness, which is further described in articles 3:12 and 6:248. Based on this term and the given circumstances of the case, the court can decide to adjust the agreement. More importantly, this term also indicates a behavioural standard. The exact interpretation differs from case to case, but it already needs to be taken into account during negotiations of an adjustment of the agreement by both contracting parties.

2.2 Project specific elements

In an agreement, the requirements of a project are described. Every project is unique resulting in an unique agreement. Just like the contract model, also a project belongs to the context of an actual agreement. To be able to compare projects with one another, some project specific elements need to be identified. Therefore, this section is subject to the following sub question:

Which project specific elements need to be taken into account in defining the flexibility of an agreement?

2.2.1 Project complexity

From literature can be conducted that the specific elements of a project are related to the complexity of projects. Construction projects are often executed in a dynamic environment and the scope of projects is becoming larger. As a result, the complexity of a project also increases. Already in the nineties, the first attempt was made to define the complexity of construction projects, which leads to a division into organisational and technical complexity (Baccarini, 1996). More recently, Bosch-Rekveldt, Jongkind, Mooi, Bakker, and Verbraeck (2011) proposed to use a framework to identify the complexity of projects. This framework is named the TOE framework and it focuses on the technical, organisational and external elements of a project. Below, these element are broken down into the project specific elements used in this thesis.

2.2.2 Technical elements

The technical elements of a project have to do with the ‘what’ of the project (Bosch-Rekveldt et al., 2011, p. 734). So, what will be build and what tasks are involved in the project? These elements are needed to objectively characterise a project and can be summarised as scope and tasks.

2.2.2.1 Scope

Scope is defined in the dictionary as “the range of things that a subject, an organization, an activity, etc. deals with” (Hornby, 2010). In the context of this thesis, this definition should be interpreted as: scope is the range of objects that the project deals with. These objects are defined in the system definition of an agreement, which is part of the program of requirements. The objects are related to a certain modality of the project: road, rail and waterways. Further, the scope largeness is one of the elements included in the TOE framework, and it is defined as “the number of official deliverables involved in the project” (Bosch-Rekveldt et al., 2011, p. 736). So, the deliverables that are awarded in the contract, also referred to as objects, are the scope of the project, and the more deliverables are involved in a project, the more complex the project is.

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19 UAC-IC: ‘Employer’s requirements’; DBFM: Schedule 9 ‘Schedule of requirements’
Also the variation of construction techniques used for the deliverables is decisive for the complexity, and especially the interrelations between the technical processes (Bosch-Rekveldt et al., 2011, p. 736). Consequently, the combination of for example concrete and composites in one object will be more complex, than the use of only concrete.

2.2.2.2 Tasks
The tasks of a project are related to the contract model. In a D&C agreement the contractor only is responsible for the design (D) and construction (C) of the project, while in a DBFM agreement the contractor is responsible for almost the whole spectrum of a project (figure 8) (Jansen, 2009, p. 76). However, the exact division of tasks cannot be derived from the type of contract, but is defined in the actual agreement (Jansen, 2009, p. 76). Consequently, the division of tasks based on the contract model is only an indication. The number, the variety and the dependencies between tasks define the complexity of a project (Bosch-Rekveldt et al., 2011, p. 736). Hence, it can be expected that a DBFM project is more complex than a D&C project.

<table>
<thead>
<tr>
<th>Project phase</th>
<th>Traditional contract</th>
<th>Integrated contract</th>
<th>DBFM</th>
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<tr>
<td>Initiative – schedule of requirements</td>
<td>UAC/RAW</td>
<td>Design &amp; Construct</td>
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<th>Initiative – schedule of requirements</th>
<th>Responsibility contracting authority</th>
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<tr>
<td>Design</td>
<td>Responsibility contractor</td>
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Figure 8 Responsibilities in different contracts (Oostveen, 2013, p. 18)

2.2.3 Organisational elements
The organisational elements of a project have to do with the ‘how’ of the project (Bosch-Rekveldt et al., 2011, p. 734). So, for example how long will the project take and how much will the project cost? These questions are related to the project duration and the project budget. But also project resources are part of the organisational elements, like the used contract model. The organisational elements are to a large extent pre-defined in the plan development phase of the project.

2.2.3.1 Project duration
The initial duration of a project can be derived from the project planning, which is defined by the contracting authority during the plan development phase. Intermediate milestones can be part of the project planning (Rijkswaterstaat, 2014a, p. 7; 2014c, p. 6; 2014d, p. 5). Hereby coordination is possible in case the project is a part of a larger project (Jansen, 2009, p. 102). In UAC-IC based projects, milestones are incorporated in the annex about planning 20. The DBFM Model Agreement has multiple ‘milestones’: commencement date, on which financial close need to be reached; availability date, on which the infrastructure is available and the maintenance phase of the project starts; completion date, on which all work is finished; and expiry date, which is the end date of the agreement. In addition, coordination milestones may be incorporated in the output specification of a DBFM agreement as requirement.

20 Annexen bij de Vraagspecificatie, Annex II Planning (Rijkswaterstaat, 2014c)
A factor influencing the project duration may be the expected lifetime of the assets (Bregman & de Win, 2005, p. 417). This is mainly of interest if maintenance of the assets is involved in the project, as in a DBFM project. In general, the economic life cycle of infrastructure is longer than 10 years, so large maintenance will be executed after these years (Koster et al., 2008, p. 25). For road infrastructure projects, this is for example the reconstruction of the asphalt. Therefore, a DBFM project often has a contract duration of 25-30 years. Overall, the initial project duration is defined in the plan development phase of the project, and it may be influenced by the expected lifetime of the assets.

2.2.3.2 Contract value

The value of a project is twofold: first, there is a procurement estimation, set by the contracting authority in the plan development phase; and second, there is the initial contract value, which was concluded between the contracting authority and the contractor (Verweij, van Meerkerk, & Korthagen, 2015, p. 197). The procurement estimation indicates the expected bids by the contracting authority. For this thesis only the initial contract value will be taken into account.

The initial contract value is determined by the scope, the risks involved and the chosen payment scheme (Koster et al., 2008, p. 74). In a UAC-IC based project, the contract value will be based on direct and indirect costs (Rijkswaterstaat, 2014b, p. 35). The direct costs are related to the design and construction works, while the indirect costs include provisional sums, general costs, profit and risks. In a DBFM project, the contractor will make use of a financial model. In the model, the investments, costs and revenues, expected inflation, taxes and interest rate developments are involved (Koster et al., 2008, p. 73). The result of this model will be discounted to the present value, in order to determine the initial contract value.

2.2.3.3 Contract model

The used contract model is also defined in the plan development phase, even as the level of completeness of the agreement. As mentioned earlier, this research focuses on projects based on the UAC-IC 2005 and the DBFM Model Agreements Infrastructure. As they are already generally described in section 2.1, this subparagraph only focuses on the completeness of the contract and the risk allocation between the contracting parties of the contract models.

Contract completeness

An incomplete contract is another term for a flexible agreement (Harris, Giunipero, & Hult, 1998, p. 376; Kosnik, 2014, p. 199). In the determination of the completeness level of an agreement, a trade-off of costs and benefits should be made. By several researchers, the transaction cost theory is used, in order to define the costs and benefits related to the completeness of an agreement (Kosnik, 2014, p. 200; Saussier, 2000, p. 194). In short, the transaction cost theory identifies four categories: asset specificity, uncertainty, duration, and probity (Kosnik, 2014, p. 199). The main predictions, related to these categories, read as follows:

- the marginal costs of a contract formation process will increase with a contract that aims for completeness, if there is more uncertainty in a contracting environment (Saussier, 2000, p. 193);
the level of benefit from a complete contract will increase, if the level of asset specificity becomes higher, because opportunism is reduced (Kosnik, 2014, p. 200);

- a longer duration of a contract will require a lower level of contract completeness (Kosnik, 2014, p. 200);

- an increasing probity will require a lower level of contract completeness (Kosnik, 2014, p. 200).

As a result, the marginal costs to come to a complete agreement are higher in a complex project environment with a lot of uncertainties. In respect of this thesis, a complete contract is related to the hedging strategy of Collingridge (1983) (elaborated in paragraph 1.2.2), which means that the requirements in the agreement are more detailed. So, the flexibility of an agreement is also influenced by the level of completeness of the agreement, as in a more incomplete contract possibly less adjustments of the actual agreement are required. However, the costs related to the formation of the more complete agreement are higher, so the trade-off of costs and benefits of a complete agreement needs to be made in the plan development phase.

Risk allocation

The choice of a contract model is also decisive for the risks allocation between the contracting parties. The risk allocation already starts in the plan development phase. Here, the contracting authority makes a concepts of the risk allocation. During the procurement phase, negotiations take place in which the concept of risk allocation can be adjusted (De Greef, 2006, p. 17). In principle, risks are allocated to the party best able to control them (De Greef, 2006, p. 15). In the procurement phase of DBFM agreements, a system of list risks is included. In short, this system assumes there is a limited number of important risks, which need to be allocated between the contracting authority and the contractor (Janssen, Orobio de Castro, & De Groot, 2010, p. 910). Therefore, this system is used during the negotiations in the procurement phase. The final allocation will become part of the actual agreement.

In the contract models, a risk allocation is prescribed. In principle, the employer or contracting authority is only responsible for the risks explicitly assigned to him by the actual agreement (Janssen et al., 2010, p. 903). The remaining risks are allocated to the contractor. The most important risks that are allocated to the employer according to the UAC-IC are:

- all information in possession of the employer, the land and/or water described in the employer’s requirements, and all goods of which it is expressly stated in the agreement that they shall be put at the contractor’s disposal shall be made disposable in good time (clause 3.1);
- accuracy of disposed information and employer’s requirements (clauses 3.2 and 3.3);
- obtaining the permits and/or licences, exemptions, orders and permissions as included in an annex to the employer’s requirements (clause 9.1);
- release of unforeseen materials in the soil (Model Basic Agreement; article 8); and
- costs of contract changes entrusted by the employer (clauses 14 and 45).

In the DBFM Model Agreement, the risk allocated to the contracting authority (CA) are named ‘supervening events’. Under these events, the contractor shall be entitled to compensation and postponement of deadlines by the length of the delay. In short, the following supervening events are described in the DBFM Model Agreement:

- delay event (e.g. compensation event; force majeure event; lenders exercising of their rights pursuant to the Direct Agreement; Route Decision has not become irrevocable on date X; late access to relevant plot of Schedule 15 ‘access exceptions to RWS infrastructure’; not obtain a timely decision of the competent administrative authority at request of permit; revoking a permit by a competent administrative authority due to a request, objection or appeal by a third party);

21 Dutch: lijstrisico’s
• delayed completion event (event occurring after availability date);
• compensation event (e.g. CA default; CA change; relevant change in law; traffic measures in terms of article 18.7 ‘Incident management, prevention of slippery conditions, traffic accidents and abnormal loads’; measures as referred to in article 18.6 ‘[Traffic] safety’; CA’s granting of access to third parties, with which the contractor does not need to comply, in accordance with article 4.2 ‘Access’; damage to infrastructure due to incident or work carried out by third parties; carrying out work to make up a critical delay at request of CA; implementation measures on grounds of force majeure event; a manager of the third party infrastructure or a manager of category 2 or 3 cables and conducts does not apply with the relevant implementation agreement or project agreement for a period longer than 6 months following 30 working days); and
• force majeure event (e.g. disruption of financial markets before financial close; war, civil war or acts of terrorism; nuclear explosions; ionising radiation or radioactive chemical; crashing aircraft; meteorite strike; earthquake; or flooding).

There are differences between the risk allocation of the two contract models. The first difference is related to obtaining of permits. In the UAC-IC, the employer is responsible for a limited amount of permits, which are described in the agreement. Obtainment of the remaining permits is for responsibility of the contractor. In the DBFM Model Agreement, obtainment of all permits is for responsibility of the contractor. However, the dependence on third parties or other authorities is for responsibility of the CA, once the contractor complies with the prescribed conditions of obtaining a permit. In other words, once another authority neglected to make a timely decision about a request for a permit, the contractor may be compensated for the delay due to this event. In the UAC-IC, it is not expressly stated that non-compliance of a third party is for risk of the employer. The employer is only obliged to co-operate in order to obtain a permit, as far as it lies within his powers.

The second difference is related to the risks of soil conditions. In the UAC-IC, the employer is responsible for the release of unforeseen materials in the soil. In the DBFM Model Agreement, the risks with respect to the immovable property are generally allocated to the contractor (Koster et al., 2008, p. 122). In this respect, also unforeseen soil conditions are for responsibility of the contractor. However, unfamiliarity with the soil conditions and existing infrastructure can lead to major risks, which cannot always be transferred to the market in all fairness (Janssen et al., 2010, p. 908). Therefore, Janssen et al. (2010) encourages the use of ‘risk capping’, which limits the consequences of an occurring risk for the contractor.

Another difference is related to the information disposal of the employer or CA to the contractor. In the UAC-IC, the employer is responsible for the accuracy of the disposed information (clause 3-2). In contrast, the CA is not responsible for the content of the information provided by the CA to the contractor, according to the DBFM Model Agreement (clause 12.1 (a)(ii)). The responsibility for the accuracy of the disseminated information is not expressly described in the DBFM Model Agreement. Therefore, it could be expected that risks related to the accuracy of disseminated information are allocated to the contractor.

There are also similarities in the risk allocation of both contract models. For instance, in both contract models, the employer or CA is responsible for the providing of relevant information. Also, the impact in terms of money of contract changes is in both contract models for responsibility of the initiating party.

At last, in the DBFM Model agreement, force majeure events are extensively described. This is not the case in the UAC-IC, as there is also a system of force majeure included in the DCC: article 6:75.

2.2.3.4 Collaboration

The collaboration in a project is influenced by the used contract model and by the dynamics of the project itself. In the context of this thesis, collaboration only relates to the inter-organisational collaboration between the contracting authority or employer and the contractor. So, the collaboration in the internal project teams of both contracting parties is considered out of scope.
Inter-organisational collaboration can be divided in soft and hard collaboration (Brinkman, 2013, p. 49). First, soft collaboration is identified as the human aspects, in which trust and arrangements are the most important factors. Herein, trust is defined as “trust one has in the intentions of a partner towards the relationship” (Klein Woolthuis, Hillebrand, & Nooteboom, 2005, p. 814). Trust and arrangements are typical factors that are influenced by the dynamics of a project. On the other hand, hard collaboration is about the tangible elements, like reaching goals and profit. Brinkman (2013, p. 49) states that soft collaboration works as mediation factor for hard collaboration, which means that trust and arrangements are needed in order to reach the desired outcome of the project.

The used contract model also influences the collaboration of the project. In figure 9, several characteristics of a collaboration are listed in relation to the used contract model. Both the UAC-IC and the DBFM Model Agreement are seen as fixed contracts, because in principle the scope, value and duration of these contract models are fixed. Based on the contracting collaboration continuum, trust is mostly based on the contractual arrangements in the studied contract models. Further, the collaboration will be characterised by a more formal relationship. The contract change negotiations will be focused on price and service, and will be characterised by a strong use of bargaining. As a DBFM project has a longer project duration, it is expected that the relationship characteristics will shift more towards an alliance agreement. This should lead to contract change negotiations that are more focused on mutual gains and a more personal relationship.

2.2.4  External elements
The external elements of a project have to do with the ‘where’ and ‘when’ of the project. So, where and when does the project take place? These questions say something about the location of the project and about the stakeholders involved in the project.

2.2.4.1  Location
The location of a project has many facets which may make a project more complex. For example, the type of soil can influence the project complexity, but also the existence of cultural or natural heritage (Neijenhuis, 2014, p. 54). Another facet is the country where the project takes place, because regulation and technical experience may differ by country.

Further, the location of the project determines the type of intervention of the project. The intervention of a project can be characterised by building in the open field or in a brown field, and is defined by the amount of interfaces with other projects or current infrastructure. The more interfaces are involved in the project, the
higher the amount of uncertainties in the project will be (Jansen, 2009, p. 108). Eventually, more interfaces will lead to a higher project complexity.

2.2.4.2 Stakeholders

The amount of stakeholders and their variety of perspectives also contribute to the complexity of a project (Bosch-Rekveldt et al., 2011). The perspective of stakeholders can be identified by the following characteristics: opinion, interest, resources and relationships with other stakeholders (De Bruijn & Ten Heuvelhof, 2007, p. 47). Resources of a stakeholder are the type of power they have, like production power which is needed to make decisions, or blocking power which can be used to block the decisions. In the context of this thesis, stakeholders with either production power or blocking power are of most interest, as they can introduce change events and they can also influence the adjustment of the agreement.

In addition, also political influences need to be taken into account. Integrated projects often are executed at national or even international level, by which they are more sensitive for changes in the national priorities and the public pressures (De Neufville & Scholtes, 2006, p. 2). As a result, attention needs to be paid to political influences resulting from regulatory bodies as provinces, municipalities, water boards and the government. Further, in the Netherlands there are elections every four year, by which the political priorities can change. Especially in DBFM projects, which have a long project duration, this may cause changing circumstances. All in all, stakeholders that need to be taken into account are the regulatory bodies with either production or blocking power.

There are different ways to identify the stakeholders involved in an UAC-IC or DBFM based project. In an agreement based on the UAC-IC, a list of stakeholders is given in schedule A of the employer’s requirements (Rijkswaterstaat, 2014e). In this list, all stakeholders are listed with consequently different resources and interest. In order to identify the stakeholders in a DBFM agreement, more background information about DBFM agreements is needed. In addition to the DBFM agreement, the contracting authority also has implementation agreements (IAs) with third parties (figure 10). These third parties can be provinces, municipalities and/or water boards, and are named ‘stakeholder’ in the DBFM Model Agreement. These IAs are incorporated in the DBFM agreement in ‘Annex 9 Program of Requirements’, and they define the obligations of the contracting authority and the stakeholder towards each other, accompanied by the output specifications for the infrastructure of the third parties (Rijkswaterstaat, 2014a, pp. 220-253). By using the IAs, the output specifications of the third parties are outsourced by the contracting authority to the consortium. So, the list of IAs defines the stakeholders with production power in a DBFM agreement.

![Figure 10 Schematic representation of DBFM agreement (based on(Oostveen, 2013, p. 20))](image)
2.2.5 Preliminary conclusion

This section has defined the project specific elements, in order to find an answer to the following sub question: ‘Which project specific elements need to be taken into account in defining the flexibility of an agreement?’ These elements are related to the complexity of a project, and can be divided into technical, organisational and external elements.

First of all, the technical elements used in this thesis are: the scope of the project, defined as the deliverables awarded in the actual agreement; and the tasks of the project, based on the responsibilities of the contractor by means of the contract model.

Further, the organisational elements are divided into: the project duration, resulting from the project planning influenced by interfaces with other projects and the maintenance strategy; the contract value, which is the initial contract value concluded between the contracting authority and the contractor; the contract model and the actual agreement, which define the completeness level of the actual agreement and the risk allocation between the contracting parties; and the inter-organisational collaboration, which is subject to project dynamics like trust and arrangements, and the used contract model.

At last, the external elements are identified as follows: the type of intervention, following from the location and the interfaces with other projects and current infrastructure; and the stakeholders, following from the iAs in a DBFM agreement and schedule A in an UAC-IC based agreement.

2.3 Contract changes

As mentioned in paragraph 1.2.2, changes and extensions of the scope are a way to create flexibility in the agreement. In order to be prepared for a future contract change, there is a change procedure included in both the UAC-IC and the DBFM Model Agreement. This procedure describes the obligations of both parties towards each other. In this section, contract changes will be classified and the similarities and differences between the two procedures will be characterised, in order to give an answer to the third sub question:

*By which elements can contract changes and the actual contractual change procedures be characterised?*

First, the origin and cause for a contract change are studied. Thereafter, the change procedures as described in the two contract models are further discussed and compared. At last, the impact of contract changes will be described more in detail.

The suppositions, as defined in the first chapter, will be further elaborated in this section, as they are related to the change procedure and the impact of contract changes. The suppositions reads as follows:

- **S1:** Contract changes with a long process time are a result of an inflexible agreement
- **S2:** Contract changes with a high impact in costs are a result of an inflexible agreement
- **S3:** Contract changes resulting in a critical time delay are a result of an inflexible agreement

2.3.1 Change events

A change is “any event that results in a modification of the original scope, execution time, cost, and/or quality of work”, from a project management point of view (Ibbs et al., 2007, p. 45). A contract change may be needed in order to respond to a change event and other uncertainties in the project (Sun & Meng, 2009, p. 560; Verweij et al., 2015, p. 195). The change events can be subdivided in the origin and the cause of a change.

First, the origin of change events will be studied more in detail. Only change events related to the context of the project will be studied in this thesis, so the TOE framework will be used again to identify the origin of changes. The TOE framework is used to divided the project into influencing elements: the technical,
organisational, and external elements. A change itself is a modification of the original scope, and is therefore related to the technical elements of a project, like scope and tasks. The organisational element is subdivided in project duration, project value, contract model and collaboration. A change will not originate from the first three items, so the collaboration, or in other words, the internal project teams can be an origin. The external element is subdivided in location, political influences and stakeholders. Mainly the latter two items may be an origin of a change. Concluding, a change event only can have an external origin or an internal project team origin.

A change event also has a certain cause. A cause of change is “a condition or event that either directly trigger or contribute to a change” (Sun & Meng, 2009, p. 563). Related to the origin of a change, Sun and Meng (2009, p. 567) have developed a classification of change causes based on literature, namely: changes with an external origin are for example political, economical and environmental factors; and changes with an internal project team origin are for example project requirement changes generated by contracting authority or contractor. Below, these possible causes will be further discussed.

Economical development is one of the causes with an external origin. It may lead to inflation and price increases (Sun & Meng, 2009, p. 567). Exceptional cost increases are already recognised as unforeseen circumstance in subparagraph 2.1.3.1. The conclusion of that subparagraph is that economic development generally belongs to the economic risk of the contractor. Moreover, both contract models make use of indexation, in order to adjust prices to the current price level. This allows the contracting parties to capture non-exceptional cost increases. Considering the above arguments, economical development is not identified as a cause for a change event in this thesis.

Another cause with an external origin are the political factors. Changing policies by the government or a change in legislation are both identified as political factors (Sun & Meng, 2009, p. 567). Changes in legislation may have a large impact on the project. This can be illustrated by the following case of the introduction of the standard for safety of road tunnels by the Dutch government. At the time the decision was made to change the law, several tunnel projects were in the execution phase. The implementation of the standard has faced some difficulties. In particular, the negotiations of the ‘Tweede Coentunnel’ project were difficult. Eventually, the cost impact of the contract change amounts € 116 million. These costs were mostly time related, due to uncertainties about the design of the systems and control software. In addition to the case, the political influences are also stipulated as an external element of the project to take into account (para. 2.2.4.2). Therefore, political factors are identified as a cause to take into account in the remainder of this thesis.

Also environmental factors can be cause of a change event, like conservation restrictions, geological conditions or unforeseen ground conditions (Sun & Meng, 2009, p. 567). Especially unforeseen ground conditions have already led to a going to court (para. 2.1.3.1). The occurrence of unforeseen ground conditions may lead to extra costs, and the studied cases were often about the responsibility for these extra costs. So, unforeseen ground conditions should also be taken into account in relation to the flexibility of an agreement.

Furthermore, there are also changes caused by a change in project requirements (Sun & Meng, 2009, p. 565). These kind of changes can originate from either the internal project team or from an external origin. For instance, the expectations of a client are changed by which he updates the requirements. Also stakeholders can initiate additional requirements to the project.

In addition to the cause classification of Sun and Meng (2009), also Rijkswaterstaat identified four possible causes specifically for contract changes: (1) omissions in the original agreement, (2) technically necessary

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22 Handelingen I 2012/13, 29, p. 29-5-36
23 Kamerstukken II 2013/14, 33750 A, nr. 2, p. 23
24 Kamerstukken II 2013/14, 33750 A, nr. 2, p. 18
changes, (3) changes in laws or regulation, and (4) scope changes. The exact definitions of the causes used by Rijkswaterstaat are slightly outdated, because these causes are based on traditional contract models. However, these causes are recently applied by Verweij et al. (2015) who also studied the causes of changes in the Netherlands. Furthermore, they are in line with the causes identified based on the cause classification of Sun and Meng (2009): changes caused by political factors are related to changes in law or regulation; changes caused by unforeseen ground conditions are related to the technically necessary changes; and changes caused by changes in the project requirements are related to the scope changes. Only omissions in the actual agreement was not yet identified as a cause of a change event based on the study of Sun and Meng (2009). Concluding, the following causes and related definitions are used in this research:

- Omissions in the actual agreement are changes that have to be made in/to the agreement because the agreement appeared incomplete, unclear, or contained incorrect or conflicting contract terms;
- Technically necessary changes are changes in the physical and/or technical conditions under which the project is being implemented (e.g. changes in the ground conditions or the availability of materials), requiring additional work so as to finish the project;
- Changes in law or regulation will only cause a change if they require stricter requirements, so that the agreement may have to be changed to meet these requirements;
- Scope changes are a result of an extension of the contracted with the purpose to achieve e.g. a faster completion of the project, cost advantages, reducing traffic obstructions and logistic advantages.

2.3.2 Change procedures

This paragraph is based on the two change procedures as included in the contract models, in order to find possible differences and similarities. Further, this paragraph is subject to the first supposition: (S1) contract changes with a long process time are a result of an inflexible agreement.

The change procedure of the UAC-IC is described in clause 14, 15 and 45 (see flowchart and literal phrases in Appendix B). Clause 14 describes the procedure in case the employer entrust a contract change, while clause 15 describes the procedure in case a contract change is initiated by the contractor. Once the employer entrust a contract change, the contractor has the duty to investigate to what extent the contract change implies a deviation of the original requirements, choices, documents, representatives or subcontractor, work and results of work (clause 14-4). Once the contractor accepts to execute the contract change, the parties continue to the procedure of clause 45, in which the impact of the contract change will be determined. When the contractor refuses to execute the change, both parties discuss whether or not the contract change need to be executed. The procedure of clause 45 starts with a price offer of the contractor. A price offers includes the price and the adjustment of the planning and the payment schedule (clause 45-2). After acceptation of the price offer by the employer, the contract change becomes part of the actual agreement. Hereby, the actual agreement is adjusted.

The change procedure in the DBFM Model Agreement (see flowchart and literal phrases in Appendix C) is described in clause 13 of the main agreement and in schedule 5 ‘Changes’. In clause 13, the change conditions are described, while in schedule 5 the actual change procedure is described. When the contracting authority (CA) or the contractor requests for a change, first the value of the contract change will be estimated. There is a threshold set in the actual agreement (schedule 1 ‘Definitions’ – definition Small Change), which defines whether a contract change is a, so called, ‘small’ change or an ‘other’ change.

The procedure for ‘small’ changes is in principle shorter. Only a proposal of the contractor is needed, in which the measures and work required for and/or arising from the ‘small’ change are included plus the expected cost impact. The ‘small’ change becomes part of the agreement, once the CA has agreed to the proposal.

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Kamerstukken II 2005/06, 28244, nr. 109, p. 2
If the CA request an ‘other’ change, the procedure starts with a meeting between the contracting authority and the contractor, in which the following elements are discussed: the kind of contract change; the necessary adjustment of the actual agreement; possible critical delay due to the contract change; the order of magnitude of cost impact due to the contract change; and insight into possible cost impact, which cannot be predicted or quantified during the meeting. The contractor prepares this meeting by providing required information, calculations and other kind of information, which is needed during the negotiations. After this meeting, the contractor prepares a change proposal including a description of the contract change, the proposed solution and the expected time and cost impact. Once the CA agrees to this proposal, the ‘other’ change becomes part of the actual agreement.

The contractor can request a contract change by submitting a proposal of either a ‘small’ or an ‘other’ change (Schedule 5; clauses 1.1 (b) and 2.2). Thereafter, the change procedure continues the same way as a contract change requested by the CA.

Contract changes to the implementation agreements (IAs) initiated by the contractor are an exception to the change procedure of the DBFM Model Agreement (clause 13.3 (e)). These contract changes may be submitted to the CA, accompanied by a written approval of the particular stakeholder. In principle, the CA only have to verify whether the contract change has no negative consequences to the position of the CA itself or other stakeholders. If the CA also sign the change agreement, the change will become part of the actual agreement. This all is possible without using the general change procedure.

### 2.3.2.1 Change conditions

In principle, a contract change can be initiated by both contracting parties. However, the possibility to adjust the agreement is related to either the authority to adjust the agreement of both contracting parties, or to the responsibility for the consequences of different kind of change events. The division of the authority to adjust and responsibility for change events differs for both contract models.

In the UAC-IC, the contracting parties are not equal in their possibilities to adjust the actual agreement. The differences are listed in table 1. The contractor is only entitled to adjust his own choices (clause 15-1 (a)) and documents, representatives or subcontractor, work and results of work (clause 15-1 (b) to (e)) before they are acknowledged by the employer. The employer can only adjust these elements after he has acknowledged them (clause 14-1 (d) to (h)), if he is for instance not satisfied with the result (CROW, 2005b, p. 58). In addition, the employer may adjust the requirements stated in the employer’s requirements, the attached annexes and the basic agreement (clause 14-1 (a) to (c)).

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Allowed to change by the Employer (clause 14-1)</th>
<th>Allowed to change by the Contractor (clause 15-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements stated in the Employer’s Requirements</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>The attached annexes by the Employer’s Requirements</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>The Basic Agreement</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Choices made by the Contractor when carrying out Work in so far as the Contractor in doing so was free to interpret the requirements stated in the Employer’s Requirements</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>(Acknowledged) Documents</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>(Acknowledged) representatives or subcontractors</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>(Acknowledged) Work</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>(Acknowledged) results of Work</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

As can be seen in the table 1, changing the requirements is reserved for the employer. Bleeker (2014b, p. 710) appoints this as a point of discussion, because in practice often the contractor indicates a change in requirements. There is one possibility for the contractor to adjust a requirement, by using the
acknowledgement procedure (clause 15-3). However, the employer can refuse this proposal without reasons (clause 15-4). All in all, the employer has more authority to adjust the agreement, than the contractor.

In the DBFM Model Agreement, both contracting parties have a more equal position in their possibility of adjusting the actual agreement. This can be derived from clause 13.2 (a) and 13.3 (a), which state: ‘If the Contracting Authority (Contractor) proposes a change to the Agreement, this is designated a Contracting Authority Change (Contractor Change).’ However, there are some change events appointed which always will be designated as a contracting authority change (CAC) or a contractor change (CC). The following change events will be designated as CAC (clause 13.2 (b)):

- A relevant change in law, which necessitates an amendment of the agreement;
- A deviation in the content between the Route Decision, as it stands at the time of becoming irrevocable and the Route Decision as it stood on the date two weeks prior to date Final Submission, which necessitates an amendment of the agreement;
- If the agreement (with exception of the Contractor Schedules) imposes an act in conflict with Regulation or the intellectual or industrial property rights of a third party, and it can be remedied by means of an amendment to the agreement;
- If the adoption of measures or recommendations arising from a requirement of the management specifications leads to an amendment of the agreement (excepting the Contractor Schedules).

If the contractor schedules imposes an action in conflict with regulation, other than as a consequence of a relevant change in law, or with intellectual or industrial property rights of a third party and this can be remedied by an amendment of the agreement than the parties must introduce that as a CC (clause 13.3 (c)). The same applies to the amendment of the contractor schedules due to the adoption of measures or recommendations arising from a requirement of the management specifications (clause 13.3 (b)).

The differences between a CAC and a CC can be attributed to the responsibility for the consequences resulting from the contract change. A CAC is seen as a compensation event (clause 13.2 (d)), which means the CA has to compensate the contractor for the financial loss resulting from the compensation event in question (Schedule 3 ‘Compensation for supervening events’; clause 2.1 (a)). Consequently, the CA bears the risks of a CAC (Hamdan, 2011, p. 49). So, additional risks for the contractor or the lenders due to a CAC need to be compensated by the contracting authority (clause 13.2 (e)). Respectively, the consequences of a CC are borne by the contractor, unless the parties have agreed otherwise (clause 13.3 (f)). So, the possibility to adjust the agreement in the DBFM Model Agreement is not related to the authority to adjust the agreement, but only to the responsibility for the consequences of a contract change.

Besides the difference in possibility to adjust the agreement, also another difference is identified concerning the changeable elements of the contract models. In an UAC-IC based agreement the employer’s requirements, the basic agreement and documents, representatives or subcontractors, work, and the results of work may be subject to adjustment (clause 14-1 and 15-1). In contrast, a contract change in the DBFM agreement may concern any provision of the actual agreement (clause 13.2 (a) and 13.3 (a)). The acknowledgement and review procedures, as known in UAC-IC based agreements, are not applicable in a DBFM agreement. So, in a UAC-IC based agreement both the agreement and the results of work may be adjusted, while in a DBFM agreement only the agreement may be adjusted.

However, there are some restrictions to the possibility to adjust the agreement and the changeable elements, which always need to be taken into account. In a DBFM agreement a contract change may not result into substantive changes to the original purpose of the agreement (clause 13.2 (c)(i)), nor result in acting contrary to the law by the contractor (clause 13.2 (c)(ii)) or the contracting authority (clause 13.3 (d)). In addition, there are grounds of refusal formulated in the DBFM Model Agreement (Schedule 5 ‘Changes’; clause 2.1 (d)): once a CAC (i) is incompatible with working methods customarily applied; (ii) jeopardises the safety of the
infrastructure or persons; or (iii) substantially prejudices the ability of the contractor to fulfil its obligations pursuant to the agreement, the contractor may refuse to implement a CAC.

In the UAC-IC, there are also grounds of refusal described (clause 14-6), which reads as follows: (a) contract change is not ordered in writing; or (b) carrying out the contract change results in an unacceptable disruption of work according to reasonableness and fairness; or (c) carrying out the contract change results in the contractor being forced to carry out work beyond his technical know-how and/or capacity; or (d) carrying out the contract change is unacceptable to the contractor according to reasonableness and fairness, given the mutual interests of the parties. Bleeker (2014b, p. 711) argues that these grounds of refusal in the UAC-IC are broadly formulated, which can result in a conflict between the contracting parties.

The grounds of refusal in both contract models are partly comparable and partly specifically related to the nature of the agreement. Grounds (b) and (d) of the UAC-IC are comparable to the change conditions described in clause 13.2 (c) and 13.3 (d) of the DBFM Model Agreement. However, ground (c) of the UAC-IC is not mentioned in the DBFM Model Agreement. This may be attributed to the fact that a DBFM agreement is not directly made with a contractor but with a SPC. A SPC contracts a ‘design and build’ contractor in order to execute the work (para. 2.1.2). Therefore, the technical know-how and/or capacity that is needed can be contracted by the SPC. Further, in the DBFM Model Agreement a change condition is included related to the financing part of the agreement (clause 13.2 (e)): the CA needs to compensate the contractor in case a CAC has an adverse effect on the risk profile of the work or the lenders. Regardless of the amount of the compensation, this change condition still can result in funding problems for the contractor, as the lenders want to avoid increased risks (Koster et al., 2008, p. 30). Consequently, the CA can only choose to waive the CAC, once the lenders do not want to fund it.

2.3.2.2 Process time
The time that is needed to come to a contract change is named process time. The process time includes all steps in the change procedure, from the request for a contract change to formal agreement to the contract change by respectively the contracting authority or employer.

In the DBFM Model Agreement, there are restrictions described about the response period both parties have towards each other for several steps in the change procedure (Schedule 5; clauses 1.1 (a), 1.1 (b), 2.1 (c), 2.3 (b), 2.3 (c), and 2.4 (a)). The process time of an ‘other’ change is restricted to a maximum of 40 working days, and the process time of a ‘small’ change even to 20 working days (Hamdan, 2011, p. 48). These response periods may be extended by agreement of both contracting parties, in case one of the parties expects the prescribed response time is insufficient (Schedule 5; clause 2.8 (a)). In the UAC-IC, such restrictions regarding the response period are not included. The only indication of a response period is given by the words ‘as soon as possible’ (clauses 14-7, 14-9, 45-2, 45-4).

A response period can be seen as a performance incentive for both contracting parties. Performance incentives are advisable to include in the change procedure, as it shall be an incentive for both contracting parties to optimise their own performance (Bregman & de Win, 2005, p. 416). In order to reach the incentive, also management towards meeting the deadlines is needed.

Further, factors can be denoted that influence the process time of a contract change. First of all, internal processes can be distinguished in the separate project teams, which are needed to come to a contract change. For instance, a new design or a calculation of the price is needed, in order to make a price offer or proposal for a contract change. Besides, the contracting authority or employer needs to check, whether he agrees with the proposal or price offer of the contractor. These processes can become more extensive if lenders are involved in the project, or contract changes need to be aligned with the maintenance contractor (Hamdan, 2011, p. 51). Moreover, the process of contract changes is always an addition to the regular design and construction process. Therefore, disruptions may be caused, which reduce the labour productivity of the regular process. In
the end, this may result in a longer process time of contract changes or an extension of the project duration (Ibbs et al., 2007, p. 46). Additionally, certain people in both project teams are given the mandate to sign the change agreements, as mentioned by practitioners. These people are only not always directly involved in the negotiation process of a contract change. Therefore, it can take longer to receive the final agreement to a contract change. Overall, internal processes can become quite extensive, which may have a negative influence on the overall process time of the change procedure.

Moreover, often negotiations are needed in order to reach an agreement upon a contract change (Hamdan, 2011, p. 51). Sometimes, parties even have the idea that they need to agree upon all aspects of the contract change, before they can start the change procedure (Hamdan, 2011, p. 50). In the last case, parties reach already an informal agreement, before the formal settlement of the contract change is started. This informal agreement is often on both content and impact in time and cost of the contract change. However, it is also possible that the informal agreement is only on the technical aspects of a contract change, and the impact of the contract change is determined during the formal settlement. Such a technical informal agreement can be used to decrease the disruptions of the regular process of the project, but simultaneously it can decrease the need to formalise the contract change. As a result, the overall process time can become longer.

### 2.3.3 Impact of contract changes

Contract changes will have an impact on the agreement. In the introduction of this thesis, two suppositions are recognised related to the impact of contract changes, namely: cost and time impact. This paragraph is subject to these suppositions, and they read as follows: (S2) contract changes with a high impact in costs are a result of an inflexible agreement; and (S3) contract changes resulting in a critical time delay are a result of an inflexible agreement.

The impact of contract changes can be divided into: time impact (e.g. time extension, increased risks); cost impact (direct or indirect cost increase); and relationship and people impact (e.g. relationship related, working conditions, and quality) (Sun & Meng, 2009, p. 569). In particular time and cost impact are well-known. These are also named in both change procedures in respectively the price offer and the proposal of the contractor. Besides, impact on the relationship between the contracting parties is also important to take into account, because contract changes may result into claims and disputes (Sun & Meng, 2009, p. 569). However, claims and disputes are seen as a result of an inflexible agreement, as the parties are not able to reach an agreement about the required contract change by using the regular change procedure. As a result, the impact on the relationship is not further investigated.

By desk research also another effect of contract changes in infrastructure projects is recognised, namely: traffic disruption. This effect is expressed in ‘lost vehicle hours’ (VVU), and it is calculated by a calculation model, which is used in the procurement and realisation phase of the project, in order to limit the traffic disruption (Cluitmans & Blokland, 2011). A VVU is defined by multiplying the travel time extension and the number of people affected by the traffic disruption. Traffic disruptions may be caused by change events. For example, unforeseen soil conditions may result in a longer duration of the traffic measures. On the other hand, acceleration measures of the work can positively affect the traffic disruption, as showed in traffic management results of the project ‘A12 Utrecht Lunetten – Veenendaal’ (Borsje & Voorburg, 2013, p. 5). As this effect is not quantified in the UAC-IC based projects, it is considered to be out of scope for this research.

This thesis focuses on the time and cost impact as a result of contract changes. These are often seen as directly linked, while, strictly speaking, this proposition is incorrect (Haidar & Barnes, 2014, p. 24). It is possible that a contract change results in an extension of the project duration, while there is no financial impact, and the other way around. Therefore, the cost and time impact are discussed separately for both contract models.
2.3.3.1 Cost impact

Contract changes often lead to cost impact. The cost of a contract change is a combination of several cost items and these items vary by contract model. The Armed Services Board of Contract Appeals stated “that the costs of performing changed work consist of both (1) those costs directly related to the accomplishment of the changed work; and (2) those costs arising from the interaction between changed work and unchanged work” (as cited in Ibbs et al., 2007, p. 46). Mainly the second cost item varies by the contract models. For the calculation of the costs of a contract change, it is of importance whether the contractor is responsible for the maintenance of the project or not, and whether the specific contract change has an impact on the maintenance phase. Once this is the case, the size of cost impact is harder to determine, as on beforehand a prediction is needed about what is caused by the contract change and what is not (Hamdan, 2011, p. 50). Moreover, this difficulty is inherent to UAC-IC and DBFM agreements in general.

In the UAC-IC, the price breakdown of a contract change consists of direct and indirect costs, and a fair increment for overall costs, profits and risks (clause 45-2 (a)). However, the UAC-IC does not specify the further breakdown of indirect costs. Bleeker (2014b, p. 710) expects these costs may include the costs related to time extension. Also costs related to acceleration measures could be considered as indirect costs.

In the DBFM Model Agreement, a distinction is made related to the cost impact by classifying cost impact as either financial loss or financial benefit. Financial loss will be compensated by the contracting authority, while financial benefit shall be shared between the two contracting parties. Financial loss should be substantiated on the basis of ‘open book’ (Schedule 2; clause 2.1 (c)). In other words, the contractor have to provide all information and documents concerning the substantiation of the financial loss to the contracting authority. The specification of the financial loss reads as follows: (1) direct building costs; (2) direct exploitation- and maintenance costs; (3) engineering costs (5% of direct costs); (4) one-off, time-bound general construction site costs (5% of direct costs); (5) other organisational costs (5% of direct costs); (6) standardised increment for market conforming general costs and profit (5% of direct costs); (7) risks; and (8) other expenses, including processing costs and a decrease in income (Rijkswaterstaat, 2014a, p. 122).

Cost impact related to contract changes is expected by practitioners. Only, an acceptable size of the cost impact is hard to predict. A rule is made about the size of the cost impact of contract changes in the UAC 2012. This rule says that the contractor is obliged to accept contract changes of the specifications up to a maximum of 10% of the initial contract value without extension of time (UAC 2012; clause 36-3). Thereby, the rule is named the 10% rule (Jacobs, 2013, p. 42). This rule indicates that the size of cost impact should be considered in relation to the initial contract value.

2.3.3.2 Time impact

To a greater or lesser extent, a contract change can affect the project planning. This depends on the activity that is affected by the contract change and whether this activity is on the critical path or not. The critical path is “the longest path of the resulting schedule of linked activities” (Haidar & Barnes, 2014, p. 32). In other words, if an activity on the critical path is delayed, the whole project will be delayed. In addition to the critical path, there are also non-critical paths in the project planning. For the activities on the non-critical path, there is “float between the completion of one activity and the commencement of a subsequent activity” (Haidar & Barnes, 2014, p. 32). If these non-critical activities are affected by a contract change, it will not have direct consequences for the project planning. Given these points, as long as contract changes do not affect activities on the critical path, the contract changes are still processed within the context of the agreement.

However, a contract change that affects the critical path will not always directly result in a delay of the project. The contractor still has the possibility to mitigate, by choosing other working methods or sequence of working, or to accelerate the work (Haidar & Barnes, 2014, p. 46). Therefore, the contractor is able to manage the risk of delay, but he wants to be compensated for this risks. So, the size of costs impact of contract changes is expected to be higher once mitigation measures are included.
Part of the price offer in the UAC-IC is the adjustment of the planning, the agreed milestones and the date of completion (clause 45-2 (b) and 45-2 (c)). In the DBFM Model Agreement, the proposal for a contract change only needs to include the contractors opinion whether or not the change will lead to a critical delay (Schedule 5; clause 2.3-a (iii)). However, also in the DBFM agreement, the contracting authority still has insight into the project planning, due to the ‘open book’ mechanism (Schedule 2; clause 2.1 (c)). Related to the flexibility of an agreement, contract changes with an impact in time by which milestones or the date of completion are delayed, are classified as less flexible.

2.3.4 General classification of contract changes

Based on the literature study and desk research in the preceding section, a general classification of contract changes can be established. Table 2 shows the classification of contract changes of respectively the origin, cause, initiator, and impact of a contract change. This general classification of contract changes will be used in the remainder of this thesis.

<table>
<thead>
<tr>
<th>Origin</th>
<th>Internal project team</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>Omissions in the contract</td>
<td>Technical necessary change</td>
</tr>
<tr>
<td>Initiator</td>
<td>Contracting authority/Employer</td>
<td>Contractor</td>
</tr>
<tr>
<td>Impact</td>
<td>Cost</td>
<td>Time</td>
</tr>
</tbody>
</table>

2.3.5 Preliminary conclusion

In this section, contract changes are classified and the differences and similarities of the change procedures in both contract models are characterised, in order to give an answer to the third sub-question: ‘By which elements can contract changes and the actual contractual change procedures be characterised?’

First of all, the change events are divided into the origin and the causes of change. A change event can either have internal project team origin or external origin. Changes with an external origin originate from stakeholders to the project or from a change in regulation. The causes of contract changes are identified as follows: (1) omissions in the actual agreement; (2) technically necessary changes; (3) changes in law or regulation; and (4) scope changes.

In both the UAC-IC and the DBFM Model Agreement, a change procedure is included. This procedure describes the obligations of the two contracting parties and how the impact of a contract change need to be defined. In short, both procedures start with a request for a contract change by one of the contracting parties. After accepting the request by the other contracting party, respectively a price offer or a proposal needs to be made by the contractor. Once the employer or contracting authority has agreed to the price offer or proposal, the contract change becomes part of the agreement. In addition, in the DBFM Model Agreement a distinction in the change procedure is made according to the value of the contract change. Contract changes with a value below the predefined threshold are denoted as ‘small’ changes, and contract changes with a value above the threshold are denoted as ‘other’ changes.

The actual initiator of a contract change in both contract models is related to either the authority to adjust the agreement of both contracting parties, or to the responsibility for the consequences of different kind of change events. In the UAC-IC, the employer has more extensive possibilities to adjust the agreement. Consequently, the initiator of a certain contract change is related to the authority of the contracting party to adjust the agreement. For example, only the employer may adjust the requirements stated in the employer’s requirements, and he can refuse a contract change regarding the requirements without reasons, once it is initiated by the contractor. In contrast, the differences in a DBFM agreement between the initiator of a contract change are more related to the responsibility for the consequences resulting from the contract change. For instance, a relevant change in law is always denoted as contracting authority change.
Further, the changeable elements in both contract models are different. In a UAC-IC based agreement both the agreement and the results of work can be changed, while in a DBFM agreement only the agreement can be changed. However, in both contract models, restrictions are described to adjusting the agreement. For instance, a contract change may not result into a substantive change to the original purpose of the agreement. Further, a contractor may refuse a contract change according to the UAC, once the contract change requires the contractor to carry out work beyond his technical know-how and/or capacity. In the DBFM Model Agreement, compensation from the contracting authority is obliged if a contract change has an adverse effect on the risk profile of the work or the lenders. Regardless of this compensation, lenders still can refuse the contract change if they expect an increased risk profile.

The time that is needed to come to a contract change is named process time. In the DBFM Model Agreement, restrictions are described regarding the response period of both contracting parties towards each other during the change procedure. In the UAC-IC, such restrictions are not included. A response period can be seen as a performance incentive, which may lead to an optimisation of the performance of both contracting parties in the change procedure.

Besides, internal processes of both contracting parties regarding the change procedure may influence the process time. The internal process can become quite extensive, especially if lenders are involved in the project, or contract changes need to be aligned with the maintenance contractor. Moreover, the process of contract changes is always an addition to the regular design and construction process. This may cause disruptions of the regular process and a longer process time. Additionally, certain people in both project teams are given the mandate to sign the change agreement, but these people are not always directly involved in the negotiation process of a contract change. This also may cause a longer process time of the change procedure.

Further, negotiations are needed in order to reach an agreement upon a contract change. During this negotiations, an informal agreement can be reached upon the content and the impact of the contract change. Thereafter, only the formal settlement of the contract change is needed. The informal agreement can also regard only the technical content of the contract change, in order to decrease the disruptions of the regular project process. In this case, the impact in time and cost of the contract change is discussed during the formal settlement, which may lead to a longer overall process time.

In the end, contract changes will often have impact in cost or time. The cost impact can be divided in direct and indirect costs. Mainly the indirect costs of a contract change are harder to determine, as it is hard to predict on beforehand what is caused by the contract change and what is not. In the DBFM Model Agreement, a distinction of the cost impact is made by classifying them as either financial loss or financial benefit. A financial loss will be compensated by the contracting authority, while a financial benefit shall be shared between the two contracting parties. Further, a contract change can affect the project planning, once an activity on the critical path is affected by the contract change. A critical delay can be mitigated by, for instance, acceleration measures. However, the mitigation measures may lead to an increase of the cost impact of a contract change. Related to the flexibility of an agreement, contract changes resulting in a critical time delay are classified as less flexible.

### 2.4 Hypotheses

Based on the preceding literature study and desk research concerning the UAC-IC, DBFM Model Agreement, project specific elements, contract changes and change procedures, expectations are formed about the behaviour of contract changes in actual agreements. These expectations are formulated as hypotheses. They support the suppositions recognised in the introduction of this thesis:

- **S1**: Contract changes with a long process time are a result of an inflexible agreement
- **S2**: Contract changes with a high impact in costs are a result of an inflexible agreement
S3: Contract changes resulting in a critical time delay are a result of an inflexible agreement

The suppositions will be measured in a quantitative way, and the hypotheses will be used to explain the quantitative data in a qualitative way. Below, the hypotheses are listed, accompanied by a short description. In the remainder of this thesis, the hypotheses will be used to explain the behaviour of contract changes as measured in the actual agreements.

**H1: An informal agreement on the technical content and/or impact in time and cost of a contract change will result in a longer process time**

In UAC-IC based agreements, a contract change will become part of the agreement after acceptance of the price offer by the employer. A similar process applies to contract changes in a DBFM agreement, as a contract change becomes part of the actual agreement once the contracting authority agrees to the proposal of a ‘small’ or ‘other’ change. This assumes that the work related to a contract change only will be carried out, once the price is agreed. However, the construction process of a project often requires an earlier execution of the work related to a contract change, even before the parties reach an agreement upon the price (Bleecker, 2014b, p. 710). This is a risk for the contractor, which is not provided for in the UAC-IC or the DBFM Model Agreement. In order to minimise the disruptions of the construction process, it is expected that there will be an informal agreement after the negotiations have been completed about the technical content and impact of the contract change. Other research into the flexibility of DBFM agreements has showed that the change procedure is seen as a formalisation process of issues that are discussed before they enter the procedure (Roosjen, 2013, p. 66). So, by using an informal agreement, the process time is expected to be longer, as the necessity to formally settle the contract change is less.

**H2: Performance incentives in the change procedure will result in a shorter process time**

In the change procedure of the UAC-IC, deadlines regarding the response of both the employer and the contractor towards each other are not described. In the DBFM Model Agreement, there are prescribed periods of response of 20 working days. Bregman and de Win (2005, p. 416) argue that it is advisable to include performance incentives for both contracting parties, in order to optimise their own performance. In the change procedure, these performance incentives should be configured as deadlines, in which one contracting party has to respond to the proposal given by the other contracting party. As this is not the case at the moment, it is expected that the process time of the change procedure in UAC-IC based agreements is higher than the one in a DBFM agreement.

**H3: Extensive internal processes will result in a longer process time**

Internal processes of the separate project teams also influence the process time of a contract change. For instance, lenders can influence the process of adjusting the agreement in a DBFM agreement, once they expect an increased risk profile due to a contract change (Koster et al., 2008, p. 30). Further, contract changes are always an addition to the regular process of the project. Therefore, contract changes can cause disruptions, which reduce labour productivity. In the end, this may result in a longer process time of contract changes or an extension of the project duration (Ibbs et al., 2007, p. 46). Besides, the mandate of the project manager of both contracting parties to sign, and thereby finalise a contract change may influence the process time. By practitioners is indicated that certain people are given the mandate to sign a change agreements. Only these people are not always directly involved in the negotiations about a contract change. Therefore, it can take longer to receive the final agreement to a contract change. In a DBFM agreement, there is another internal process related to the change procedure, once a contract change impacts the maintenance phase of a project. If this is the case, negotiations are needed with the M-Company. All these aspects together may cause an
extensive internal process which may extend the overall process time of a contract change. The influence of the individual aspects of an internal process regarding contract changes is out of scope for this research. So, the internal process will be considered as a whole.

**H4: The combination of time and cost impact of a contract change will generally cause larger individual cost and time impact**

Cost and time impact are identified as a possible impact of a contract change. These two are often seen as directly linked towards each other. Only strictly speaking, this statement is incorrect, as contract changes may result in a compensation of the extra costs, even if an extension of the project planning is not applicable, and the other way around (Haidar & Barnes, 2014, p. 24). In order to test whether the statement of Haidar and Barnes (2014) applies to the impact of contract changes in UAC-IC based agreements and DBFM agreements, hypothesis H4 is formulated. In contrast to the statement of Haidar and Barnes (2014), this hypothesis assumes that time and cost impact of a contract change are directly linked towards each other, and therefore generally will cause larger individual cost and time impact.

**H5: Cost impact of contract changes in DBFM agreements is generally higher than the cost impact of contract changes in UAC-IC based agreements**

In the DBFM Model Agreement, a separate cost item is included in the price breakdown of contract changes concerning the direct exploitation and maintenance costs of a contract change (para. 2.3.3.1). Due to the long maintenance phase of the project – often twenty to twenty-five years – this cost item is expected to be high. In addition, the level of risk costs of a contract change may be higher in a DBFM agreement, as the impact of a contract change is hard to predict for the entire project duration (Hamdan, 2011, p. 53). UAC-IC based agreements often have a shorter project duration than DBFM agreements. Moreover, UAC-IC based projects often only concern Design and Construct projects. Therefore, it is expected by the researcher that the cost impact of contract changes in DBFM agreements are generally higher than cost impact of contract changes in UAC-IC based agreements.
3 Data analysis

In the preceding chapters, the research focuses on several levels of the problem. On the one side, the juridical context with respect to adjusting the actual agreement is studied, by analysing relevant provisions of contract law and case law. Also, the DBFM Model Agreement and the UAC-IC 2005 are studied in more detail by focusing on the change procedures. On the other side, also the influences of the project context are studied by analysing the technical, organisational and external elements of a project, and the possible change events. All together, this forms a theoretical basis for the rest of the research.

In this chapter, the focus of the research shifts to the contract changes of actual DBFM and UAC-IC based agreements. The framework of flexibility, as developed in chapter 1 ‘Introduction’, is used in this analysis as basis. In other words, the actual agreements are analysed in perspective of the three suppositions.

First, the research method is described. Thereafter, the first results are listed. Subsequently, a first analysis of the results is made. This analysis is extended by additional analyses based on the hypotheses as formulated in the previous chapter. At last, the observations are summarised per supposition.

3.1 Method

In order to reflect upon the flexibility of actual DBFM and UAC-IC based agreements, contract changes of Dutch infrastructure projects are studied in the perspective of the suppositions of the framework of flexibility. The suppositions relate to the process time to come to a contract change, and to the costs and time impact of a contract change.

3.1.1 Data gathering

First of all, projects are selected in which the VolkerWessels organisation is involved. The selection criteria for the project selection are: (1) a variety of contract models (DBFM Model Agreement or UAC-IC); (2) a variety of modalities (road, rail and waterway); (3) a variety of contract values (large to small); and (4) a variety of type of interventions (greenfield and/or brownfield). As the VolkerWessels organisation is only involved in one DBFM project, also other contractors are approached in order to increase the number of DBFM projects.

From the selected projects, data is gathered about the contract changes and about the project itself. At first, data is gathered about the suppositions of the flexibility framework. This is only done for all approved contract changes, according to the following definitions:

---

26 The theoretical research has focused on the DBFM Model Agreement version 4.1. However, in practice this version of the DBFM Model Agreement is not used yet. Therefore, also earlier versions of the DBFM Model Agreement meet the selection criteria for the project selection. Differences with the earlier versions are described in Appendix D.
• **Process time** [working days]: date first ‘request for change’ to date ‘approval change’
• **Cost impact** [%]: cost of contract change divided by initial contract value
• **Time impact** [working days]: time delay due to rescheduling of milestones or completion date as result of the contract change

Further, explanatory data is gathered about the change events of approved contract changes. For this data gathering, the general classification of contract changes is used. Consequently, data is gathered about: (1) the origin of a change event (internal project team or external); (2) the cause of the change event (omission in the actual agreement, technically necessary changes, change in law or regulation, or scope changes); and (3) the initiator of the contract change (employer/contracting authority or contractor). Also, data about the numbers of contract changes is gathered, namely the numbers of: approved contract changes; refused contract changes; withdrawn contract changes; and contract changes in progress.

In order to explain the process time data, more qualitative questions are posed to the contract managers at the contractor side of the projects. These questions concern the collaboration between the contracting parties regarding contract changes, and the actual change procedure as used in the projects. An example of a question is: ‘How is the communication with the contracting authority/employer regulated regarding contract changes?’

At last, data is gathered about the projects itself based on the answer on sub question 2 (project specific elements). By use of this data, it is possible to compare the several projects with each other. The following data about the projects is gathered: (1) contract model; (2) initial contract value; (3) project duration and contractual milestones; (4) scope of the project in numbers of deliverables and involved modalities; (5) type of intervention; and (6) the number of stakeholders.

The data is gathered by approaching project managers and contract managers of the selected projects via mail and telephone, at the start of the research. After commitment to participate in the research, a more extensive research protocol (see Appendix E) is send, accompanied by an Excel sheet (see Appendix F) and an example of an already filled out sheet. The Excel sheet is developed by the researcher, in order to gather the data in an organized way.

The data is partly filled in by the contract managers and partly by the researcher. Hereby, the process of data gathering could be accelerated. If the data is filled in by the researcher, the gathered data is submitted for approval to the contract manager of the specific project. Only after approval the data is used in the research. The qualitative questions (see Appendix H) are asked by telephone to the contract managers. Of these calls, a short interview report is made and submitted for approval to the contract managers. After approval, the answers are used in the research.

The gathered data is based on project records. This is seen as an objective research method. Only, the downside is that the results are influenced by the accuracy and completeness of the project records kept by the contract managers (Sun & Meng, 2009, p. 564). Consequently, for some data an estimation is made by the contract managers.

### 3.1.2 Data processing

The gathered data is not directly usable for analysis. Therefore, the data is processed in order to make it usable. Because all the respondents were Dutch, also the information is gathered in Dutch, but this is translated for this research.

First of all, not all projects are completed yet at the moment of data gathering. Therefore, the data of the process time, and the cost and time impact need to be scaled to the project progress.

The process time of the individual contract changes is sorted by the date first ‘request for change’ of the contract change. This results in a linear trend line of the process time per project. These trend lines are
extrapolated to the completion date of the project. Thereafter, the average of the highest and the lowest process time is calculated. At last, this average process time in working days is related to the design and construction phase in working days. The process time is related to the design and construction phase of a project, because contract changes initiated in this phase also need to be processed during this phase in order to avoid delay of the construction phase. This results in a percentage of the average process time in relation to the design and construction phase. This percentage will be used throughout the remainder of the data analysis.

The cost impact is already gathered in a percentage of the initial contract value. As not all projects are completed yet, the initial contract value need to be scaled to the project progress. The expenditures of a project are assumed to be logarithmic. Therefore, the ‘weighted contract value’ is used, which is the initial contract value logarithmic related to the project progress. Subsequently, the cost impact is related to the weighted contract value, which results in a percentage. This percentage will be used throughout the remainder of the data analysis.

At last, the time impact is processed. The delay of a project is independent of the progress of the project, but can only occur in the design and construction phase of a project. Therefore, the time impact in working days is related to the design and construction phase in working days. This results in a time impact percentage, which will be used throughout the remainder of the data analysis.

Further, the qualitative questions are summarised in appendix H. This data gives insight into the general ways of communication in the change procedure, into the use of an informal agreement and into other ways that are used to adjust the agreement. This data will only be used to explain the observations of the process time data.

The data about the projects is processed in order assign a complexity level to each project. By using this complexity level, the projects are comparable to each other. For every individual project specific element, the project with the highest value is scored a 1. The other projects are related to the project with the highest value. All scores of one project together form the complexity level of a project. This process is further elaborated in appendix G.

### 3.1.3 Analysis method

The flexibility of actual DBFM and UAC-IC based agreements will be defined on the basis of the suppositions. The suppositions reads as follows:

- **S1**: Contract changes with a long process time are a result of an inflexible agreement
- **S2**: Contract changes with a high impact in costs are a result of an inflexible agreement
- **S3**: Contract changes resulting in a critical time delay are a result of an inflexible agreement

As can be seen, the suppositions define whether an agreement is flexible or inflexible. However, an agreement is not either flexible or inflexible; this is more like a gradient. Therefore, a flexibility score will be assigned to the actual agreements per project. In order to define the flexibility score of the actual agreements, a scoring model is established corresponding to each supposition. By combining the individual scores on process time, cost impact and time impact, the flexibility score will be defined. As a result, it can be defined to what extent the agreements are flexible.

This used scoring method is based on a scoring method used to score and analyse risks (Berkelaar, 2015, p. 16). In this method, scores from 1 to 5 are used, in which 1 is related to the lowest risk and 5 to the highest. The division of percentages is adapted to the gathered data, and is presented to practitioners. First, the score of process time (table 3) is defined by the average process time related to the design and construction phase. The

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27 the design and construction phase is measured from contract date to completion date
28 the project progress is an percentage of the total project duration (contract date to end date) for all projects at the moment of analysis (April 11th, 2015)
division of percentages of this score is based on the data of the average process time. Second, the score of cost impact (table 4) is defined by the relative cost impact related to the weighted contract value. The division of percentages for the cost impact score is based on the 10% rule of extra costs (para. 2.3.3.1). This 10% is taken as the average and therefore related to the score 3. At last, the score of time impact (table 5) is defined by the time extension related to the design and construction phase of a project. For this scoring model, another division in percentages is made, as ‘no time extension’ is perceived to be better than a small time extension. Therefore, a separate score is related to ‘no time extension’ (score 1). The others percentages are divided with the same steps as the other scoring models.

<table>
<thead>
<tr>
<th>Scoring model: Process time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scoring model: Cost impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scoring model: Time impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

Based on the scoring models, the actual agreements of all studied projects are assigned a flexibility score. The lower the flexibility score, the more flexible is the agreement. The data about the change events, the complexity levels of the projects and the information about the collaboration shall be used to find an explanation of the differences in flexibility score.

### 3.2 Results

Subject to this research are the projects listed in table 6. As most of the projects are still in the execution phase, all projects are handled anonymous. In total, approved contract changes of 15 projects are analysed. Most of the projects are based on the UAC-IC (73.3%); the other projects are based on the DBFM Model Agreement (26.7%). The modalities of the projects differ: most of the projects are road projects (40.0%), the other projects are road bridge projects (26.7%), road tunnel projects (20.0%), waterway projects (6.7%), and rail projects (6.7%). Not all projects are completed yet. Therefore, the progress of the projects is determined by measuring the progress at the moment of data analysis (April 11th, 2015). Furthermore, a complexity level is
assigned to the projects. The higher the level of complexity, the more complex the project is. Appendix G elaborates on the exact composition of the complexity level.

<table>
<thead>
<tr>
<th>Projects</th>
<th>Type of contract</th>
<th>Project progress</th>
<th>Complexity level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DBFM</td>
<td>8%</td>
<td>6.5</td>
</tr>
<tr>
<td>2</td>
<td>DBFM</td>
<td>21%</td>
<td>4.6</td>
</tr>
<tr>
<td>3</td>
<td>DBFM</td>
<td>11%</td>
<td>4.7</td>
</tr>
<tr>
<td>4</td>
<td>DBFM</td>
<td>23%</td>
<td>5.8</td>
</tr>
<tr>
<td>5</td>
<td>D&amp;C</td>
<td>98%</td>
<td>4.4</td>
</tr>
<tr>
<td>6</td>
<td>DBM</td>
<td>82%</td>
<td>4.5</td>
</tr>
<tr>
<td>7</td>
<td>D&amp;C (BVP)</td>
<td>100%</td>
<td>1.9</td>
</tr>
<tr>
<td>8</td>
<td>D&amp;C (BVP)</td>
<td>47%</td>
<td>2.5</td>
</tr>
<tr>
<td>9</td>
<td>D&amp;C (BVP)</td>
<td>100%</td>
<td>3.1</td>
</tr>
<tr>
<td>10</td>
<td>D&amp;C (BVP)</td>
<td>100%</td>
<td>2.6</td>
</tr>
<tr>
<td>11</td>
<td>D&amp;C</td>
<td>96%</td>
<td>3.2</td>
</tr>
<tr>
<td>12</td>
<td>D&amp;C</td>
<td>77%</td>
<td>3.6</td>
</tr>
<tr>
<td>13</td>
<td>E&amp;C</td>
<td>74%</td>
<td>2.1</td>
</tr>
<tr>
<td>14</td>
<td>D&amp;C</td>
<td>80%</td>
<td>2.1</td>
</tr>
<tr>
<td>15</td>
<td>D&amp;C (alliance)</td>
<td>86%</td>
<td>2.9</td>
</tr>
</tbody>
</table>

The mean of the initial contract value of the projects is €172,931. The average total project duration is 2,572 working days, which is equal to 9.9 years. Further, there are on average 71 approved contract changes, 36 withdrawn changes and 19 changes in progress. The maximum of the relative cost impact related to contract changes is 225.57%, with an average of 49.72%. The mean score of the average process time is 118 working days, which is equal to 2.2 years or 38.47% of the project duration.

<table>
<thead>
<tr>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial contract value [k€]</td>
<td>15</td>
<td>4,595.00</td>
<td>687,000.00</td>
<td>172,931.00</td>
</tr>
<tr>
<td>Project duration [working days]</td>
<td>15</td>
<td>372</td>
<td>7,863</td>
<td>2,572.07</td>
</tr>
<tr>
<td>Approved contract changes [numbers]</td>
<td>15</td>
<td>12</td>
<td>210.00</td>
<td>71.07</td>
</tr>
<tr>
<td>Withdrawn contract changes [numbers]</td>
<td>15</td>
<td>0</td>
<td>100.00</td>
<td>35.87</td>
</tr>
<tr>
<td>Contract changes in progress [numbers]</td>
<td>15</td>
<td>0</td>
<td>66.00</td>
<td>19.33</td>
</tr>
<tr>
<td>Relative total cost of change [%]</td>
<td>15</td>
<td>1.73</td>
<td>225.57</td>
<td>49.72</td>
</tr>
<tr>
<td>Average process time [working days]</td>
<td>12</td>
<td>29</td>
<td>291</td>
<td>118.67</td>
</tr>
<tr>
<td>Relative average process time [%]</td>
<td>12</td>
<td>3.24</td>
<td>33.33</td>
<td>14.45</td>
</tr>
<tr>
<td>Total time extension [working days]</td>
<td>15</td>
<td>0</td>
<td>569</td>
<td>141.80</td>
</tr>
<tr>
<td>Relative total time extension [%]</td>
<td>15</td>
<td>0</td>
<td>38.47</td>
<td>10.96</td>
</tr>
</tbody>
</table>

3.3 Flexibility analysis

In this section, the data of actual agreements is analysed. Both the individual scores and the overarching flexibility score are assigned.

First, the average process time of the contract changes is plotted per project in figure 11. Of projects 2, 4 and 6 no data is available about the process time. Therefore, the contract managers of these projects have made an estimation of the average process time. The figure shows a scattered average process time, with also a variety of maxima and minima. The average process time in terms of percentage is listed in table 8, accompanied by the score of the process time based on the scoring model ‘process time’.
Besides the availability of the data, also some other general remarks about the process time data need to be made. First, in the UAC-IC based agreements there is often no official request for a contract change. Therefore, the process time measuring often starts after submitting the price offer by the contractor. If the employer directly accepts this offer, it could result in a short process time. However, there is often discussion in advance, in order to define the price offer, as mentioned by several contract managers. This discussion time is not included in the measured process time.

Further, the progress of the project is of influence on the process time measured. The average process times are extrapolated to the completion date of the project, but for the less progressed projects this is a less reliable method. This applies especially for the projects with a relatively large amount of contract changes in progress (projects 1, 6, 8, 12, 13, and 15), as it takes longer to approve these changes.

Second, the total cost impact of contract changes is plotted per project in figure 12. This figure already shows some remarkable results if the ‘10% rule’ is kept in mind. The explanation for these results will follow in the next section. The cost impact score is listed in table 9, and 8 out of the 15 projects has a score 5 for the cost impact.
At last, the time impact caused by contract changes is plotted per project in figure 13. Projects 1, 2, 8, 9, 13, and 14 have had no time impact up till now. The total time impact in terms of percentage is listed in table 10, accompanied by the time impact score.
Table 10  Time impact score

<table>
<thead>
<tr>
<th>Projects</th>
<th>Percentage of D&amp;C phase</th>
<th>Time impact score</th>
<th>Projects</th>
<th>Percentage of D&amp;C phase</th>
<th>Time impact score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0%</td>
<td>1</td>
<td>9</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0%</td>
<td>1</td>
<td>10</td>
<td>16%</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>7%</td>
<td>3</td>
<td>11</td>
<td>5%</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>23%</td>
<td>5</td>
<td>12</td>
<td>25%</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>38%</td>
<td>5</td>
<td>13</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>27%</td>
<td>5</td>
<td>14</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>3%</td>
<td>2</td>
<td>15</td>
<td>20%</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>0%</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The sum of the individual process time, cost and time impact scores results in a flexibility score for every project. In figure 14, all flexibility scores of the projects are plotted. Superficially, it can be seen that there is no direct relationship between the contract type and the flexibility score. For example, the DBFM agreements are scored respectively 4, 6, 10 and 13. In general, the UAC-IC based agreements have a higher flexibility score, so they seem to be less flexible than the DBFM agreements. Exceptions are project 7 and 14, which both have a low flexibility score. Both projects have low a complexity level, thus this can be an explanation, but in the next section this will be analysed more in depth.

![Flexibility scores per project](image)

The flexibility scores can be roughly divided into a low range (score 3 – 6), middle range (score 7 – 11) and high range (score 12 – 15) flexibility score. The projects with a low flexibility score (no. 1, 2, 7, 8, 14) have each a different dominant score. The DBFM projects (no. 1 and 2) have a relatively high process time score, as they score respectively 2 and 3 on this element. Project 7 only has some time extension, while projects 8 and 14 have to deal with cost increases.

A comparable analysis is executed for the projects with a middle range flexibility score (no. 3, 9, 11, 12, 13). In general, these projects score high (4 or 5) on the process time score. The exception herein is project 12, but this project is not finished yet and the approved contract changes show scattered process times. As a result, the extrapolation of the process time in this project is less reliable. Therefore, it can be expected that the average process time for this project will rise. Further, the middle range projects score high on the cost impact score, and low on the time impact score. There are two possible explanations for this observation. Acceleration
measures can have been taken, in order to avoid time extension. On the other hand, these projects were also subject to a relatively high amount of scope changes in which also most of the costs were involved. So, probably it will be a combination of both explanations.

At last, this analysis is also conducted for the projects with a high range flexibility score (no. 4, 5, 6, 10, 15). In general, these projects score relatively low on process time score (2 or 3), but all of them score a 5 for both the cost and time impact scores. In all cases, these high scores can be attributed to large, unforeseen changes, with most of the time an external origin.

3.3.1 Changes in law or regulations – an early conclusion
Large unforeseen changes seems to affect the flexibility score of the whole agreement. However, there is often only one such kind of contract change. This can be illustrated by analysing the individual contract changes in the same way as the overall project results. In table 11, the descriptive statistics of the individual contract changes are listed.

An analysis on the kurtosis and the skewness indicators, gives some more insight into the distribution of the data set. Once the kurtosis is larger than 0, there is a high probability for extreme values. In contrast, once the kurtosis is smaller than 0, the data set is flatter than the normal distribution, and there is less probability for extreme values. Further, the skewness indicator shows the distribution compared to the mean. Once the skewness is larger than 0, most values are concentrated left of the mean. In contrast, once the skewness is smaller than 0, most values are concentrated right of the mean.

By taking a look into the distribution of the contract changes per project, some projects show a high probability for extreme values. In project 4, 6, 10, 12, 14, and 15, the highest probability for extreme is observed. Only, project 14 does not show a real extreme value, as the highest flexibility score for this project is 7. Therefore, this project is not taken into account in the analysis of extreme values.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Statistic</th>
<th>Statistic</th>
<th>Statistic</th>
<th>Statistic</th>
<th>Statistic</th>
<th>Statistic</th>
<th>Std. Error</th>
<th>Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>91</td>
<td>3.00</td>
<td>7.00</td>
<td>4,0330</td>
<td>.97126</td>
<td>1,198</td>
<td>.253</td>
<td>1,538</td>
<td>.500</td>
</tr>
<tr>
<td>P2</td>
<td>61</td>
<td>2.00</td>
<td>3.00</td>
<td>2,6721</td>
<td>.47333</td>
<td>-.752</td>
<td>.306</td>
<td>-1,484</td>
<td>.604</td>
</tr>
<tr>
<td>P3</td>
<td>54</td>
<td>3.00</td>
<td>9.00</td>
<td>5,6296</td>
<td>1,97433</td>
<td>-.025</td>
<td>.325</td>
<td>-1,452</td>
<td>.639</td>
</tr>
<tr>
<td>P4</td>
<td>210</td>
<td>2.00</td>
<td>10.00</td>
<td>2,4333</td>
<td>.71741</td>
<td>5,731</td>
<td>.168</td>
<td>58,135</td>
<td>.334</td>
</tr>
<tr>
<td>P5</td>
<td>18</td>
<td>4.00</td>
<td>13.00</td>
<td>6,7778</td>
<td>2,34033</td>
<td>.982</td>
<td>.536</td>
<td>1,606</td>
<td>1,038</td>
</tr>
<tr>
<td>P6</td>
<td>123</td>
<td>2.00</td>
<td>10.00</td>
<td>2,9187</td>
<td>.83562</td>
<td>5,810</td>
<td>.218</td>
<td>46,493</td>
<td>.433</td>
</tr>
<tr>
<td>P7</td>
<td>12</td>
<td>4.00</td>
<td>5.00</td>
<td>4,5000</td>
<td>.52223</td>
<td>.000</td>
<td>.637</td>
<td>-2,444</td>
<td>1,232</td>
</tr>
<tr>
<td>P8</td>
<td>54</td>
<td>3.00</td>
<td>8.00</td>
<td>4,3148</td>
<td>1,21040</td>
<td>1,083</td>
<td>.325</td>
<td>.927</td>
<td>.639</td>
</tr>
<tr>
<td>P9</td>
<td>62</td>
<td>2.00</td>
<td>8.00</td>
<td>6,3226</td>
<td>1,87104</td>
<td>-.721</td>
<td>.304</td>
<td>-.848</td>
<td>.599</td>
</tr>
<tr>
<td>P10</td>
<td>36</td>
<td>2.00</td>
<td>15.00</td>
<td>6,5000</td>
<td>2,40832</td>
<td>.669</td>
<td>.393</td>
<td>3,435</td>
<td>.768</td>
</tr>
<tr>
<td>P11</td>
<td>113</td>
<td>3.00</td>
<td>9.00</td>
<td>5,5752</td>
<td>1,69456</td>
<td>-.205</td>
<td>.227</td>
<td>-1,277</td>
<td>.451</td>
</tr>
<tr>
<td>P12</td>
<td>60</td>
<td>3.00</td>
<td>11.00</td>
<td>4,0833</td>
<td>1,56543</td>
<td>1,997</td>
<td>.309</td>
<td>5,369</td>
<td>.608</td>
</tr>
<tr>
<td>P13</td>
<td>84</td>
<td>3.00</td>
<td>8.00</td>
<td>6,2262</td>
<td>1,64537</td>
<td>-.472</td>
<td>.263</td>
<td>-1,030</td>
<td>.520</td>
</tr>
<tr>
<td>P14</td>
<td>28</td>
<td>3.00</td>
<td>7.00</td>
<td>4,1071</td>
<td>.95604</td>
<td>1,964</td>
<td>.441</td>
<td>4,879</td>
<td>.858</td>
</tr>
<tr>
<td>P15</td>
<td>42</td>
<td>4.00</td>
<td>15.00</td>
<td>7,2619</td>
<td>1,73991</td>
<td>1,676</td>
<td>.365</td>
<td>8,902</td>
<td>.717</td>
</tr>
</tbody>
</table>

By taking a closer look at the extreme contract changes, several origins and causes are observed to these contract changes. First, the projects with a high flexibility score (no. 4, 5, 6, 10, and 15) are analysed. Projects 4,
5, 6, and 10 all have one contract change with as cause a change in law or regulation. Projects 12 and 15 have one scope change with an internal origin, which causes a high impact.

The projects with a middle range flexibility score (no. 3, 8, 9, 11, 12, and 13) have also several origins and causes of a contract changes. First of all, an extreme contract change could be expected from project 12 as well, based on the descriptive statistics in table 13. In this project, there is one scope change with an internal origin, which causes the high cost and time impact. Other change events are related to the other project, like project 3 which has two contract changes caused by change of scope from an external origin. Projects 9 and 13 have multiple contract changes with diverse origins and causes, so these projects are not influenced by one extreme contract change. Projects 8 and 11 have both one contract change with a high flexibility score, which has an internal origin, and respectively an omission in the actual agreement or a change in scope as cause.

Based on the literature study, the changes in law or regulation are often hard to predict. In some cases, this change event even led to a dispute between the contracting parties. In both contract models, changes in law or regulation are regulated. However, based on the scoring models it is observed that it is not possible to adjust the agreement to the impact of changes in law or regulation within the context of the agreement.

### 3.3.2 Flexibility analysis without changes in law or regulation

In order to illustrate the influence of the contract changes caused by a change in law or regulation, another flexibility analysis is made. In this analysis, the contract changes caused by a change in law or regulation are excluded. As a result, the new flexibility scores are illustrated in figure 15.

![Figure 15 Flexibility score without change in law or regulation originating from an external origin](image)

The exclusion of contract changes caused by changes in law or regulation should affect projects 4, 5, 6, and 10 the most. In the previous paragraph, these projects were identified as projects with contract changes caused by changes in law or regulation, which results in extreme impact in time and costs. For projects 4 and 10, the exclusion of these contract changes has resulted in a better flexibility score. Only for projects 5 and 6, the differences between before and after the exclusion are just one scoring point. This may be attributed to also other contract changes with high impact which are caused by another change event. The same applies to project 15, which is caused by an internal scope change.

By excluding the contract changes caused by changes in law or regulation, the process time of the projects is adjusted for none of the projects. The same applies to the cost impact score. The percentages of the cost impact are decreased in absolute terms, but the combined result of all smaller contract changes is still above
20%. Overall, the exclusion mostly affect the time impact score, as often time extensions are a result of changes in law or regulation.

### 3.4 Additional analyses

In this section several additional analyses are conducted, based on the hypotheses resulting from the analytical framework. In these additional analyses, the data set without the contract changes caused by changes in law or regulation is used, unless specifically stated. In addition to the hypotheses, also the origin and causes of change events and the complexity levels of the projects are used, in order to better understand the flexibility scores resulting from the previous section.

#### 3.4.1 Informal agreements

The first additional analysis concerns the first hypothesis, which reads as follows: *An informal agreement on the technical content and/or impact of a contract change will result in a longer process time (H1).*

In 55% of the projects, an informal agreement is reached before the contract change is finalised by signing the change agreement. Initially, this is a sign of trust. The contractor decides whether he accepts the risk of starting execution of the work regarding the contract change. The formal settlement often follows within a few weeks, depending on the mandate of the employer. All of these projects have an UAC-IC based agreement. In these projects, the informal agreement is on the entire content of the contract change, including the cost and time impact. There are two exceptions, projects 13 and 15, in which the informal agreement is only on the technical content of the contract change; the impact of the contract change is defined in a later phase. This technical informal agreement results in a longer process time after the informal agreement, and eventually in a longer overall process time.

The DBFM projects barely make use of an informal agreement, or use it only for small contract changes. However, this do not result in a higher process time for contract changes in DBFM agreements. Therefore, it can be concluded that the use of an informal agreement is not dominant in defining the process time. Once the informal agreement is only on the technical content, the process time of a contract change will be longer. In all other cases, the informal agreement is just a way to start the execution of the work regarding the contract change in an earlier phase. So, the first hypothesis is partly true.

#### 3.4.2 Performance incentives

The second hypothesis reads as follows: *Performance incentives in the change procedure will result in a shorter process time (H2).*

The performance incentives are only present in the DBFM Model Agreement. However, all interviewed contract managers of the DBFM projects indicated that the set response time of forty working days in total is rarely reached. This is mainly attributed to the fact that management towards meeting the deadlines is missing. Still, the actual process times of contract changes in DBFM projects are in general shorter (on average 100 working days) than the process times of contract changes in UAC-IC based contracts (on average 140 working days). There are some exceptions on this rule, but these are projects 8 and 12, which had a less reliable process time score, and projects 7 and 14, which had a positive overall result. Overall, it cannot be concluded that performance incentives lead to a shorter process time, based on the data and information available in this analysis.

#### 3.4.3 Internal processes of a change procedure

The third hypothesis concerning the process time reads as follows: *Extensive internal processes will result in a longer process time (H3).*

In this thesis, the exact internal process is out of scope. However, there are additional questions posed to the contract managers about the finalisation of the actual change procedure. Several contract managers have
mentioned that the moment of finalising a contract change is defined by the mandate at the contracting authority side of the project. For example, contract changes with high cost impact need to be signed by the highest ranked person related to the project. On the other hand, contract changes without cost impact often may be signed by the counter part of the contract manager. Therefore, it is possible that contract changes with higher cost impact also have a longer process time. However, there is no relation observed between the cost impact and process time, as also contract changes with low or no cost impact have a high process time. Furthermore, the exact division in mandate is unknown. So, based on this data set it is not possible to make statements about this influence.

Also, additional questions are posed about the actual change procedure. The internal processes regarding the change procedure can be classified as either formal or informal processes. All projects have at least one meeting in which contract changes are discussed. For the DBFM projects, there are in general two meetings: a contract change meeting and a contract meeting. In general, the contract change meeting is more informal, as only progress and actions of the contract changes are discussed. In contrast, the contract meeting is more formal, and this is the meeting in which decisions are made. In UAC-IC based projects, it occurs that the contract change meeting is the only meeting and therefore it is also more formal. Also the frequency of the meetings will be decisive for the formality level of the actual change procedure, in which monthly meetings will cause a more formal process than weekly meetings.

Besides the meetings, also letters are used to send the change agreements and to capture a point of view. Often mail is used for the concept versions of the change agreements, and only a letter is send for the final, signed, version. In addition, all projects have unregulated communication or meetings, which are always informal. So, the formality of the internal processes is a combination of several factors: the kind and the frequency of the meetings, the usage of letters, mail and personal communication.

Further, the involvement of lenders is appointed as a possible internal process influencing the process time. Based on the contract model, only in the DBFM agreements, lenders may be involved in the change procedure. However, the actual influence of lenders per contract change cannot be determined based on the available data. One contract manager stated that the lenders are only involved above a certain threshold, but the exact threshold is unknown. Therefore, further research is needed into the involvement of lenders in the change procedure.

By analysing the internal processes and collaboration, there is also an additional question posed to the contract managers about possible other ways to process a contract change. In 40% of the analysed projects, additional arrangements are made in order to accelerate the actual change procedure. These arrangements concern contract changes without a cost and time impact. Some of the projects make use of the internal deviation process in order to capture the adjustment. Other projects make use of the list of resolutions in the contract meeting, by which adjustments or specifications to the actual agreement can be made. There is a need to capture these contract changes, in order to avoid disagreement in a later phase of the project. So, these additional arrangements indicate that both contract models do not foresee in small adjustments or specifications of requirements without a cost and time impact. The need for recording these changes is present. The projects that make use of these additional arrangements have a shorter process time and a lower process time score. Only, the actual effect of these arrangements on the process time cannot be derived from the data in this research, as it is unknown which contract changes are processed in this way. All in all, there is no prove based on this additional analysis to either reject or accept the hypothesis about the internal processes, so further research on this subject is needed.

3.4.4 Process time in general
To sum up, two of the hypotheses concerning the process time are neither confirmed nor denied. Therefore, it is difficult to pinpoint a specific reason for the process time scores. However, the actual process time of contract changes in UAC-IC based projects is generally higher than the process time of contract changes in
DBFM projects. In the DBFM projects, the process time is the highest for project 3, and the actual change procedure in this project has a more formal approach. Project 4 has a comparable estimated process time and had an even more formal collaboration. However, due to a longer project duration, this project scores better on the process time score.

<table>
<thead>
<tr>
<th>Projects</th>
<th>Percentage of project duration</th>
<th>Process time score</th>
<th>Projects</th>
<th>Percentage of project duration</th>
<th>Process time score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6%</td>
<td>2</td>
<td>9</td>
<td>31%</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>11%</td>
<td>3</td>
<td>10</td>
<td>33%</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>20%</td>
<td>4</td>
<td>11</td>
<td>17%</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>10%</td>
<td>2</td>
<td>12</td>
<td>3%</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>13%</td>
<td>3</td>
<td>13</td>
<td>17%</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>8%</td>
<td>2</td>
<td>14</td>
<td>5%</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>5%</td>
<td>1</td>
<td>15</td>
<td>19%</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>4%</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The UAC-IC based projects 9, 10 and 15 have a remarkable process time score, as they all score a 5. For the first two projects this partly may be attributed to the short project duration, as the process time in absolute terms is average. These projects also have tracked the contract changes from the start of the discussion instead of the first submitting of the price offer. Therefore, the measured process time in these projects is more accurate. The same applies to project 15, in which the contract manager starts tracking the process from the moment he does an internal, so called, legitimacy test of the contract change. After this test, the contract change can be included in the design and construction works, and the formal change procedure starts. However, the start of the formal procedure is not tracked, so the measured process time is biased by including the internal process. On the other hand, the collaboration in this project is very formal, so the actual process time of a contract change will not differ much.

Another remarkable score is observed for projects 7, 8, 12 and 14, as they all score a 1 on process time. Project 8 make use of a comparable meeting as described in the DBFM change procedure version 4.1. So, there is a special contract change meeting with employer and contractor involved, in which the content of the contract changes is discussed and actions between the parties are divided. There are no decisions made in this meeting, but still it results in a relatively short process time (score 2). In project 14, the process time is only tracked from the moment the contractor submits the price offer for the first time, up to informal agreement is given by the employer. As a result, the discussion time is not tracked, and also after approval the formal change agreement still had to be made. Therefore, the actual process time is expected to be longer. Also in project 12, the discussion time before the official price offer is submitted, is not tracked. This also results in a shorter average process time. In project 7, the technical managers from both contracting parties arranged meetings to quickly obtain agreement. This has resulted in a shorter average process time.

Overall, for DBFM projects the formality of the collaboration is the most decisive element in defining the process time, while for UAC-IC based projects the dominant factor is harder to define. This is a result of the less comparable data of these projects, as the differences are mostly a result of including or excluding the discussion time of a contract change.

3.4.5 Combined effect of time and cost impact

The fourth hypothesis concerns both the cost and time impact, and it reads as follows: The combination of time and cost impact of a contract change will generally cause larger individual cost and time impact (H4)
Only projects with a time impact score of more than 1 are subject to this additional analysis. First, the contract changes that have led to a time extension are analysed on their individual cost impact. Thereafter, the individual cost impact is analysed on their contribution to the overall cost impact. The results are shown in table 13. As can be seen, contract changes that result in a time extension also result in a cost impact in most of the cases. Moreover, this related cost impact contributes for a large extend to the overall cost impact. Concluding, once there is a time impact, there is also a high cost impact, but this relation does not apply the other way around. Consequently, the hypothesis is only partly true.

3.4.6 Cost impact
The last hypothesis reads as follows: Cost impact of contract changes in DBFM agreements is generally higher than the cost impact of contract changes in UAC-IC based agreements (H5).

Also after exclusion of the contract changes caused by changes in law or regulation, the cost impact shows scattered results. First the DBFM projects are analysed more in depth. Projects 1, 2 and 3 are all subject to the same version of the Model Agreement (version 3.0). However, they show different results. Projects 1 and 2 score low on the cost impact, respectively 1 and 2. Project 3 scores average on the cost impact, due to two contract changes in caused by slow decision making. The only DBFM project that scores a 5 on the cost impact score was subject to the first version of the DBFM Model Agreement. In this version the system of IA’s is not included in the agreement, whereby the requirements of stakeholders were not involved in the agreement. This caused more contract changes with an external cause, resulting in cost impact.

Table 13  Combined time and cost impact

<table>
<thead>
<tr>
<th>Projects</th>
<th>Time impact</th>
<th>Related cost impact</th>
<th>Percentage of total cost impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7%</td>
<td>5,3%</td>
<td>81,0%</td>
</tr>
<tr>
<td>4</td>
<td>23%</td>
<td>22,2%</td>
<td>42,8%</td>
</tr>
<tr>
<td>5</td>
<td>38%</td>
<td>53,3%</td>
<td>69,1%</td>
</tr>
<tr>
<td>6</td>
<td>27%</td>
<td>23,7%</td>
<td>64,6%</td>
</tr>
<tr>
<td>7</td>
<td>3%</td>
<td>0,3%</td>
<td>16,2%</td>
</tr>
<tr>
<td>10</td>
<td>16%</td>
<td>21,8%</td>
<td>48,9%</td>
</tr>
<tr>
<td>11</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>25%</td>
<td>17,5%</td>
<td>52,9%</td>
</tr>
<tr>
<td>15</td>
<td>20%</td>
<td>53,8%</td>
<td>64,6%</td>
</tr>
</tbody>
</table>

In contrast to the DBFM projects, almost all UAC-IC based projects score a 5 on the cost impact score. This is often a result of contract changes caused by additional scope requirements, or technically necessary changes, due to unforeseen soil conditions. Scope changes also occur in DBFM agreements. Only the risk of unforeseen soil conditions is in the DBFM Model Agreement allocated to the contractor (para. 2.2.3.3). Once this risk occurs, the contractor cannot claim the consequences on the contracting authority. Therefore, there are often no contract changes in the DBFM agreements caused by unforeseen soil conditions.

There are some exceptions in the UAC-IC based agreements, that does not score a 5 on the cost impact score, namely projects 7, 8, 9, 10, and 14. The first four projects are subject to another procurement and project
management approach: Best Value. In projects with this approach, first potential contractors make an offer on broad terms. Thereafter, a pre-award phase takes place with one contractor, in which the scope of the project is further defined. This results in less ambiguities in the agreement during the execution phase of the project. Furthermore, there is an ‘opportunity dossier’, in which the contractor appoints opportunities and elaborates on the ways to make use of them (Van de Rijt, n.d.). Consequently, some of the change events can be eliminated by using the opportunity dossier, resulting in no extra costs.

Project 14 is also noted as a project with a low cost effect score. This project was a relatively small project, with also a low complexity level and a clear scope. Eventually this have led to a positive outcome.

So, in general, the cost impact of DBFM agreements is lower than the cost impact of UAC-IC based agreements. Also the costs impact in absolute terms are higher for UAC-IC based agreements. This may be attributed to more functional specified requirements in the DBFM agreements, which results in more freedom of interpretation for the contractor, and also a more robust agreement. Consequently, it should be expected that there are less contract changes in DBFM agreements. However, this is not the case; there are only less contract changes with a cost impact in DBFM agreements. So, probably there are different kinds of contract changes in both contract models, which may cause the differences in cost impact. The differences in risk allocation between the two contract models may be appointed as explanation. However, the actual content of contract changes is not studied for this thesis, nor the original requirements for the projects. Therefore, no conclusion can be drawn about the differences between the contract models based on this analysis. Overall, it need to be concluded that the hypothesis needs to be rejected.

### 3.4.7 Complexity of projects

Beside the hypotheses, the actual agreements of the projects are also analysed based on their complexity score. The exact definition of the complexity level is elaborated in appendix G.

By sorting the flexibility score of the projects to the complexity level, a division of DBFM and UAC-IC based projects is observed (figure 16). The projects become generally more inflexible by an increase in complexity. Project 13 is an exception in this trend. However, this project may be more complex in the end, than scored in this thesis, as this project is a renovation project.

![Figure 16: Flexibility score of projects sorted by ascending complexity level](image)

The complexity level is the highest for DBFM projects, but the actual agreements of these projects are also more flexible. For instance, projects 5, 6 and 2 have a comparable complexity level, but project 2 is more flexible. This project is subject to a DBFM agreement, while the other two projects are subject to an UAC-IC based agreement. Based on these observations, it is concluded that the use of the DBFM Model Agreement makes it possible to deal with complexity in a flexible way.

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29 Dutch: kansendossier
3.4.8 Change events

At last, the change events are analysed more in depth, in order to identify possible dominant change events influencing the agreement. The change events are identified in paragraph 0, and can be summarised by an internal project team origin or an external origin, and by the following causes of changes: omissions in the actual agreement, technically necessary changes, change in law or regulation, and scope changes.

First of all, the causes for time extension are analysed. It is concluded that scope changes cause the most and longest time extensions in projects. Subsequently, technically necessary changes and omissions in the actual agreement influence the project duration negatively. By analysing the origin of the change events, it is noted that the external scope changes are overall the dominant cause for time extension.

In figure 17, the cost impact per cause of change event are illustrated. In this figure, the changes in law or regulation are not excluded. The figure obviously shows that the scope changes in general have the highest cost impact. Also, the technically necessary changes have a large impact on the initial contract value. For project 4, 5, and 6 needs to be noted that they all had to deal with the introduction of the tunnel standard. This results in a large cost impact caused by a change in law. Consequently for these projects, the contract changes originating from an external change event have a higher cost impact. The same applies to the DBFM projects in general, while most UAC-IC based projects have a higher cost impact originating from internal project team change events.

At last, the effect of change events on the process time of contract changes is analysed. Contract changes that are caused by a technically necessary change or an omission in the actual agreement often tend to claims, as these contract changes apply to already executed work. These claims result in discussion about the contract changes, which can influence the process time in a negative way. In the UAC-IC, claims need to be handled by a separate procedure (clause 44). However, in practice it is often seen that these claims are also submitted and treated as contract changes, in order to control them. Besides, scope changes can also influence the process time in a negative way, as these may result in discussion between the contracting parties about the original scope of the project. All in all, the combination
of contract changes with change events originating from technically necessary changes and additional scope requirements determine 40% to 60% of the process time, as illustrated in figure 18. Further, the contract changes originating from an internal project team change event generally just take a bit longer to process than contract changes with an external origin, as illustrated in figure 19. The reason for this difference is hard to identify based on the data available in this thesis.

3.5 Observations per supposition

The above analyses can be summarised per supposition into several observations of the studied agreements. This results into an overall conclusion of the flexibility of an actual agreement.

The first group of observations is related to the first supposition: Contract changes with a long process time are a result of an inflexible agreement (S1). First of all, the process time vary substantially per project and per contract change. This is attributed to the fact there is no real uniformity in the ‘official’ initiation moment of a contract change. This especially applies to the UAC-IC based agreements. Therefore, an objective comparison of the process time is in any case rather difficult.

Second, the influence of performance incentives in the change procedures of DBFM projects is studied. There is no management towards meeting the deadlines as mentioned by interviewed contract managers. So, the actual influence of these performance incentives on the process time of a contract change could not be defined based on the data and information available in this analysis.

Further, the process time is only partly affected by the contractual change procedure. This is attributed to the fact that also the handling of the actual agreement is decisive. An example are informal agreements on a contract change before the formal change agreement is set, as used in UAC-IC based agreements. The formal change agreement follows in a couple of weeks. If the informal agreement is only on the technical content of the contract change, the actual process time is longer. Therefore, it seems there is less priority to formalise the contract change after a technical informal agreement. In contrast, there are barely informal agreements used in DBFM projects.

An additional result based on the analysis of the handling of the agreement is that contract models do not provide sufficient flexibility for small adjustments and specifications of requirements without a time and cost
impact. The need for those adjustments is present, as several contracting parties have made additional arrangements regarding these small contract changes. However, the actual effect of these additional arrangements need to be further researched.

At last, the internal processes regarding the actual change procedure are superficially studied. It is not possible to draw hard conclusions based on this analysis. However, there are reasons appointed by which can be expected that the mandate at the contracting authority side of the project influences the process time in a negative way. Also, the level of formality in the inter-organisational communication is decisive for the process time. Especially in the DBFM projects, the differences between the process times of the individual projects can be related to the level of formality, as projects with more informal meetings have a shorter average process time.

3.5.2 Cost impact (S2)
The second group of observations is related to the second supposition: *Contract changes with a high impact in costs are a result of an inflexible agreement (S2).* First of all, 85% of the studied projects show a cost impact above 10% of the weighted contract value. Based on literature, this is perceived to be less flexible. However, after taking a closer look to the individual contract changes, it is observed that the total cost impact is in approximately 65% of the projects influenced by only one contract change with an extreme cost impact. So, the agreements are probably more flexible than the first observation shows.

The contract changes with extreme cost impact are caused by either changes in law or regulation initiated by a stakeholder to the project, or by scope changes initiated by a member of the project team due to incorrect assumptions. The cost impact of changes in law or regulation is often high because these changes are caused by a political decision made by the government or another organisation, which are not directly involved in the project. As a result, the impact is hard to predict for these external parties. Also, contract changes due to incorrect assumptions can lead to a high impact, because they may influence the design and the work method. Only these kinds of changes could have been obviated in the plan development phase of the project. Moreover, these kinds of scope changes due to incorrect assumptions, only occur in UAC-IC based agreements, due to the fact that the risk of incorrect assumptions is allocated to the contractor in DBFM agreements.

Further, the analysis shows that the cost impact in UAC-IC based agreements is higher than the cost impact of DBFM agreements. This might be a result of more functional specified requirements in DBFM agreements, by which the agreement is a more robust agreement instead of a more flexible one. However, the amount of contract changes in a DBFM agreement is similar to the amount in UAC-IC based agreements, so the assumption of a more robust agreement is not completely true. The differences in cost impact also may be attributed to the differences in risk allocation between the two contract models. For instance, the risk of unforeseen soil conditions is allocated to the employer in the UAC-IC, while in the DBFM Model Agreement this risk is in principle allocated to the contractor. In the UAC-IC based agreements, there are also more contract changes caused by technically necessary changes. However, the exact content of contract changes is unknown. Therefore, it is not possible to substantiate the differences in cost impact. Overall, the cost impact of UAC-IC based agreements most often exceed the line of 10% extra costs, so these agreements are considered less flexible regarding the cost impact. Only projects based on the Best Value approach are an exception to this rule, which is attributed to the pre-award phase used in these projects.

3.5.3 Time impact (S3)
The third group of observations is related to the third supposition: *Contract changes resulting in a critical time delay are a result of an inflexible agreement (S3).* First of all, a time impact due to a contract change is observed in 60% of the studied projects. This is perceived to be less flexible. However, the time impact is also related to one or up till three contract changes per studied agreement. So, likewise the cost impact, the agreements are probably more flexible than the first observation shows.
The contract changes with a time impact are also caused by changes in law or regulation or scope changes with an internal origin. For this time impact, the same explanation applies as for the contract changes with an extreme cost impact. As a result, there is a strong relationship observed between the time and cost impact of a contract change. If a contract change results in a time extension, there is also most of the time a cost impact involved. This cost impact contributes for a large extend to the overall cost impact of all contract changes in an agreement. The contract changes with a time and cost impact often originate from an external change event and occur in every project, by which there is no difference between the DBFM and UAC-IC based agreement on this point.
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4 Conclusion and Discussion

Before this research it was unknown to what extent integrated contracts are flexible regarding changing project circumstances. Therefore, the objective of this research is to fill the gap of knowledge about the actual extent of flexibility provided in integrated contracts for legally accommodating changing project circumstances and to propose recommendations for improving the flexibility of integrated contracts. This chapter reflects on the overall research and provides an answer to the research question. Thereafter, the conclusions are connected to the broader field of research in the discussion.

4.1 Conclusion

This research is subject to the following research question:

*To what extent do integrated contracts provide flexibility for legally accommodating changing project circumstances, within the actual DBFM and UAC-IC 2005 based agreements in the Dutch infrastructure sector?*

Flexibility of an agreement is in this research defined as the ease of adjusting the agreement to accommodate changing circumstances within the context of the agreement. The context of the agreement is further defined as the contract models (DBFM Model Agreement and UAC-IC 2005), the project specific elements, and the Dutch law, case law and general terms and conditions regarding adjusting the agreement. The definition of flexibility in an agreement is expressed in three suppositions regarding the process time to come to a contract change and the cost and time impact related to the contract changes. Based on these suppositions, the flexibility of actual agreements is measured. The process time needs to be in proportion to the total project duration, in order to be flexible. Furthermore, cost impact within 10% of the initial contract value is seen as a result of a flexible agreement, even as no critical time delay in the project.

Based on the observations of the actual agreements, it is concluded that the process time of a contract change is only partly influenced by the contractual change procedure. Also the handling of the agreement contributes to the length of the process time, like making use of informal agreements before the contract change is finalised. The contractual change procedure of the DBFM Model Agreement describes deadlines in order to limit the process time of a contract change. However, in practice there is no management towards meeting these deadlines as mentioned by interviewed contract managers. In the UAC-IC, there are even no deadlines described. Concluding, the integrated contracts contribute in a limited way to a flexible process of a contract change.

The observations of the actual agreements also show that there is a high impact in time and costs due to contract changes caused by changes in law or regulation or internal scope changes. The changes in law or
regulation occur regardless of the used contract model, as these are a political decision from the government or another organisations outside the project. Changes in law or regulation are specifically described in integrated contracts. They always need to be denoted as a contract change initiated by the employer or contracting authority. As a result, the risk for changes in law or regulation is allocated to respectively the employer and contracting authority. Still, the impact of these contract changes is high and therefore, the integrated contracts are considered to be inflexible towards these kind of contract changes.

Also, contract changes caused by an internal scope change are observed to have a high impact in time and costs. The reason for a scope change resulting in a high impact is observed to be an incorrect assumptions regarding the technical condition of the current infrastructure or the soil condition of the work area. These kind of contract changes only occur in UAC-IC based agreements, as the risk of incorrect assumptions is allocated to the contractor in the DBFM Model Agreement. In other words, once the risk of incorrect assumptions occurs, the contractor of a DBFM agreement cannot claim the consequences of the change to the contracting authority. Case law have showed that the risk of unforeseen soil conditions is allocated to the employer in UAC-IC based agreements. So, based on the difference in impact in terms of cost and time, the DBFM Model Agreement is flexible towards scope changes, while the UAC-IC 2005 is inflexible towards these contract changes.

The contract changes with extreme impact in time and costs are observed to be an exception in the actual agreements. Most of the contract changes are easily processed within the context of the agreement in terms of costs and time. For these contract changes, the process time is decisive for a flexible adjustment of the agreement. Only results show scattered process times of the contract changes, regardless of the contract model or change event. This is attributed to the handling of the agreement, and not to the contractual change procedure as mentioned before. Therefore, the integrated contracts provide flexibility for most of the contract changes.

Overall, integrated contracts do not provide flexibility regarding large changes in law or regulation, and the UAC-IC 2005 does not provide flexibility for large internal scope changes. For the remaining contract changes, both integrated contracts provide sufficient flexibility.

4.2 Discussion

As the research is part of a bigger picture, it will be placed in the context of the field of research. Furthermore, the research for this thesis is limited in time and scope. This results in some limitations in the scope of the research and in the research method, which are described in respectively paragraph 4.2.1 and 4.2.2. Further, paragraph 4.2.3 reflects on the research compared to other studies to flexibility of integrated contracts.

4.2.1 Limitations of the scope of the research

First of all, this research is based on only four DBFM projects, of which three projects are just in the maintenance phase. There are possibly other kind of change events in the maintenance phase of the project. This also might require different flexibility in the agreement, even though the flexibility of an agreement already needs to be provided in the construction phase of a project. Therefore, it is needed to track the DBFM projects also in the maintenance phase, in order to define whether the contract models are still flexible in this phase.

Furthermore, the research cannot be generalised based on the amount of DBFM projects. Four project of which also only three projects are based on the same version of the DBFM Model Agreement is not a representative sample. However, the population of DBFM projects in the Netherlands is not much larger at the moment. So, this is another argument to keep track of the current and future DBFM projects, in order to gather more data about the flexibility of these agreements.
The data set of UAC-IC based projects is larger, and also shows more variety in the type of projects. For instance, some of the projects are renovation projects, while others are more construction projects with new parts of roads. Also, the modalities of the projects differ more than the modalities involved in the DBFM projects. Due to the variety of the data set, the set is representative for the population of UAC-IC based projects.

The DBFM and UAC-IC based projects are comparable due to the focus on the construction phase of the project. Overall, the data set as a whole is representative for integrated contracts in the Dutch infrastructure sector, but it is also a small population by which the results cannot be generalised.

Second, this research is focused on the Dutch infrastructure sector. Only the surrounding countries also make use of similar integrated contract models. The DBFM Model Agreement is derived from the Private Finance Initiative (PFI) in the United Kingdom. But also for instance Germany and Belgium make use of comparable contract models. The cultural backgrounds and the legal context in these countries is different. Therefore, it would be interesting to study the impact of these cultural differences on the flexibility of the agreement and to compare the results of this thesis with experiences abroad, in order to learn from their findings regarding flexibility of the agreements.

The third limitation concerns the studied contract changes. In this research, only the change events and the impact in time and costs are studied, in order to study many different agreements that way. Thereby, the actual content of the contract changes is not studied. Based on this thesis it is hard to draw conclusions about the difference between the two contract models regarding the cost impact of contract changes. By knowing the exact content of the contract changes, this would be more possible, as the content gives for instance more insight into the risk allocation between the contracting parties.

Furthermore, only the approved contract changes are studied in this research, whereas also withdrawn contract changes could give information about the flexibility of an agreement. For instance, it may turn out that several changed circumstances cannot result in a contract change. There are grounds of refusal described in both contract models, and they are also used once in a while considering the number of withdrawn contract changes. By knowing the reasons for withdrawing a contract change, the conclusions of this research about the flexibility of integrated contracts could be refined or substantiated.

Also, the specific content of actual agreements is out of scope in this research. For every project, specific arrangements are made between the contracting parties regarding the risk allocation. Also contractors can include additional arrangements in their tender documents regarding contract changes. Both elements might be of importance in defining the actual flexibility provided in the actual agreement.

Another element that is out of scope for this thesis is the decision process in projects. In this research is concluded that the process time of a contract change only partly is defined by the contractual change procedure, and also by the handling of the agreement. Hereby, it is proven that the flexibility of an agreement is closely linked to the decision process of the project. For instance, the internal processes of a project are part of the decision process. The contracting parties can decide whether to adjust the agreement or not. Also the decisiveness of the project managers determines the ease of adjusting the agreement, as a project manager can decide to adjust the work method on crucial moments in the project without knowing the impact of this adjustment. Often a decision on a crucial moment is better than no decision, as no decision may result in even higher impact in time and costs. Further, the moment of initiating a contract change is decisive in the decision process. Towards the end of the project, it is harder to adjust the scope of the project as a large part of the work is already executed. This is also a consequence of the design and construction method, which can be more flexible, if flexibility in the design is taken into account right from the start of the project. The agreement is during the entire project the same, except for the contract changes, but the project becomes less flexible.
towards the end of a project. Therefore, the decision process of projects needs further research in order to create a complete picture of the flexibility in integrated contracts.

4.2.2 Limitations of the research method
The used research method determines the validity and reliability of the research. Therefore, some limitations of the used method are enumerated:

- **Research is based on project records**: As already mentioned in the description of the research method, the research is based on project records (section 3.1). Therefore, the results are influenced by the accuracy and completeness of the project records kept by the contract managers. Hereby, the data of the process time is less reliable, as the process time is tracked in every project in a different way or it is not even tracked. This makes drawing conclusions regarding the process time more challenging.

- **The used scoring models are superficially validated**: The scoring models that are used in order to score the flexibility of agreements are only superficially validated by a few practitioners. The scoring models are based on implications resulting from literature and on the data gathered in this research. Consequently, based on this research further discussion is possible with practitioners in order to start the real validation. However, the conclusions of this research are not only based on the results of the scoring models, but also on observations and analyses of individual contract changes. Therefore, the conclusions are not less reliable.

- **Most of the studied projects are not completed yet**: Half of the studied projects is not finished yet. In order to align the results, the data is scaled in relation to project progress. Especially for projects that are not progressed far, like the DBFM projects this results in less reliable data. Therefore, the results cannot automatically be generalised.

4.2.3 Research compared to other studies
This research aimed at providing more insight into the flexibility of integrated contracts. Especially the DBFM contract model is seen as an inflexible agreement (Eversdijk & Korsten, 2009, p. 8). However, the results of the studied projects given the flexibility framework of this thesis prove differently. DBFM agreements seem to be more flexible than UAC-IC based agreements, regarding cost impact of contract changes. Moreover, both contract models are flexible regarding most of the contract changes.

Roosjen (2013, p. 64) stated that DBFM agreements are flexible for small contract changes. This research needs to make a nuance to this statement, as the contract models do not provide sufficient flexibility for the purpose of small contract changes without time and cost impact. In addition to her research, the contract models are not flexible regarding large changes in law or regulation and large internal scope changes. The scope change originating from an internal cause can be avoided by focusing on the settlement of the internal scope requirements and the technical conditions of the site in the plan development phase of contract formation. The large changes in law or regulation need to be challenged together by both contracting parties.

Further, this research confirms that flexibility of an agreement is not only a result of the agreement itself, but also of handling the agreement by the contracting parties. This is most reflected by the process time of a contract change, as the process time is only partly defined by the contractual change procedure. However, the contract model is the guideline, in case parties are not on speaking terms. Therefore, the flexibility already needs to be regulated in the contract model.
5 Recommendations

The objective for this research is to recommend improvements of the integrated contract models in order to improve the flexibility of the agreements. This research has showed that the integrated contracts are more flexible than expected from the beginning of the research. However, there is room for improvement on some points in the contractual change procedure. Therefore, some practical recommendations are drawn to improve the flexibility of integrated contracts. These are proposed in section 5.1. Furthermore, there are some limitations to the research, which need to be investigated in order to substantiate the conclusions of this research. These are described in section 5.2.

5.1 Recommendations for more flexible integrated contracts

Considering the conclusions and limitations of this research, the following practical recommendations are proposed to improve the flexibility of the integrated contracts:

- The integrated contracts are inflexible towards changes in law or regulation, based on this research. The risk of changes in law or regulation is allocated to the employer and contracting authority, as they are expected to control the risk the best. However, the impact of these contract changes is still high. In order to improve the flexibility of both the DBFM Model Agreement and the UAC-IC 2005, probably the risk need to be relocated. Only, the contractor cannot control the risk of changes in law; they can only control the impact of the contract change. Therefore, it is recommended to control the risk together by both contracting parties. First, the employer has to control the political influence and thereafter, the contractor is responsible for the best possible implementation of the contract change.

- The UAC-IC 2005 is inflexible towards scope changes due to incorrect assumptions about the technical conditions of the current infrastructure and the soil conditions of the work area. In the DBFM Model Agreement, the risk of these incorrect assumptions is allocated to the contractor. Also in this case, the contractor can better control the impact of the scope changes. Therefore, it can be a solution to transfer the risk of incorrect assumption to the contractor in the UAC-IC 2005 as well. However, the employer has the information regarding the technical conditions and the soil conditions. So, it is recommended to share this information in the pre-award phase and thereafter, the responsibility of incorrect assumptions can be allocated to the contractor.

- In the research, contract changes are observed that are accommodated within the context of the agreement, but of which the ease of adjustment is perceived to be low by the interviewed contract managers. These contract changes concern temporary adjustments of requirements in the agreement or specifications of requirements. Actually, these are arrangements between the contracting parties about the actual agreement. There is a need to capture these arrangement in a contract change in order to avoid discussions in a later phase of the project. Strictly speaking, these arrangements also
need to be processed by the contractual change procedure, only they will not result into impact in
time or costs. In the DBFM Model Agreement, a division in ‘small’ and ‘other’ changes is made in the
change procedure based on the value of contract changes. It is recommended to adjust this division
into a change procedure for ‘small’ changes without impact in time and costs and into one for ‘other’
changes. The same can be applied to the UAC-IC 2005. As a result, small arrangements can be adjusted
in a more flexible way.

- The process time of a contract change is only partly influenced by the contractual change procedure;
also the handling of the agreement is decisive. However, there is no management towards meeting
the deadlines described in the change procedure of the DBFM Model Agreement as mentioned by the
interviewed contract managers. First of all, it is recommended to apply these deadlines also in the
UAC-IC 2005. Further, both contracting parties together need to apply management towards meeting
these deadlines in order to create openness towards each other and in the end a faster processing of
contract changes. This will result into a more flexible handling of the integrated contract.

5.2 Recommendations for further research

Due to the limited scope and time of this research, not all aspects of flexibility of integrated contracts are
studied yet. Therefore, the following subjects are proposed for further research:

- **Track results of contract changes in integrated contracts**: The conclusion of this research is based on a
relatively small data set of projects, of which most of the projects are not completed yet. In order to
generalise the outcomes of this research, more preferably complete projects need to be analysed in
the same way. Also the result of new projects need to be tracked. Based on the gathered data, also
internal processes can be adjusted. Therefore, it is recommended to track the results of contract
changes to both contracting parties.

- **Experiences and results abroad**: This study is only executed in the Netherlands, while surrounding
countries like the UK and Germany also make use of integrated contracts. The cultural backgrounds
and the legal context in these countries differs from the Dutch situation. It would be interesting to
study the impact of these differences on the flexibility of integrated contracts. Therefore, the same
study should also be executed in other countries. Based on those studies, the outcomes can be
compared and eventually this will result in learning for both countries.

- **The content of contract changes is yet unknown**: This research is based on the causes of change events
and the impact resulting from a contract change. In addition, the process time to come to a contract
change is studied. However, it is observed that not all contract changes result in a (cost) impact,
especially in DBFM projects. Furthermore, the process time of contract changes differs per contract
change. In order to further explain the differences in DBFM and UAC-IC based projects regarding
contract changes, the content of contract changes need to be studied more in detail.

- **Grounds of refusal of withdrawn contract changes are unknown**: This research has focused on the
approved contract changes and their impact, but there are also withdrawn or refused contract
changes observed. Further research to these withdrawn contract changes and their grounds of refusal
may probably lead to knowledge about certain contract changes that under no circumstance can be
processed in the agreement. This can refine the statements about flexibility of agreements resulting
from this research, once it turns out that several changed circumstances cannot result in a contractual
change.

- **The decision process in the actual projects**: The decision process in a project is closely related to the
flexibility of an agreement, and it completes the picture of the flexibility of integrated contracts. Only
the decision process is influenced by many facets. For instance: the influence of the internal processes,
like the involvement of lenders and the maintenance company; the decisiveness of the project
managers regarding quick decisions; the flexibility of the project towards the end of the construction
phase; and the flexibility of the design. All these elements require further research.
References


Appendices

Appendix A  Glossary

**Agreement**  (Dutch: Overeenkomst) The actual contract (including schedules belonging thereto) between two or more parties.

**Availability Date**  (Dutch: Beschikbaarheidsdatum) The date on which the contracting authority signs the availability certificate.

**Change**  (Dutch: Verandering) Any change in or in the environment of the project

**Change agreement**  (Dutch: Wijzigingsovereenkomst) Document that is drawn up to capture a contract change

**Change event**  An event that results into a contract change

**Contract change**  (Dutch: Wijziging) An adjustment of the actual agreement initiated by either the contracting authority/employer or contractor

**Contract models**  (Dutch: contract modelen) The UAC-IC 2005 and the DBFM Model Agreement

**Commencement Date**  (Dutch: Aanvangsdatum) The date on which the contracting authority issues the commencement certificate.

**Compensation Event**  (Dutch: Geval van Vergoeding) The circumstances as a result of which the Contractor is unable to comply with its obligations pursuant to the agreement or is only able to comply with incurring a Financial Loss

**Completion Date**  (Dutch: Voltooingsdatum) The date on which the contracting authority issues the completion certificate.

**Contract Date**  (Dutch: Contractdatum) The date on which the agreement is signed.

**Contracting Authority**  (Dutch: Opdrachtgever) Used in the DBFM Model Agreement to indicate the client

**Contractor**  (Dutch: Opdrachtnemer)

**Critical Delay**  (Dutch: Kritieke Vertraging) A delay in the work that makes it impossible to avoid the scheduled availability date being exceeded by more than the a number of Calendar Days without incurring a financial loss

**DBFM Model Agreement**  (Dutch: DBFM Model Overeenkomst) DBFM Model Agreement Infrastructure version 4.1 unless explicitly mentioned

**DBFM agreement**  Agreement between parties based on the DBFM Model Agreement

**DBFM project**  Project subject to an agreement between parties based on the DBFM Model Agreement

**Employer**  (Dutch: Opdrachtgever) Used in the UAC-IC 2005 to indicate the client
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expiry Date</td>
<td>(Dutch: Einddatum)</td>
</tr>
<tr>
<td>Force Majeure Event</td>
<td>(Dutch: Geval van Overmacht)</td>
</tr>
<tr>
<td>Implementation agreement</td>
<td>(Dutch: Uitvoeringsovereenkomst) The documents in Schedule 9, Part 5</td>
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<tr>
<td></td>
<td><em>(Implementation Agreements)</em>, of the DBFM Model Agreement in which</td>
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<tr>
<td></td>
<td>obligations of the contracting authority and stakeholders are captured.</td>
</tr>
<tr>
<td>Process time</td>
<td>(Dutch: doorlooptijd) Time to process a contract change</td>
</tr>
<tr>
<td>Small Change</td>
<td><em>(Dutch: Kleine Wijziging)</em> A contract change that shall result in an</td>
</tr>
<tr>
<td></td>
<td><em>(expected)</em> financial loss smaller than a predefined threshold.</td>
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<tr>
<td></td>
<td>Contracts 2005; general terms and conditions of integrated contracts</td>
</tr>
<tr>
<td>UAC-IC based agreement</td>
<td>Agreement between parties based on the UAC-IC 2005</td>
</tr>
<tr>
<td>UAC-IC based project</td>
<td>Project subject to an agreement between parties based on the UAC-IC 2005</td>
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Appendix B  Change procedure UAC-IC 2005

Figure 21  Change procedure UAC-IC 2005 (CROW, 2005b, pp. 112, 115)
De Opdrachtgever is gerechtigd om, uitsluitend schriftelijk, de volgende Wijzigingen aan de Opdrachtnemer op te dragen:

(a) wijzigingen van eisen opgenomen in de Vraagspecificatie,
(b) wijzigingen in bij de Vraagspecificatie gevoegde annexen,
(c) wijzigingen in de Basisovereenkomst,
(d) wijzigingen van keuzen die de Opdrachtnemer heeft gemaakt tijdens het verrichten van de Werkzaamheden voorover deze daarbij de vrijheid had om concrete invulling te geven aan de eisen opgenomen in de Vraagspecificatie,
(e) wijzigingen in geaccepteerde Documenten,
(f) wijzigingen van geaccepteerde gemachtigden of zelfstandige hulppersonen,
(g) wijzigingen van geaccepteerde Werkzaamheden, en
(h) wijzigingen van geaccepteerde resultaten van Werkzaamheden.

Een Wijziging als bedoeld in lid 1 van een geaccepteerde zelfstandige hulppersoon in een andere met naam genoemde zelfstandige hulppersoon, wordt gelijkgesteld met het voorschrijven van die andere hulppersoon in de zin van § 6 lid 3. In dat geval is § 6 lid 3 tot en met 7 van overeenkomstige toepassing.

Elke aanpassing van Documenten, Werkzaamheden of resultaten van Werkzaamheden, noodzakelijk geworden als gevolg van een aan de Opdrachtgever krachtens de wet, de Overeenkomst of de in het verkeer geldende opvattingen toe te rekenen omstandigheid, wordt geacht een door de Opdrachtgever opgedragen Wijziging in de zin van lid 1 te zijn.

De Opdrachtnemer is verplicht een onderzoek in te stellen naar en de Opdrachtgever te informeren over de mate waarin een door de Opdrachtgever krachtens de wet, de Overeenkomst of de in het verkeer geldende opvattingen toe te rekenen omstandigheid, wordt geacht een door de Opdrachtgever opgedragen Wijziging in de zin van lid 1 te zijn.

De Opdrachtnemer is verplicht, met inachtneming van het bepaalde in § 45, de opgedragen Wijziging uit te voeren, tenzij hetgeen overigens in deze paragraaf en in § 45 is bepaald, zich daartegen verzet.

De Opdrachtnemer is niet verplicht een door de Opdrachtgever opgedragen Wijziging uit te voeren indien:

(a) de Wijziging niet schriftelijk is opgedragen, of
(b) de uitvoering van de Wijziging een afwijking inhoudt van de in dat lid bedoelde eisen, keuzen, Documenten, gemachtigden, zelfstandige hulppersonen, Werkzaamheden en resultaten van Werkzaamheden. Deze verplichting laat de waarschuwingsplicht van de Opdrachtnemer uit hoofde van § 4 lid 7 sub h onverlet.

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Indien de Opdrachtgever van mening is dat de Opdrachtnemer ten onrechte weigert de Wijziging uit te voeren, deelt hij dat na ontvangst van de mededeling als bedoeld in lid 7 met bekwame spoed schriftelijk aan de Opdrachtgever.

Nadat de Opdrachtgever een Wijziging heeft opgedragen, deelt de Opdrachtnemer met bekwame spoed schriftelijk mee of hij de Wijziging zal uitvoeren. Indien de Opdrachtnemer verzuimt met bekwame spoed deze mededeling te doen, stelt de Opdrachtgever een nadere termijn waarbinnen hij dat alsnog kan doen. Indien de Opdrachtnemer ook dan verzuimt deze mededeling te doen, is de Opdrachtgever verplicht de opgedragen Wijziging uit te voeren, behoudens het bepaalde in lid 16.

Indien de Opdrachtnemer de opgedragen Wijziging weigert uit te voeren, motiveert hij schriftelijk de in lid 7 bedoelde mededeling, onder verwijzing naar een of meer van de in lid 6 genoemde gronden.

Indien de Opdrachtgever van mening is dat de Opdrachtnemer ten onrechte weigert de Wijziging uit te voeren, deelt hij dat na ontvangst van de mededeling als bedoeld in lid 7 met bekwame spoed schriftelijk aan de Opdrachtnemer mee. In dat geval treden partijen onverwijld in overleg om uit de ontstane impasse te geraken. Tijdens dat overleg vormen partijen zich onder meer een beeld van de financiële gevolgen en de consequenties ten aanzien van de planning, die zich zouden voordoen indien de Wijziging zou worden uitgevoerd.

Indien de Opdrachtgever verzuimt met bekwame spoed de in lid 9 bedoelde mededeling te doen, stelt de Opdrachtnemer een nadere termijn waarbinnen de Opdrachtgever dat alsnog kan doen. Indien de Opdrachtgever ook dan verzuimt deze mededeling te doen, is de Opdrachtnemer niet verplicht de opgedragen Wijziging uit te voeren.

Indien de Opdrachtnemer naar aanleiding van het in lid 9 bedoelde overleg besluit de Wijziging alsnog uit te voeren, is het bepaalde in lid 16 van toepassing.

Indien de Opdrachtgever besluit de opgedragen Wijziging in te trekken, hetzij naar aanleiding van de in lid 7 bedoelde mededeling van de Opdrachtnemer, hetzij naar aanleiding van het in lid 9 bedoelde overleg, is de Opdrachtnemer niet verplicht de opgedragen Wijziging uit te voeren.

Indien de Opdrachtgever naar aanleiding van het in lid 9 bedoelde overleg besluit de opgedragen Wijziging te handhaven, en ook de Opdrachtnemer volhardt in zijn weigerings wijziging uit te voeren, leggen partijen het geschil voor aan de Raad van Deskundigen, vooropgesteld dat partijen die bevoegdheid in de Basisovereenkomst hebben gecreëerd, teneinde te laten vaststellen of de Opdrachtnemer terecht uitvoering weigert te geven aan de opgedragen Wijziging.
Indien de Raad van Deskundigen van oordeel is dat de Opdrachtnemer ten onrechte weigerd uitvoering te geven aan de opgedragen Wijziging, is hij verplicht die Wijziging uit te voeren, behoudens het bepaalde in lid 16.

Indien de Raad van Deskundigen van oordeel is dat de Opdrachtnemer gelet op een of meer van de in lid 6 genoemde gronden redelijkerwijs geen gehoor behoeftje te geven aan de opdracht tot Wijziging, is de Opdrachtnemer niet verplicht de Wijziging uit te voeren.

Indien de Opdrachtnemer krachtens lid 7 of lid 11 meedeelt dat hij de opgedragen Wijziging zal uitvoeren, of indien hij tot uitvoering verplicht wordt gelet op het bepaalde in lid 7 of lid 14, volgen partijen de in § 45 vastgelegde procedure alvorens de Opdrachtnemer tot uitvoering van de Wijziging overgaat. Kunnen partijen in die procedure niet tot overeenstemming komen over de wijze waarop de financiële gevolgen en de consequenties ten aanzien van de planning, die aan de Wijziging verbonden zijn, tussen hen zullen worden verdeeld, dan is de Opdrachtnemer niet verplicht de Wijziging uit te voeren.

Werd de in deze paragraaf vastgelegde procedure vertraagd als gevolg van:
(a) de verzuimen van de Opdrachtgever als bedoeld in lid 10, of
(b) het overleg als bedoeld in lid 9, vooropgesteld dat de Opdrachtgever na dit overleg de Wijziging krachtens lid 12 heeft ingetrokken, of
(c) de inschakeling van de Raad van Deskundigen, vooropgesteld dat het oordeel van de Raad luidt zoals omschreven in lid 15, dan heeft de Opdrachtnemer recht op kostenvergoeding en/of termijnsverlenging, met inachtneming van het bepaalde in § 44 lid 1 sub a.

§ 15 Wijzigingen op initiatief van de Opdrachtnemer

Vooropgesteld dat de Werkzaamheden, het Werk en het Meerjarig Onderhoud zullen beantwoorden aan de bepalingen van de Overeenkomst, is de Opdrachtnemer gerechtigd tot het uitvoeren van:
(a) wijzigingen van keuzen die de Opdrachtnemer heeft gemaakt tijdens het verrichten van de Werkzaamheden, voorzover hij daarbij de vrijheid had om concrete invulling te geven aan de eisen opgenomen in de Vraagspecificatie,
(b) wijzigingen van Documenten,
(c) wijzigingen van gemachtigden of zelfstandige hulppersonen,
(d) wijzigingen van Werkzaamheden, en
(e) wijzigingen van resultaten van Werkzaamheden.

Deze Wijzigingen zijn alleen toegestaan, indien deze keuzen, Documenten, gemachtigden, zelfstandige hulppersonen, Werkzaamheden en resultaten van Werkzaamheden nog niet door de Opdrachtgever zijn getoetst of geaccepteerd in het voorkomende geval dat die toetsing of Acceptatie in het toetsingsplan Ontwerpwerkzaamheden, het keuringsplan Uitvoeringswerkzaamheden, het keuringsplan Onderhoudswerkzaamheden of het acceptatieplan zijn vastgelegd, of voorzover de Opdrachtgever daarover anderszins nog niet is geïnformeerd.

Indien de Opdrachtgever de in lid 1 genoemde keuzen, Documenten, gemachtigden, zelfstandige hulppersonen, Werkzaamheden en resultaten van Werkzaamheden reeds heeft getoetst op basis van het toetsingsplan Ontwerpwerkzaamheden, het keuringsplan Uitvoeringswerkzaamheden of het keuringsplan Onderhoudswerkzaamheden, of indien hij daarover anderszins is geïnformeerd, is de Opdrachtnemer slechts gerechtigd de desbetreffende Wijzigingen uit te voeren, onder de voorwaarde dat hij die Wijzigingen ter toetsing aan de Opdrachtgever heeft voorlegd met inachtneming van het bepaalde in § 20, § 21 en dat de Werkzaamheden, het Werk en het Meerjarig Onderhoud zullen beantwoorden aan de bepalingen van de Overeenkomst.

De Opdrachtnemer is verplicht, met inachtneming van de in § 23 vastgelegde acceptatieprocedure, elk voorstel ter Acceptatie voor te leggen dat een Wijziging beoogt van:
(a) de eisen opgenomen in de Overeenkomst, of
(b) de gemachtigden, of
(c) de in lid 1 genoemde en door de Opdrachtgever reeds op basis van het acceptatieplan gecategoriseerde keuzen, Documenten, gemachtigden, zelfstandige hulppersonen, Werkzaamheden en resultaten van Werkzaamheden. De Opdrachtgever kan dit voorstel weliger te accepteren indien de voorgestelde Wijziging tot gevolg zou hebben dat de Werkzaamheden, het Werk en/of het Meerjarig Onderhoud niet zullen beantwoorden aan de bepalingen van de Overeenkomst.

De Opdrachtgever neemt de door de Opdrachtnemer ter Acceptatie voorlegde Wijzigingen als bedoeld in lid 3 sub a in beschouwing, maar kan deze, zonder opgaaf van redenen, weigeren te accepteren.

§ 45 Procedure afwikkeling gevolgen Wijzigingen door de Opdrachtgever

Indien de Opdrachtnemer meedeelt dat hij een door de Opdrachtgever opgedragen Wijziging zal uitvoeren, of indien hij daartoe verplicht wordt gelet op het bepaalde in § 14 lid 7 of lid 14, volgen partijen de in deze paragraaf vastgelegde procedure.

Zodra hij de Opdrachtgever heeft meegedeeld dat hij de Wijziging zal uitvoeren, of zodra hij daartoe verplicht wordt gelet op het bepaalde in § 14 lid 7 of lid 14, stuurde de Opdrachtnemer met bekwaamere spoed schriftelijk een prijsovereenkomst naar de Opdrachtgever. In deze prijsovereenkomst vermeldt de Opdrachtnemer:
(a) het saldo, gevormd door alle directe en indirecte kosten, alsmede een redelijke opslag voor algemene kosten, winst en risico, verband houdende met de uitvoering van de Wijziging, verminderd met het bedrag waarmee de in de Basisovereenkomst vastgelegde prijs kan worden verlaagd als gevolg van de uitvoering van de Wijziging, en
(b) de aanpassing van de in de bij de Vraagspecificatie gevoegde annex planning, de overeengekomen mijlpaaldata en de in de Basisovereenkomst vastgelegde datum van oplevering, gebaseerd op een berekening van de tijd die nodig is voor de uitvoering van de Wijziging, en
c) de aanpassing van de termijnstaat.

3 De Opdrachtnemer heeft recht op een redelijke vergoeding van de aan de in lid 2 bedoelde prijsaanbieding verbonden kosten, ongeacht de vraag of partijen het eens worden over die prijsaanbieding.

4 De Opdrachtgever deelt na ontvangst van de in lid 2 bedoelde prijsaanbieding met bekwame spoed schriftelijk aan de Opdrachtnemer mee of hij deze aanvaardt.

5 De Opdrachtgever kan na ontvangst van de in lid 2 bedoelde prijsaanbieding de Opdrachtnemer schriftelijk uitnodigen voor overleg over de ingediende prijsaanbieding. De Opdrachtnemer is verplicht aan dit verzoek gehoor te geven, binnen de grenzen van de redelijkheid en de bilijkheid.

6 Indien de Opdrachtgever verzuimt om met bekwame spoed de in lid 4 genoemde mededeling te doen zonder voorafgaand gebruik te hebben gemaakt van de procedure die is vastgelegd in lid 7, stelt de Opdrachtnemer een nadere termijn waarbinnen de Opdrachtgever dat alsnog kan doen. De Opdrachtnemer verwijst de Opdrachtgever daarbij naar de procedure die is vastgelegd in lid 7. Indien de Opdrachtgever ook dan verzuimt de bedoelde mededeling te doen, wordt de prijsaanbieding geacht te zijn aanvaard door de Opdrachtgever vanaf het moment van het verstrijken van de gestelde nadere termijn. In dat geval is het bepaalde in lid 8 van toepassing.

7 Indien de Opdrachtgever geen kans ziet om met bekwame spoed vast te stellen of hij de prijsaanbieding wil aanvaarden, deelt hij onverwijld schriftelijk en gemotiveerd aan de Opdrachtnemer mee binnen welke termijn hij wel tot dat besluit zal komen.

8 Indien de Opdrachtgever, eventueel na het voeren van overleg als bedoeld in lid 5, besluit de prijsaanbieding te aanvaarden, deelt hij dat schriftelijk aan de Opdrachtnemer mee. Vanaf dat moment worden partijen geacht te zijn overeengekomen dat:
(a) de in de Basisovereenkomst vastgelegde prijs is verhoogd onderscheidenlijk verlaagd met het saldo vermeld in de krachtens lid 2 gedane prijsaanbieding, eventueel aangepast door partijen tijdens het in lid 5 bedoelde overleg, en
(b) de in de bij de Vraagspecificatie gevoegde annex planning, de overeengekomen mijlpaaldata en de in de Basisovereenkomst vastgelegde datum van oplevering zijn aangepast conform de inhoud van die prijsaanbieding, eventueel aangepast door partijen tijdens het in lid 5 bedoelde overleg, en
c) de termijnstaat is aangepast conform de inhoud van die prijsaanbieding, eventueel aangepast door partijen tijdens het in lid 5 bedoelde overleg.

9 Indien de Opdrachtgever, eventueel na het voeren van overleg als bedoeld in lid 5, besluit de prijsaanbieding niet te aanvaarden, laat hij de in lid 4 genoemde mededeling vergezeld gaan van een schriftelijke motivering. In dat geval is hij bevoegd de prijsaanbieding en de eventuele nadere afspraken gemaakt tijdens het overleg als bedoeld in lid 5, voor te leggen aan de Raad van Deskundigen, vooropgesteld dat partijen die bevoegdheid in de Basisovereenkomst hebben gecreëerd, teneinde vast te laten stellen of de prijsaanbieding als redelijk kan worden aangemerkt.

10 Kan naar het oordeel van de Raad van Deskundigen de prijsaanbieding van de Opdrachtnemer, eventueel aangevuld met de nadere afspraken die partijen hebben gemaakt tijdens het overleg als bedoeld in lid 5, als redelijk worden aangemerkt, dan moet de Opdrachtnemer binnen bekwame tijd een nieuwie prijsaanbieding indienen. De Opdrachtgever kan in dat geval desgewenst de Raad van Deskundigen verzoeken te bepalen dat de Opdrachtnemer de Wijziging dient uit te voeren vooruitlopend op het indienen van een nieuwe prijsaanbieding. Indien de Raad van Deskundigen dat verzoek honoreert, is de Opdrachtnemer verplicht de opgedragen Wijziging uit te voeren. In dat geval is het bepaalde in lid 8 niet van toepassing.

11 Kan naar het oordeel van de Raad van Deskundigen de prijsaanbieding van de Opdrachtnemer, eventueel aangevuld met de nadere afspraken die partijen hebben gemaakt tijdens het overleg als bedoeld in lid 5, niet als redelijk worden aangemerkt, dan moet de Opdrachtnemer binnen bekwame tijd een nieuwe prijsaanbieding indienen. De Opdrachtgever kan in dat geval desgewenst de Raad van Deskundigen verzoeken te bepalen dat de Opdrachtnemer de Wijziging dient uit te voeren vooruitlopend op het indienen van een nieuwe prijsaanbieding. Indien de Raad van Deskundigen dat verzoek honoreert, is de Opdrachtnemer verplicht de opgedragen Wijziging uit te voeren. In dat geval is het bepaalde in lid 8 niet van toepassing.

12 Indien de Opdrachtgever, gelet op het bepaalde in lid 9, besluit de prijsaanbieding niet voor te leggen aan de Raad van Deskundigen, is het bepaalde in § 14 lid 16, tweede volzin, van toepassing.

13 Wordt de in deze paragraaf vastgelegde procedure vertraagd als gevolg van:
(a) de verzuimen van de Opdrachtgever als bedoeld in lid 6, of
(b) de mededeling van de Opdrachtgever als bedoeld in lid 7, of
(c) de inschakeling door de Opdrachtgever van de Raad van Deskundigen, vooropgesteld dat het oordeel van de Raad luidt zoals bedoeld in lid 10, dan heeft de Opdrachtnemer recht op kostenvergoeding en/of termijnverlenging, met inachtneming van het bepaalde in § 44 lid 1 sub a.
13. WIJZIGINGEN

13.1 Wijzigingen Partijen kunnen deze Overeenkomst slechts wijzigen door een daartoe opgemaakt en door hen ondertekend document.

13.2 Wijzigingen Opdrachtgever

Figure 23: Change procedure DBM Model Agreement version 4.1
(a) Wanneer de Opdrachtgever een wijziging van de Overeenkomst voorstelt wordt dat aangemerkt als een Wijziging Opdrachtgever.

(b) Als:

(i) een Relevante Wetswijziging tot een wijziging van deze Overeenkomst noodzaakt;

(ii) het Tracébesluit zoals dat luidt wanneer het onherroepelijk wordt, inhoudelijk afwijkt van het Tracébesluit zoals dat luidde op de datum gelegen twee weken vóór (datum Inschrijving) en dit tot een wijziging van deze Overeenkomst noodzaakt; of

(iii) deze Overeenkomst, met uitzondering van de Bijlagen Opdrachtnemer, dwingt tot een handeling in strijd met Regelgeving of met intellectuele of industriële eigendomsrechten van een derde en dit gecorrigeerd kan worden door een wijziging van de Overeenkomst; of

(iv) het doorvoeren van maatregelen of aanbevelingen die voortvloeien uit Eits [lij] van de Managementspecificaties leidt tot een aanpassing van deze Overeenkomst, met uitzondering van de Bijlagen Opdrachtnemer,

moeten Partijen die wijziging tot stand brengen als een Wijziging Opdrachtgever. Een Wijziging als bedoeld in dit lid (b) kan iedere belasting van deze Overeenkomst, inclusief Bijlagen Opdrachtnemer, betreffen, tenzij in dit lid (b) expliciet anders is bepaald. [Als vanwege de afwijking als bedoeld in dit lid (b) onder (ii) de resultaten van eerder door de Opdrachtnemer verrichte Werkzaamheden ongedaan gemaakt moeten worden, moet de Wijziging Opdrachtgever tevens een opdracht tot het ongedaan maken van deze resultaten inhouden.]

(c) Een Wijziging Opdrachtgever mag niet tot gevolg hebben dat:

(i) de Werkzaamheden wezenlijk worden gewijzigd ten opzichte van het oorspronkelijke doel van deze Overeenkomst; of

(ii) de Opdrachtnemer in de uitvoering van de Werkzaamheden moet handelen in strijd met Regelgeving.

(d) Een Wijziging Opdrachtgever is een Geval van Vergoeding.

(e) Als de Opdrachtnemer kan aantonen dat het risicoprofiel van de Werkzaamheden voor de Opdrachtnemer of de Financiers nadelig wordt beïnvloed door een Wijziging Opdrachtgever moet worden gewaarborgd dat de meerdere risico’s worden gecompenseerd of gedragen door de Opdrachtgever.

13.3 Wijziging Opdrachtnemer

(a) Wanneer de Opdrachtnemer een wijziging van de Overeenkomst voorstelt wordt dat aangemerkt als een Wijziging Opdrachtnemer.

(b) Als het doorvoeren van maatregelen of aanbevelingen die voortvloeien uit Eits [lij] van de Managementspecificaties leidt tot een aanpassing van de Bijlagen Opdrachtnemer, moeten Partijen die wijziging tot stand brengen als een Wijziging Opdrachtnemer.

(c) Als de Bijlagen Opdrachtnemer dwingen tot een handeling die in strijd is met Regelgeving, anders dan ten gevolge van een Relevante Wetswijziging, of met intellectuele of industriële eigendomsrechten van een derde en dit gecorrigeerd kan worden door een wijziging van de Overeenkomst, moeten Partijen die wijziging tot stand brengen als een Wijziging Opdrachtnemer.

(d) Een Wijziging Opdrachtnemer mag niet tot gevolg hebben dat de Opdrachtgever moet handelen in strijd met Regelgeving.

(e) De Opdrachtnemer mag een wijziging voorstellen van de documenten die zijn opgenomen in Bijlage 9 (Programma van Eisen), deel 5 (Uitvoeringsovereenkomsten) [of deel 6 (Afspraken belanghebbenden)] voor zover deze wijziging betrekking heeft op de verplichtingen die op grond van artikel 5.2 (Ontwerp, bouw en instandhouding) lid (a) [of artikel 18.4 (Afspraken belanghebbenden)] op de Opdrachtnemer rusten, onder de voorwaarde dat de desbetreffende belanghebbende aantoonbaar schriftelijk met deze wijziging instemt, en onder de voorwaarde dat de Opdrachtnemer blijft voldoen aan zijn overige verplichtingen uit deze Overeenkomst. De Opdrachtnemer moet een aldus gewijzigd document, dat al door de betreffende belanghebbende is ondertekend, aan de Opdrachtgever ter ondertekening voorleggen. De Opdrachtgever moet het gewijzigde document binnen 20 Werkdagen na ontvangst ondertekenen, tenzij de wijziging:

(i) een negatief effect heeft op de positie van de Opdrachtgever; of

(ii) een negatief effect heeft op de positie van andere belanghebbenden. De wijziging wordt pas van kracht na ondertekening van het gewijzigde document door de Opdrachtgever. Na ondertekening door de Opdrachtgever wordt het gewijzigde document geacht te zijn opgenomen in Bijlage 9 (Programma van Eisen), deel 5 (Uitvoeringsovereenkomsten) [of deel 6 (Afspraken belanghebbenden)]. Artikel 13.4 (Procedures bij Wijzigingen Opdrachtgever en Wijzigingen Opdrachtnemer) is niet van toepassing op deze Wijzigingen Opdrachtnemer.

(f) Voor zover Partijen niet anders overeenkomen zijn de gevolgen van een Wijziging Opdrachtnemer voor rekening van de Opdrachtnemer.

13.4 Procedures bij Wijzigingen Opdrachtgever en Wijzigingen Opdrachtnemer

Bij Wijzigingen Opdrachtgever en Wijzigingen Opdrachtnemer moeten Partijen de procedures volgen en de (financiële) gevolgen vaststellen op de wijze zoals beschreven in Bijlage 5 (Wijzigingen).
Appendix D  Differences DBFM Model Agreement version 4.1 and earlier versions

The change procedures in the DBFM Model Agreements are, even as the Model Agreement itself, adjusted in the various versions of the DBFM Model Agreement. This leads to some significant differences between the various versions. In this appendix, the relevant differences for this research are elaborated.

The first difference has to do with the prescribed response time between the several steps in the procedure. In the procedure for small changes of version 3.0 there is a set response time for the contractor, but the contracting authority has to respond ‘as soon as possible’. In version 4.1 this is changed, resulting in a defined response time for both contracting parties and can address it together when the time is passed. This gives a more equal relationship. In version 1.1 there was no distinction made between small changes and ‘other’ changes, so this differences does not apply to version 1.1.

Another significant change in the procedure has to do with the start of the procedure for other changes. Up to version 3.0, there was a request for change from the contracting authority, on which the contractor had to respond. This is a time consuming step and the contractor has to define the impact of the change with the risk of refusal of the proposal by the contracting authority. This can result in a lengthy discussion. In version 4.1 of the DBFM Model Agreement, these steps have been changed into one step, in which the contracting authority and contractor together define the impact of the change in an arranged meeting. Hereby, the lengthy discussion can be avoided or limited to the meeting, which will lead to a saving of time. This difference is illustrated in a schematic way in appendix C.

Further, up to version 3.0 parties can only adjust a part of the agreement, while in version 4.0 and further, in principle the entire agreement may be changed.

- **Contracting Authority Change (version 1.1):** The Contracting Authority may propose a change to Schedules [2] (Payment Mechanism), [3] (Communication and Information protocol), [5] (Traffic measurements), [6] (Management Plan) or [7] (Output specifications) or to the definitions of “Scheduled Availability Date” or “Expiry Date”.
- **Contracting Authority Change (version 3.0):** If the Contracting Authority proposes a change to [Schedule 8 ([Qualitative Part of Submission]) or Schedule 9 (Schedule of Requirements) or the definitions of “Scheduled Availability Date” or “Scheduled Expiry Date” and the resulting changes in Schedule 2 (Payment Mechanism), this is designated a Contracting Authority Change.
- **Contracting Authority Change (version 4.1):** If the Contracting Authority proposes a change to the Agreement, this is designated a Contracting Authority Change

- **Contractor Change (version 3.0):** If the Contractor proposes a change to [Schedule 8 ([Qualitative Part of Submission]) or the Schedule of Requirements, this is designated a Contractor Change
- **Contractor Change (version 4.1):** If the Contractor proposes a change to the Agreement, this is designated a Contractor Change.
Appendix E  Research protocol

Because all participants in the research were Dutch, the research protocol is also written in Dutch.

Dit protocol beschrijft het onderzoek dat wordt uitgevoerd ter voltooiing van de master Construction Management & Engineering aan de TU Delft. Bij voorbaat dank voor uw tijd en medewerking aan dit onderzoek.

Het onderzoek

Dit onderzoek heeft tot doel een uitspraak te doen over de flexibiliteit van geïntegreerde contracten tijdens de uitvoering van het contract. De vraag die hier aan ten grondslag ligt is of het contract voldoende flexibiliteit biedt om met wijzigingen om te gaan. Om hier antwoord op te kunnen geven, zal de impact van contractwijzigingen van verschillende geïntegreerde contracten gemeten worden en vervolgens in verband gebracht worden met karakteristieken van het project.

Vertrouwelijke omgang met data

De data die verzameld wordt over de wijzigingen, wordt beschouwd als vertrouwelijke informatie. Bij publicatie van de resultaten zullen daarom alle projecten anoniem worden behandeld en zal niet herleidbaar zijn welke gegevens bij welke projecten horen.

Met name gegevens over de financiële impact van wijzigingen zal gevoelig liggen. Om deze informatie wel te kunnen verzamelen, zonder de precieze bedragen te weten wordt de volgende schaalmethode toegepast.

Relatieve waarde van contractwijzigingen: (waarde van de wijziging/contract waarde)*100%

Daarnaast zullen de stukken ter goedkeuring worden toegezonden, voordat ze gepubliceerd worden.

De uitvoering


Karakteristieken van het project

De volgende karakteristieken van het project worden verzameld, om zo in grove lijnen de complexiteit van het project te kunnen bepalen en op die manier de verschillende projecten met elkaar te kunnen vergelijken.

- Contract vorm
  - UAV-GC 2005 van toepassing?
  - Welke versie van de DBFM model overeenkomst (RWS) is gebruikt voor het opstellen van het contract?
- Contractwaarde: Netto contante waarde (NCW) van het contract op het moment van het sluiten van het contract tussen opdrachtgever en opdrachtnemer
- Contractduur:
  - Contractdatum
  - Start werkzaamheden (Aanvangsdatum)
  - (geplande) Beschikbaarheiddatum (DBFM)
  - (geplande) Voltooingdatum (DBFM)
  - (geplande) Einddatum
- Scope (meerdere opties mogelijk):
  - Type infrastructuur: weg, spoor, waterweg
o Type kunstwerken: brug, viaduct, aquaduct, rotonde, wegenknooppunt, onderdoorgang, duiker, tunnel, anders, nl.:
o Type DVM systemen: Wegkantsysteem voor Signaleren en Monitoren (WKS), Video Inwin Systeem, Informatiepaneel (DRIP), Toeritdoseerinstallatie (TDI), Wisselbaan Verkeerssysteem, Vluchthaven Aanwezigheids Detectie (VAD), Openbare Verlichting (OV), Verkeerskundige draagconstructie (VDC), Verkeersregelinstallatie (VRI), anders, nl.:
o Type voorzieningen: Geluidbeperkende constructie, Ecopassage, Bermsloot, Waterpartij, anders, nl.:
o Type interventie: Greenfield (vrije veld) of Brownfield (bouwen in bestaande situatie)

• Stakeholders:
o Opdrachtgever
o Regelgevende instanties (provincies, gemeenten, waterschappen)
o Aantal betrokken stakeholders

Kenmerken van de contract wijzigingen

De volgende kenmerken van de contract wijzigingen worden verzameld, waarmee de flexibiliteit van een bepaalde contractvorm kan worden bepaald.

• Initiator van wijziging: Opdrachtgever of Opdrachtnemer
• Oorsprong van de wijziging:
o Intern (OG gerelateerd, ON gerelateerd, of ontwerp gerelateerd)
o Extern (omgevingsfactoren, politieke factoren, sociale factoren, economische factoren, etc.)
• Type wijzigingen:
o Onvolledigheden in het oorspronkelijke contract: wijzigingen als gevolg van een incompleet, onduidelijk contract, incorrecte/conflicterende eisen of onvolledige tenderdocumenten
o Technisch noodzakelijke veranderingen: wijzigingen als gevolg van veranderingen of onvolkomenheden in de fysiek en/of technische condities
o Veranderingen in wet- en regelgeving: wijzigingen als gevolg van aanpassingen in wet- en regelgeving, die zorgen voor zwaardere eisen
o Wijzigingen in de scope: uitbreiding of verandering van de scope, waardoor het project bijvoorbeeld sneller, voordeeliger, veiliger, met minder hinder, etc. kan worden uitgevoerd
• Doorlooptijd van de wijziging:
o datum eerste ‘verzoek tot wijziging’ tot datum ‘goedkeuring wijziging’
• Financiële gevolgen wijziging:
o Relatieve waarde contractwijzigingen (%): de waarde van de contract wijziging delen door de waarde van het contract
• Planningsgevolgen door wijziging:
o Het verplaatsen van mijlpalen of de opleverdatum of het oplopen van kritieke vertraging
• Procedure gevolgd?
o wordt de procedure, zoals voorgeschreven in het contract (DBFM: Bijlage 5; D&C: UAV-GC 2005; §14, §15 en §45) gevolgd, of is deze procedure niet toereikend, waardoor er een aanvullende overeenkomst moet worden opgemaakt?
  ▪ Aanvullende overeenkomst is niet een wijzigings- of vaststellingsovereenkomst
**Praktische zaken**

**Duur van het onderzoek**

Om het gehele Excel document in te vullen wordt er iets van uw eigen tijd gevraagd. De meeste tijd gaat zitten in het invullen van de kenmerken per wijziging, maar deze tijd is dus ook erg afhankelijk van het aantal goedgekeurde wijzigingen en het voorhanden zijn van de informatie en daardoor voor de onderzoeker lastig van te voren in te schatten.

Het verzamelen van de informatie zal plaatsvinden in de eerste maanden van 2015. De uiterlijke retour datum van de data zullen we in overleg vaststellen.

**Terugkoppeling onderzoek**

De resultaten van het onderzoek zullen schriftelijk beschikbaar gesteld worden aan de deelnemers.
Appendix F  Data sheet

|   | A   | B   | C   | D   | E   | F   | G   | H   | I   | J   | K   | L   | M   | N   | O   | P   | Q   | R   | S   | T   | U   | V   | W   | X   |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|   |
|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 2 | Dank u voor uw deelname aan dit onderzoek! |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 3 | Uitgebreide instructies staan omschreven in bijlage 2 bij de mail, het onderzoeksprotocol |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 4 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 5 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 6 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 7 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 8 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 9 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 10|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 11| Step 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 12|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 13|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 14|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 15|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 16|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 17|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 18|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 19|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 20|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 21|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 22|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 23|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 24|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 25|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 26|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 27|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 28|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 29|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 30|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| 31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |

**Legenda**

- **Verplichte velden**
- **Optionele velden** (op zijn minst 1 per categorie invullen)

---

**Figure 24** Screenshot of Data sheet - Instructions
### Stap 1: Algemene karakteristieken

<table>
<thead>
<tr>
<th>Veld</th>
<th>Vereiste input</th>
<th>Eenheid</th>
<th>Toelichting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type contract</td>
<td></td>
<td></td>
<td>Maak keuze uit dropdown menu</td>
</tr>
<tr>
<td>Versie DBFM model-overeenkomst</td>
<td></td>
<td></td>
<td>De herinner voor links naar de betreffende modelovereenkomsten</td>
</tr>
<tr>
<td>UVG-Gr. 2005 van toepassing?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opdrachtgever</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract waarde</td>
<td>*10% [euro]</td>
<td></td>
<td>Netto contract waarde van contract op het moment van sluiten</td>
</tr>
<tr>
<td>Contractdatum</td>
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<td>[dd-mm-yyyy]</td>
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<td>Start werkzaamheden (Aanvangstdatum)</td>
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<td></td>
<td>Allein voor DBFM</td>
</tr>
<tr>
<td>(Geplande) Beschikbaarheidsdatum</td>
<td></td>
<td></td>
<td>Allein voor DBFM</td>
</tr>
<tr>
<td>(Geplande) Voltooiingdatum</td>
<td></td>
<td>[dd-mm-yyyy]</td>
<td></td>
</tr>
<tr>
<td>(Geplande) Einddatum</td>
<td></td>
<td>[dd-mm-yyyy]</td>
<td></td>
</tr>
</tbody>
</table>

Links naar DBFM modelovereenkomsten Infrastructuur:
- Versie 4.3 (2014)
- Versie 4.0 (2013)
- Versie 3.0 (2012)
- Versie 2.0 (2009)
- Versie 1.1 (2006)

---

**Figure 25** Screenshot of Data sheet – Step 1

---

*Flexibility of integrated contracts*
<table>
<thead>
<tr>
<th>Step 2: Te bouwen objecten (Systeemdefinities)</th>
<th>Mogelijke opties</th>
<th>Einde/afmeting</th>
<th>Toevoeging</th>
<th>Opmerking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tape Infrastructuur</strong></td>
<td>Weg X (m)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Oppervlakte X (m²)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reboer X (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tape kunstwerken</strong></td>
<td>Brug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brug</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Toren</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weergebied X (m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ondergrond X (m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dwarsdoorsnee X (m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tunnel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Andere, namelijk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tape systeem</strong></td>
<td>Figuren en monitoren</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video toon systeem</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Informatiedefinitie (IDD)</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Vloathav Aanwezigheden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voorsprongsteun</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overgangsstructuur (OOS)</td>
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<td></td>
<td></td>
</tr>
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<td></td>
<td>Verenigingsschakeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Andere, namelijk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tape inpassingsvoorwaarden</strong></td>
<td>Gebruiksdecreet</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Afvoer X (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water X (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waterparti X (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Andere, namelijk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tape inlevering</strong></td>
<td>Greepheid X %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bewindhoud X (in bestaande situatie)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Figure 27**  Screenshot of Data sheet – Step 3

<table>
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<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stap 3: Belanghebbenden</strong></td>
<td>Stakeholders</td>
</tr>
<tr>
<td><strong>Verblijf</strong></td>
<td>Verenigde Nationen</td>
</tr>
<tr>
<td><strong>Regelgevende instanties</strong></td>
<td>Benoem de regelgevende instanties waar het project mee te maken heeft (Provincies, Gemeenten, Waterschappen)</td>
</tr>
</tbody>
</table>

*Flexibility of integrated contracts*
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Stap 4: Algemene informatie</td>
<td>Vereiste input</td>
</tr>
<tr>
<td>3</td>
<td>wijzigingen</td>
<td>Aantal wijzigingen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aantal goedgekeurde wijzigingen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aantal afgekeurde wijzigingen</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Aantal wijzigingen in behandeling</td>
</tr>
</tbody>
</table>

Figure 28  Screenshot of Data sheet – Step 4
### Figure 29  Screenshot of Data sheet – Step 5

<table>
<thead>
<tr>
<th>Nummer</th>
<th>Initiator</th>
<th>Oorsprong</th>
<th>Type wijziging</th>
<th>Datum ingediend</th>
<th>Datum goedgekeurd</th>
<th>Financiële gevolgen</th>
<th>Planning</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Opdrachtgever (OK) of Opdrachtnemer (ON)</td>
<td>Intern (I) of Extern (E)</td>
<td>Onvolledigheid in het oorspronkelijke contract (O); Technisch noodzakelijke veranderingen (T); Veranderingen in wet- en regelgeving (W); Wijzigingen in de staat (S)</td>
<td>dd-mm-yyyyyy</td>
<td>dd-mm-yyyyyy</td>
<td>Waarde van de wijziging/laatste contractie?</td>
<td>Zo ja, hoe lang?</td>
<td>Wijzigingsprocedure: Gevolgd? (Ja/nee) zo nee, hoe is het dan afgehandeld?</td>
</tr>
</tbody>
</table>

**Flexibility of integrated contracts**
Bedankt voor uw tijd en deelname aan dit onderzoek!

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Alle benodigde informatie is ingevuld</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 30** Screenshot of Data sheet – Step 6
Appendix G  Complexity level

In order to compare the several projects, there will be a complexity level defined for every project. The elements that will define the complexity are based on TOE framework of Bosch-Rekveldt et al. (2011). The following project specific elements are gathered:

- Contract type
- Involved modalities
- Project duration
  - Realisation phase of the project
- Contract value
- Length of infrastructure (in kilometres)
- Number of deliverables (objects)
- Number of stakeholders
  - Regulatory stakeholders (stakeholders with production power)
- Type of intervention (ratio greenfield/brownfield)
- Technical specials
  - Tunnel
  - Reversible lane

For each of these elements a list is made of the values gathered from the projects, and these elements are scaled to each other. So, the highest value per element is scored a 1, and all the other elements are scaled to the highest value. Exceptions in this method are the contract type, the involved clients, the stakeholders and the type of intervention. These scores are listed in table 15.

<table>
<thead>
<tr>
<th>Contract type</th>
<th>Involved modalities</th>
<th>Stakeholders</th>
<th>Type of intervention [G/B]</th>
<th>Technical specials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DBFM</td>
<td>1</td>
<td>400+</td>
<td>1</td>
</tr>
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<td>0.8</td>
<td>DBM</td>
<td>0.5</td>
<td>200-400</td>
<td>0.8</td>
</tr>
<tr>
<td>0.6</td>
<td>D&amp;C</td>
<td>0</td>
<td>100-200</td>
<td>0.6</td>
</tr>
<tr>
<td>0.4</td>
<td>E&amp;C</td>
<td>0</td>
<td>50-100</td>
<td>0.4</td>
</tr>
<tr>
<td>0.2</td>
<td>Construct</td>
<td>0</td>
<td>0-50</td>
<td>0.2</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This results in the complexity level as listed in table 16. The total of stakeholders is the result of score of stakeholders multiplied by the score of regulatory stakeholders.
<table>
<thead>
<tr>
<th>Projects</th>
<th>Contract type</th>
<th>Modality</th>
<th>Contract value</th>
<th>Project duration</th>
<th>Realisation phase</th>
<th>Length of infrastructure</th>
<th>Deliverables</th>
<th>Type of intervention</th>
<th>Total stakeholders</th>
<th>Technical specials</th>
<th>Complexity level</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
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<td>0.6</td>
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<td>2.1</td>
<td></td>
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<tr>
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<td>0.08</td>
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<td>0.03</td>
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<td>0.038</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>0.4</td>
<td>0.12</td>
<td>0.09</td>
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<td>0.01</td>
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<td>0.03</td>
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<td>0.054</td>
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<td></td>
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<td>0.5</td>
<td>0.11</td>
<td>0.12</td>
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<td>1</td>
<td>0.038</td>
<td>2.6</td>
<td></td>
<td></td>
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<tr>
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<td>1</td>
<td>0.046</td>
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<tr>
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<td>1</td>
<td>0.99</td>
<td>0.69</td>
<td>0.55</td>
<td>0.83</td>
<td>0.8</td>
<td>0.46</td>
<td>0.2</td>
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</table>
Table 17  Defining total stakeholder score

<table>
<thead>
<tr>
<th>Projects</th>
<th>Stakeholders</th>
<th>Regulatory stakeholders</th>
<th>Total stakeholders</th>
</tr>
</thead>
<tbody>
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<td>7</td>
<td>0.2</td>
<td>0.27</td>
<td>0.054</td>
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<tr>
<td>14</td>
<td>0.2</td>
<td>0.19</td>
<td>0.038</td>
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<td>0.15</td>
<td>0.03</td>
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<td>0.27</td>
<td>0.054</td>
</tr>
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<td>0.2</td>
<td>0.19</td>
<td>0.038</td>
</tr>
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<td>0.2</td>
<td>0.23</td>
<td>0.046</td>
</tr>
<tr>
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<td>0.2</td>
<td>0.19</td>
<td>0.038</td>
</tr>
<tr>
<td>11</td>
<td>0.6</td>
<td>0.19</td>
<td>0.114</td>
</tr>
<tr>
<td>12</td>
<td>0.6</td>
<td>1</td>
<td>0.6</td>
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<td>0.62</td>
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<td>6</td>
<td>0.8</td>
<td>0.35</td>
<td>0.28</td>
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<td>0.2</td>
<td>0.42</td>
<td>0.084</td>
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<td>0.31</td>
<td>0.062</td>
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<td>0.2</td>
<td>0.23</td>
<td>0.046</td>
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<td>1</td>
<td>0.46</td>
<td>0.46</td>
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</table>
Appendix H  Inter-organisational collaboration

The following questions were asked to the contract managers of the contractor, in order to acquire more information about the collaboration in the field of contract changes. As all respondents were Dutch, the questions are also in Dutch.

1. Hoe wordt er gecommuniceerd over contractwijzigingen?
2. Hoeveel overleg organen zijn er betrokken bij de communicatie over contractwijzigingen?
3. Wordt er een informeel akkoord tussen OG en ON bereikt voordat er formele goedkeuring komt voor een contractwijziging, en zo ja, op welk gebied?
4. Wat is de waarde van een mondeling akkoord met OG?
5. Hoeveel tijd zit er gemiddeld tussen het mondeling akkoord en de formele goedkeuring?
6. Worden er ook contractwijzigingen op een andere manier afgehandeld dan met een wijzigingsovereenkomst (VTW)?
7. Mist er nog iets?

The answers to these questions are summarised in the following table.

<table>
<thead>
<tr>
<th>Projects</th>
<th>General ways of communications</th>
<th>Informal agreement?</th>
<th>Value of informal agreement</th>
<th>Process time informal-formal agreement</th>
<th>Other ways of changing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Letters (F): CA WO (I): weekly; CO (F) every two weeks</td>
<td>Barely</td>
<td>Low</td>
<td>2 months</td>
<td>list of resolutions (CO)</td>
</tr>
<tr>
<td>2</td>
<td>I: PD ON – CM OG; CO (F); WO (I); Letters (F): CA</td>
<td>Only small changes</td>
<td>Execution</td>
<td>Small: 1 month Large: 2-3 months</td>
<td>Deviation form (became CA) &amp; notification system</td>
</tr>
<tr>
<td>3</td>
<td>WO (I) monthly; CO (F)</td>
<td>Yes</td>
<td>Execution</td>
<td>Few days</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>CO (F); Letters (F); I with counter part</td>
<td>Barely</td>
<td>Execution</td>
<td>2-3 weeks (mandate OG)</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>WO (F); CO (F)</td>
<td>Yes</td>
<td>Execution</td>
<td>Differ per change</td>
<td>Deviation for changes without cost effect</td>
</tr>
<tr>
<td>6</td>
<td>CO (F): no decisions!; Mail (I): VTW</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>Deviation for changes without cost effect</td>
</tr>
<tr>
<td>7</td>
<td>PO &amp; WRR (I): announcing; Letters (F): CA; CO (F) monthly</td>
<td>Yes</td>
<td>In good faith: execution. Large cost effect: wait till formal agreement</td>
<td>Max. 1 month</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Procedure UAC-IC; Letter (F): CA; mail (I): discuss content</td>
<td>Yes</td>
<td>Often already executed</td>
<td>2-3 weeks (mandate OG)</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>WO (F): every two weeks; EO (F)</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>Yes, SA</td>
</tr>
<tr>
<td>10</td>
<td>WO (F): every two weeks; EO (F)</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>Yes, SA</td>
</tr>
<tr>
<td>11</td>
<td>WO (F); CO (F); bilateral consult (I)</td>
<td>Yes</td>
<td>Small risk = execution</td>
<td>1 week</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>Start project: CO and</td>
<td>Yes</td>
<td>Often already executed</td>
<td>1 week – several</td>
<td>Deviation for</td>
</tr>
<tr>
<td></td>
<td>PO; now integral consult (F); Informal contact; Letters (F): CA</td>
<td>executed</td>
<td>months (mandate OG)</td>
<td>changes without cost effect</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------</td>
<td>----------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>WO (I): weekly; Letters (F): CA</td>
<td>Yes</td>
<td>Only technical, cost effect not defined yet</td>
<td>Differ per change (urgency)</td>
<td>No</td>
</tr>
<tr>
<td>14</td>
<td>CO (F): announce VTW; Mail (I): VTW</td>
<td>Yes</td>
<td>Already executed</td>
<td>VTW: 2 weeks; CA: longer</td>
<td>list of resolutions (CO)</td>
</tr>
<tr>
<td>15</td>
<td>WO (F); CO (F); Mail (I): content VTW; VISI (F)</td>
<td>Yes</td>
<td>Execution</td>
<td>Process time only F process</td>
<td>No</td>
</tr>
</tbody>
</table>

Abbreviations used in the table:

- **WO** = Change consultation (Dutch: wijzigingenoverleg or VTW overleg). Changes are discussed in this meeting and actions will be divided.
- **CO** = Contract consultation (Dutch: contract overleg). In this meeting decisions can be made.
- **EO** = Escalation consultation (Dutch: escalatie overleg)
- **SA** = settlement agreement (Dutch: vaststellingsovereenkomst)
- **CA** = change agreement (Dutch: wijzigingsovereenkomst)
- **VTW** = Request for change (Dutch: Verzoek tot Wijziging)
- **PD** = Project Director
- **CM** = Contract Manager
- **ON** = Contractor
- **OG** = Contracting authority / Employer
- **PO** = Project consultation (Dutch: project overleg)
- **WRR** = Weekly Risk Report; part of Best Value approach
- **VISI** = communication software
- **I** = Informal
- **F** = Formal