Witteveen + Bos

Collaboration through gain-and-pain-share mechanism

A roadmap to incentivize collaboration by gain-and-pain-sharing concepts.

Rob Ooms

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Research into the working of the gain-and-pain share mechanism based in construction contracts.

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Preface

This report is written as my master thesis research that concludes my master's in construction management and engineering at the TuDelft. The research was conducted at Witteveen+Bos in Breda, which provided me with support and resources to successfully conduct this research.

The study is useful and relevant for clients, contractors and engineering consultancy organisations that work with collaborative contract incentives. This research can provide new insights into possibilities to create a collaborative environment. With the overview of options to implement a gain pain sharing mechanism, organisations can focus on aligning their project objectives to successfully complete a project.

Over the past months, I had the opportunity to apply my knowledge, be extremely challenged and gain many insights into the working field. It was a real privilege to work with the best professionals in this domain. Commencing with writing the thesis was not at all easy when Covid-19 hit the Netherlands. Finding a solution to work from home and the company offices was a real struggle, but when I started, the support from my graduation committee (Marleen, Leon, Louis, Rob) was amazing. I would like to thank them for their time, guidance and real interest in helping me to succeed by myself but still with a slight feeling of togetherness. They provided serious criticism and focus, which I needed to make the right steps. I would also like to thank my colleagues and other graduation students for the fun and tips at work, as well as their great expertise. Furthermore, thanks go to all of the interviewees and experts, who made this research possible. Last but not least, I wish to express my gratitude to my family and friends, who supported me day by day.

Rob Ooms

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Executive summary

The Dutch construction sector is facing several problems, such as poor performance related to costs and time overruns, poor quality, low productivity, poor customer satisfaction and a win-lose climate (Chan et al., 2008). The cause of this poor performance is a lack of collaboration in the current fragmented sector (Rahman & Kumaraswamy, 2004). The increasing complexity in particular has made it more difficult to successfully deliver a project (Chen et al, 2014). To counter this, the major parties in the sector has drafted the Marketvision 2016 and 2019 (Rijkswaterstaat, 2016 & 2019). The goal of this paper is to guide the sector towards a collaborative culture where a win-win situation is normal; however, measures to achieve this are still absent.

To stimulate this collaboration and the related desirable behaviour, it would be worthwhile for clients and contractors to start with certain responsibilities and risk sharing in the contract between them (Hosseini et al. 2018). On this list of possible factors to increase collaboration is gain-and-pain-sharing a common contractual mechanism to improve collaboration and fix the current problems.

This research aims to identify gain-and-pain-sharing methods to foster a collaborative environment to create win-win situations and create mutual objectives. To do so, gain-and-pain-sharing methods that can positively influence a collaborative environment are explored. This study is restricted to the Dutch construction sector because it is for Dutch implementation. Second, the research scope includes projects with high complexity because otherwise, gain-and-pain-sharing do not have effects, and most problems arise due to complexity. Lastly, the research focuses on the client side, since the client chooses the type of contract and criteria. The objective of the research is to provide clients with insight into the gain-and-pain-sharing possibilities and practical implementation steps to implement a gain-and-pain-sharing mechanism to incentivise collaboration. To this end, the following primary research question is formulated:

How can a gain-and-pain-sharing mechanism be used, to incentivise collaboration and create mutual objectives in a construction project?

The sub-questions are as follows:

1. Which concepts of the gain-and-pain-sharing mechanism can we identify in the current literature?
2. Which factors of the concepts are important according to the theory for realising a gain-and-pain-sharing mechanism?
3. Which conditions are important for successful implementation of the gain-and-pain-sharing mechanism to incentivise collaboration in a construction project?
4. What steps must be taken during the contracting phase to choose and implement a gain-and-pain-sharing mechanism?

To answer the main and sub-questions, three types of research methodologies are used: first, a literature study; second, a case study; and third, an expert validation. Based on the data from the three methods, a conclusion is drawn.

Literature study
Before researching collaboration via gain-and-pain sharing, the objectives of clients and contractors were studied. Bringing those objectives together and understanding their respective objectives is the starting point for gain-and-pain sharing. Second, understanding the concept of partnering is important – partnering environments are collaborative relationships, such as alliances or other forms of contracting in the construction industry – and the idea is that partnering should decrease adverse objectives and conflicts (Ling et al. 2006). To create this environment, trust between parties must be established. The partnering environment can be the starting point for a well-functioning gain-and-pain-sharing mechanism.

In the literature, different definitions of gain-and-pain sharing were identified and combined into the following definition: 'Gain-and-pain sharing is defined as an agreement that allows the parties in a construction project to share profits or cost savings and to share losses due to errors or cost increases. Mutual benefits are achieved

through gain sharing. Benefits could, for example, also be a reward for one's delivered work, a bonus or recognition, and losses are the risks'. Based on this definition, the following gain-and-pain-sharing concepts were identified:

- Bonus-malus;
- Sharing of new created benefits;
- Risk pot;
- Target cost.

Case study and validation
The identified gain-and-pain-sharing concepts were further investigated in five case studies wherein the contract manager was interviewed. Through the use of a case study, the steps, factors, conditions and preconditions of different gain-and-pain-sharing concepts that are important for broader implementation of the mechanism were researched. Based on this information, a roadmap was devised showing the decision steps that must be taken to use a gain-and-pain-sharing mechanism.

After completion of the roadmap design, the identified steps, factors, conditions and preconditions were validated by industry experts. Since they acknowledged most steps, only a few changes were made. The roadmap was also validated for generalisability and then approved. The validated roadmap, along with an explanation, can be found in Chapter 5.

Conclusion
Based on the findings in the literature regarding a gain-and-pain-sharing mechanism, the case studies and the expert validation, an answer was given to the main research question, namely,

How can a gain-and-pain-sharing mechanism be used to incentivise collaboration and create mutual objectives in a construction project?

This research has demonstrated that there are multiple practical applications of the gain-and-pain-sharing mechanism to incentivise collaboration and create mutual objectives. The following concepts with regard to this mechanism can be used:

- Bonus-malus;
- Sharing of new created benefits;
- Risk pot;
- Target cost.

The different concepts have different effects and different reasons for use as gain-and-pain sharing mechanisms. The way to deploy the mechanism depends on the choice based on the vision and strategy that the client has for the project. These two elements in turn depend on the *company and project objectives, project specifications, experience with collaboration concepts, risk aversion, market conditions* and one of the most important conditions, the *scope certainty*.

A *bonus-malus* concept can be used to achieve objectives through a common goal by means of a bonus or malus. It is based on the requirements and milestones, and it is applicable to all contract types.
Sharing of new created benefits contributes to collaboration and the achievement of objectives through a joint enterprise of a product/service because both parties engage in a long-term entrepreneurial activity to achieve certain objectives. This concept is applicable to long-term contracts.
A *risk pot* contributes to collaboration and the achievement of objectives by means of joint management of the risks. Through this joint management, an attempt is made to reduce costs and achieve optimum quality. A partnering environment is required to apply this concept through a contract such as an alliance, a Bouwteam or the New Engineering Contract (NEC) . That is, to achieve the objectives and mitigate additional project-related risks, an environment is needed in which project risks are tackled together.
The *target cost* contributes to collaboration and the achievement of objectives through joint control of the total project costs. For this gain-and-pain-sharing concept, a high degree of scope certainty is required to

properly discount the project to determine the target cost. To apply this concept, a partnering environment is required to realise gain-and-pain sharing concept jointly, such as the NEC or a pure form of alliance contract.

It can be concluded that the gain-and-pain-sharing mechanism is deployed by different concepts for different purposes to incentivise collaboration and create mutual objectives. This coordination for the implementation of the mechanism is custom-made for each project based on a number of steps. The step-by-step plan that supports the implementation of the gain-and-pain-sharing mechanism can be found in Chapter 5 or Appendix P. The case studies demonstrated that such a mechanism has been successful in those cases and is an added value for collaboration and the realisation of common goals.

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INTRODUCTION

One of the problems the Dutch construction sector is currently facing is that due to a loss of knowledge, an excessive focus on procedures and the price element on the part of clients, things regularly go wrong for infrastructure companies; as a result, the responsibility for the design is increasingly shifting from the client to the contractor, particularly in terms of poor risk distribution (Clahsen, 2020). For a significant amount of time, the sector has been faced with insufficient collaboration, which results in poor performance, such as cost and time overruns, poor quality, low productivity, poor customer satisfaction and a win-lose climate (Chan et al., 2008). The cause of this poor performance and lack of collaboration in the market is the current fragmentation in the sector (Rahman & Kumaraswamy, 2004). Construction projects are fraught with adversarial relationships, conflicts and increasing complexity, the latter of which has made the successful delivery of a project especially difficult (Chen et al., 2014).

In the Netherlands, the need to move from the old way of collaborating to a new way is evident. Several studies from McKinsey, commissioned by the Department of Waterways and Public Works, highlight these problems and the need to shift to a new collaborative way. The Dutch construction sector has long been faced with insufficient collaboration (Noorderhaven et al., 2006; Chen et al., 2014). To move towards a collaborative culture, the Marketvision 2016 was drafted by the Department of Waterways and Public Works based on the prior research by McKinsey (2016) on the global civil engineering sector. This research indicates that contracts are the main cause of the problems faced by the industry, stating that contracts give incorrect incentives and are not properly geared to the sector and its situation. The future task of the Department of Waterways and Public Works emphasises the great importance of collaboration to achieve success. In the market vision document from 2016, the following ambitions and goals are mentioned:

a) Instead of working for self-interest, think, work, act and learn through the construction industry chain.
b) Step away from opportunistic behaviour, and aim for early collaboration in terms of discussing risks and dilemmas.
c) Move from an adversarial relationship to excel in works that have started from real preconditions.
d) Move from hierarchical structures to a more collaborative environment throughout the whole construction industry chain.

In continuation of this, another study by Mckinsey (2019) has resulted in the new future Department of Waterways and Public Works Task: Perspective on the challenges and opportunities for improvement in the civil engineering sector. In this paper, measurements are suggested, aimed at addressing the issues faced by the construction industry, such as the two-phase contract. The changes are currently small, and improvements are more in demand than ever in the Dutch construction sector (Wisse & Arends, 2017).

Overall, collaboration between clients and contractors is still poor (Crow, 2017). The so-called old behaviour of poor collaboration is still at play (Dronkers, 2016). According to Mckinsey (2016), arrangements and clauses in contracts play a key role in the success of a collaboration. The current contracts offer adverse incentives for collaboration (Grinblatt & Titman, 1989). Chris Jansen (2020), head teacher of private law at VU Amsterdam, stated that it is better if contracts are furnished with a basic arrangement in the future. Facilitated by the contract, parties can agree on specific terms to stimulate collaboration. This also means continuously and proactively informing the other party if clauses or rules of conduct are not met. To stimulate this collaboration and related desirable behaviour, clients and contractors should start with certain responsibilities and risk

sharing in the contracts between them (Hosseini et al. 2018). Furthermore, they should relate to the principle of reasonable sharing to obtain the contract prize for both (Rahman & Kumaraswamy, 2004).

According to Meng (2012), Bayliss (2004), Eriksson (2008) and Hosseini (2018), there are 10 identified factors that stimulate collaboration. The 10 factors are as follows:

1 Mutual objectives;
2 Gain-and-pain sharing;
3 Trust;
4 A no-blame culture;
5 Joint working;
6 Communication;
7 Joint problem solving;
8 Fair risk allocation;
9 Effective performance measurement;
10 Continuous learning.

On this list of factors, gain-and-pain sharing is considered to be a new and effective factor to realise collaboration. A method of realising a collaborative relationship is through facilitating a collaborative environment and steering towards best management practices. In the construction sector, different additions to a contract exist to facilitate collaboration, such as an alliance, the New Engineering Contract (NEC), a framework agreement or Bouwteam, where different gain-and-pain-sharing methods can be used to incentivise collaboration.

Gain-and-pain sharing provides incentives to achieve project goals (Bayliss et al. 2004). The Chartered Institute of Building (CIOB) defines gain-and-pain sharing as an agreement that allows the parties in a construction project to share both profits or cost savings and losses due to errors or cost increases. Mutual benefits are achieved through gain sharing, thereby leading to the client and contractor reaching the project goals, which is a win-win situation for both parties. Benefits could be, for instance, a reward for one's work, a bonus or recognition, and losses are seen as the risks. Therefore, it is also known as the risk/reward scheme (Rahman & Kumaraswamy, 2004). This also means that monetary and non-monetary rewards exist, with the latter including satisfaction and recognition (Bayliss, 2004). In addition, Walker (2004) states that non-monetary rewards can also be access to learning and other factors that enhance the experience of the project decision making. These rewards are difficult to make explicit but can be recognised in designing and evaluating partnering and alliancing relationships (Walker et al. 2004).

The international monetary basic principle is that target value costs are agreed in advance and that the contractor is then paid for the work performed against payment of costs. Payments to the contractor are made based on the contractor's accounts, provided to the employer for inspection on an 'open-book' basis (Williams et al. 2013). In theory, many hard and soft factors are required for this mechanism to succeed, and the most commonly named hard factors are contractual agreements based on target costs, while the most-named soft factors are trust, commitment and communication to succeed. In the philosophy of gain-and-pain sharing, the concepts of bonus-malus, a risk pot and the sharing of new created benefits can be found as well. These concepts aim to create a fair balance in sharing costs and create a win-win or lose-lose situation, which is required for mutual understanding and collaboration. These concepts relate to gain-and-pain sharing, but are not defined as the practical implementation of the mechanism. Improvement and understanding of the concept could lead to better use of the mechanism and incentivise the desired collaboration between client and contractor. The literature points to several benefits of employing a partnering approach, including less conflict, increased productivity, shorter execution time, more innovation, better cost efficiency, increased flexibility, improved work environment and continuous improvement of quality in results and services (Black et al. 2000). As already mentioned, the industry forms of contractual relationships and behaviours are not suited to the best project objectives in terms of cost, time and quality. Especially the previously mentioned confrontations involve alignment of the parties' goals, needs, interests, and resources are a major problem (Bayliss, 2002). Gain-and-pain sharing could provide incentives to achieve project goals (Bayliss et al. 2004). The forms of gain-and-pain sharing are hence studied in this report to clarify their use and implementation.

1.1 Research design

This chapter contains the design of the research. Section 1.1.1 shines a light on the different aspects of the problem statement and formulation. The gap in the research is then specified in Section 1.1.2, utilising the research objective in Section 1.1.3 to give direction to the research, and the scope is defined in Section 1.1.4. Furthermore, the research questions are stated in Section 1.1.5. Finally, the methodology in Section 1.2 explains and justifies how the answers to those questions will be reached and what steps need to be taken.

1.1.1 Problem formulation

The previous sections already introduced the development of a collaborative environment and incentive to work with a gain-and-pain-sharing mechanism. In this research, the gain-and-pain-sharing contract mechanism is further explored.

To meet the future objective of realising a collaborative environment, the area of collaborative incentives in contracts must be optimised (Hosseini et al. 2018). Different researchers have stated that the gain-and-pain sharing mechanism is a possible successful mechanism as an incentive to realise this collaborative environment. However, this mechanism is not, for example, described in all NEC contracts but is merely seen as the target cost option. This study explores the definition of the gain-and-pain-sharing mechanism and the possible implementations thereof. This implementation should involve a roadmap or strategy tool for the client when implementing the mechanism in the contract. The embedding of collaboration is strongly linked to the sharing of mutual project goals, and it comprises mutual benefits. The use of the gain-and-pain-sharing model will be evaluated to answer the question of how it can be implemented in future projects.

With the help of this study, public and private clients will be able to optimise their area of collaboration. The main goal is to create a strategy for implementing a gain-and-pain-sharing model to incentivise collaboration.

1.1.2 Research gap

According to Hosseini (2018), who investigated the complementary factors of collaboration in various studies around the world, the most frequently presented factor for the theoretical success of collaboration is the gain-and-pain-sharing mechanism. For this mechanism, target costs constituted the most presented hard factor. However, an interesting practical fact is that it is only used in 50% of the projects where a partnering contract is employed. Achieving gain-and-pain sharing between parties is currently difficult, regardless of whether the real performance is high or low (Meng, 2012). This is sometimes because the project description does not match the gain-and-pain-sharing requirements; however, the main reason is that professionals are not accustomed to implementing this mechanism (Walker et al. 2002).

Furthermore, there is insufficient knowledge about the mechanism. While several concepts share the idea of gain-and-pain sharing, they are not commonly seen as gain-and-pain-sharing models (Bayliss et al. 2004). Especially for non-monetary gain-and-pain sharing, much knowledge about its practical implementation can be gained to improve the mechanism itself (Walker et al. 2002). The current concepts only focus on the monetary aspect, which is the first step but does not have the practical implementation of bringing non-monetary objectives together. Developing an understanding of the concept will be an ideal new asset for the literature. Moreover, this research has practical relevance for public and private clients; it proposes a strategy for applying and optimising this mechanism in a decision process. For contractors, understanding this principle is important to anticipate in the future contract collaboration mechanisms. The research contributes to the area of collaboration through the gain-and-pain-sharing mechanism in two ways: first, it identifies the mechanism and its abilities; second, it focuses on the optimisation of its use in practical work.

1.1.3 Research objectives

Building on the problem and relevance, the objective of the research is formulated. Based on the relevance, it can be concluded that the gain-and-pain-sharing mechanism has great potential and is therefore interesting in terms of its usefulness and the possibility of implementing it in a positive form. The objective of this research is to build a roadmap of the gain-and-pain-sharing mechanism as a starting point for conversation about the possibilities to incentivise collaboration and create mutual objectives. It is designed to generate a strategy for the client to use in the first phases of a project or in the implementation phase after contracting. The roadmap is about when, how and what to implement as a gain-and-pain-sharing mechanism. The explorative character of this study is reflected in the absence of a sufficient theoretical framework and in a broad rather than an in-depth focus.

1.1.4 Scope

It is essential to make well-balanced decisions regarding the boundaries of this research. This study is explorative in nature, aiming to be a conversation starter and a guide for the first implementation process steps. Without a clear scope, the risk of having too little focus is possible and a barrier to success. First, this research is limited to the construction domain of the Netherlands because the focus of implementation is written specifically for Dutch construction projects.

Second, complex projects are chosen due to unpredictability, innovation and high risks, where a gain-and-pain-sharing mechanism can deal with uncertainty and bring parties together for collaboration. Gain-and-pain sharing is suggested for more complex projects, which can be categorised as detailed and complex when they consist of many components and when those components have a high degree of interrelatedness (Hertogh & Westerveld, 2010). Projects that include dynamic complexity are interesting for use of a sharing mechanism because one cannot foresee everything. Dynamic complexity means having the potential to evolve and having limited understanding and predictability. Infrastructure projects have this complexity and are therefore interesting in terms of the use a gain-and-pain-sharing mechanism. Lessons can be learned from other construction projects or even small, complex projects regarding how to implement this mechanism (Bayliss et al. 2004). This study thus focuses on small to large construction projects to gain a deeper understanding of the Dutch construction sector.

Third, this research focuses on the client side, as the client makes the choice on how to bring the project to the market. This first phase is important to consider; nevertheless, the implementation phase for the mechanism will need to be investigated to develop a complete roadmap. This does not mean the contractor side does not have to be taken into account, because the gain-and-pain-sharing mechanism is about aligning both parties' project goals to succeed in the project and create a collaborative environment. Involving consulting and engineering firms can be argued, since they act as a type of 'extension' of the client. These firms support the client with their expertise in realising the goal of using collaborative criteria, thus making it necessary to include the considerations of the consulting and engineering firms involved.

When practical knowledge is required from both parties and the project has a high degree of complexity and uncertainty, a gain-and-pain-sharing mechanism in a partnering environment can help. This research involves different partnering contracts because it is related to gain-and-pain sharing and elaborates on the need for facilitating a collaborative relationship.

1.1.5 Research question

On the basis of the scope and the research objective, and with the use of (Verschuren, et al. 2010), the main research question is formulated:

How can a gain-and-pain-sharing mechanism be used to incentivise collaboration and create mutual objectives in a construction project?

Potential sub-questions are as follows:

1. Which concepts of the gain-and-pain-sharing mechanism can we identify in the current literature?
2. Which factors of the concepts are important according to the theory for realising a gain-and-pain-sharing mechanism?
3. Which conditions are important for successful implementation of the gain-and-pain-sharing mechanism to incentivise collaboration in a construction project?
4. What steps must be taken during the contracting phase to choose and implement a gain-and-pain-sharing mechanism?

1.2 Methodology

Depending on the data required to answer the research question, multiple research methods could be employed, for example survey research, case studies, experiments or desk research (Verschuren & Doorewaard, 2010). The most suitable method depends on three conditions: 1. the type of research question, 2. the extent of control a researcher has over behavioural events and 3. whether the focus is on contemporary or historical events (Yin, 2018). Since the research focuses on a 'how' question, the behave events could not be controlled, and the research focuses on a historical event/choice, a case study including several interviews would be an ideal fit. Case studies are qualitative research methods that can deliver in-depth information about ongoing or completed projects. A case study illustrates why and when decisions were taken and what the consequences of those decisions are. These decisions could be seen as events.

In case studies, three variants are distinguished: exploratory, descriptive and explanatory (Yin, 1994). Exploratory case studies are mostly undertaken in the initial phase of the research to explore the area; this type of study has an inductive character. Descriptive and explanatory studies are mainly based on the results of a literature study or review (Yin, 2018). In this research, the case studies are used to provide more information and have an exploratory character. In this research, since little knowledge exists on the specific topic, not much information and consensus can be found in other studies about the gain-and-pain-sharing mechanism.

A case study is hence chosen because of its qualitative character and practice-oriented approach. In the following section, the data collection method is described.

1.2.1 Desk study

As the first method, a desk study will provide context for the rest of the study. Understanding is needed to interpret the data from the case studies.

Scientific literature

For this reason, the desk study will start with the basic principles of partnering where collaboration is the facilitator. Thereafter, the different concepts of the gain-and-pain-sharing mechanism will be elaborated. The basic idea of this mechanism is to align project goals from the client's and contractor's perspectives. Therefore,

literature about the objectives from the client and contractor side must be included; this helps to identify the areas where the gain-and-pain-sharing mechanism can be applied and improve.

To find suitable and relevant literature, several search engines are used, such as Google (Scholar), Scopus and a repository. The literature consists of scientific papers, reports, books, theses, project documents and news articles. Different keywords and synonyms are searched for (i.e. gain-and-pain-sharing models/arrangements, client and contractor objectives, partnering, alliance, collaboration incentives in construction, etc.).

With the literature study, a theoretical framework is developed. This framework should describe the concept and possible implementations of the gain-and-pain-sharing mechanism, and it will then be used to develop the interview protocol for the case. The results of the literature part can be found in Part II of the report.

1.2.2 Case study

This study is exploratory in nature, and exploratory research is mostly conducted in the initial phase to explore the areas that correspond to the research objective.

Exploratory research mostly consists of interviews, which can be structured or unstructured. Structured interviews have a protocol and are easier to compare, whereas unstructured interviews allow researchers to elaborate on respondents' answers. In case studies, unstructured or semi-unstructured interviews are predominantly used. In this research, a semi-structured interview will be used with cornerstone questions to conduct a thematic analysis. This method is chosen because the objective of the case studies is to explore what methods of gain-and-pain sharing for collaboration can potentially work in practice. Semi-structured interviews can aid in identifying whether a method or mechanism can work in practice because the interviews can be used to understand how certain things or people work or behave (Easterby-Smith et al. 2002). A list of questions will be devised to allow for comparison of the cases, but there will be an opportunity to elaborate on the respondents' answers to generate in-depth information. The interview protocol can be found in Chapter 4.2.

Conducting interviews is highly time-consuming; therefore, we aim to achieve an optimal balance of cases. The information is case-specific, and the roadmap is designed for the client. The interviewee should be a contract manager who has been involved in all phases so that a complete picture of the mechanism can be drawn. This case study is primarily designed for gathering experiences to gain better insight into the mechanism and decisions that can be made. A case for this research means a project where gain-and-pain-sharing concepts are implemented.

More on the selection of the cases and the method of the case study will be described in Part III of this report. The results will then be used to perform a cross-case analysis, in which the results from case analysis could be compared. This will highlight the similarities and differences in the gain-and-pain-sharing mechanism options. Due to causality problems for several concepts, an extensive literature study will be executed.

The last phase of the research includes the results of an expert session from Witteveen+Bos, where the experts discuss the designed roadmap. Based on the results from the different analyses, the discussion and conclusions are then presented, along with the limitations and recommendations. These can be found in Part IV of this report. Figure 1 maps out the entire process of this research.

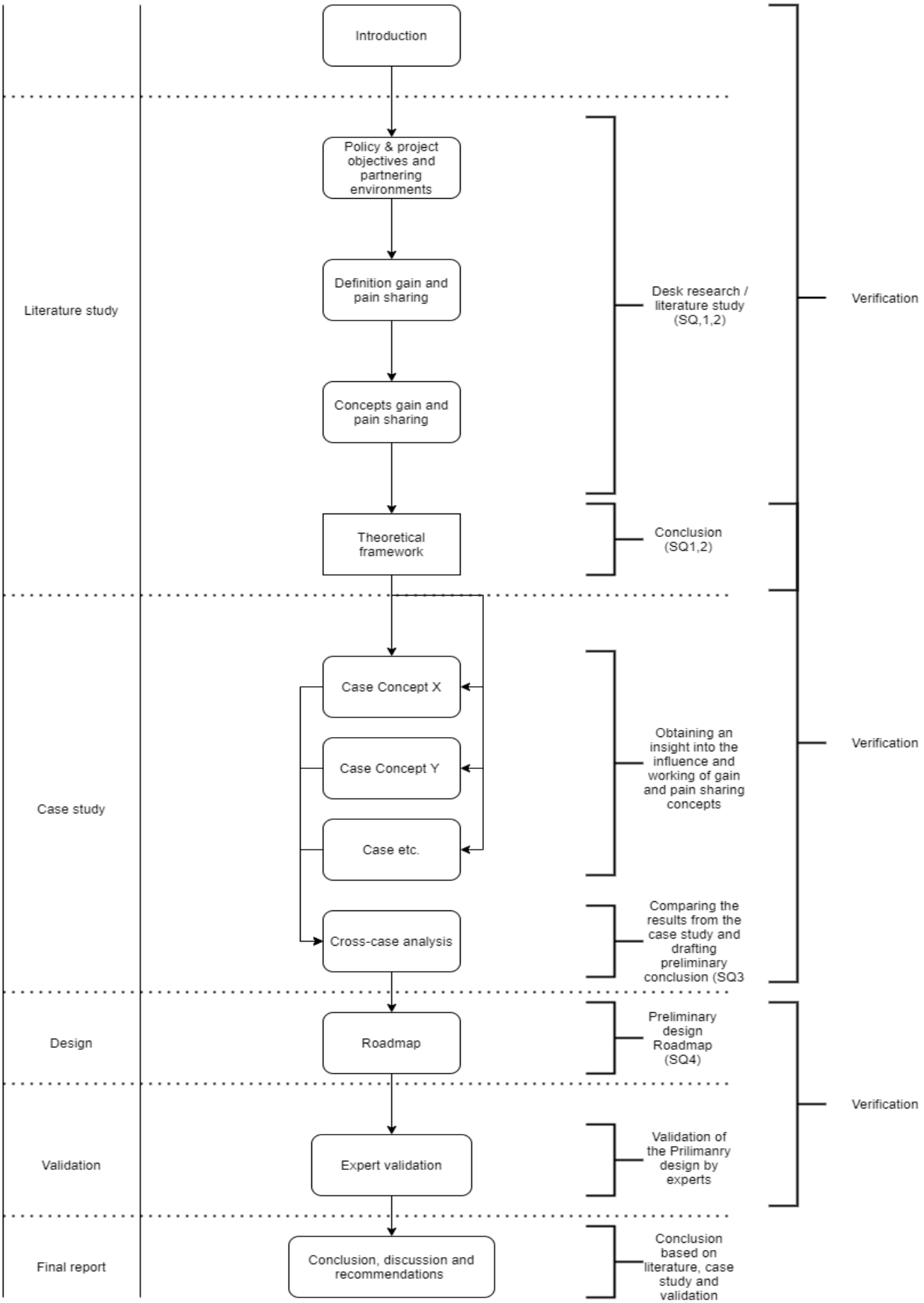

Figure 1. Research methodology flowchart

2

LITERATURE STUDY

The literature study begins by reviewing existing literature on the basis of already conducted research within the scope of this work. This shows the available knowledge, which forms the theoretical basis for this research. With this information, a theoretical framework can be designed to compare against existing cases. In this chapter, partnering through a gain-and-pain-sharing mechanism is the starting point for the research.

2.1 Client and contractor objectives

Clients could be private or governmental. For the government, the construction industry is a national economic driver. The government uses the construction industry as an economic stimulus for other economies, such as financial and labour economies, among others (Mckinsey, 2019). In the industry, performance for the client means value for money, no budget overruns, timely delivery, quality, appropriate buildings and a healthy client–contractor relationship. According to Boyd (2008), value for money is the top priority for governmental clients. Furthermore, clients can be classified as private individuals, private corporates or the public sector. We make a key distinction between public and private clients. The public sector and semi-public clients procure over 40% of the construction projects (Boyd, 2008). These public clients want to create value for money where private clients build for profit or self-use (Spenser & Winch, 2020). Private clients want to enhance the value of assets or improve a service because of change or technological improvements. To deal with clients, different categories are in play as well. For example, Newcombe (1994) stated that there are uninformed clients, partially informed clients and well-informed clients, ranging from having no experience to much experience.

The traditional strategic objectives of a client and contractor relate to time, cost and quality. These objectives are defined solely from the point of the primary work. Cost means the initial expected capital cost and subsequent expected maintenance costs. Time refers to the expected time required for the design and construction of the work. Quality relates to the expected quality expressed in terms of technical specifications, functional specifications and appearance (Ward, 1991). Based on further research, a more complete set of performance objectives are constructed as follows (Richards et al. 2005):

a) It achieves the stated business purpose;
b) It provides satisfactory benefit to the owner;
c) It satisfies the needs of the owner, users, and stakeholders;
d) It meets its pre-stated objectives to produce the facility;
e) The facility is produced to specification, within budget and on time; and
f) The project satisfies the needs of the project team and its supporters.

The problem with these objectives is that many of them are subjective criteria.
Ofori (1992) went a step further and stated that the fourth construction objective for a client should relate to the environment (i.e. ensuring that a project contributes to protecting the environment). Measures must be taken beforehand; therefore, the environment-based objective should be a major one. Ahmed and Kangari (1995) focused on the satisfaction level of the client based on objectives (i.e. what is important for the client when dealing with contractor organisations). According to their research, the most important factors, apart from the overall aforementioned major factors, are (1) client orientation, (2) communication skills and (3) response to complaints. These, together with the three previously mentioned criteria, lead to the following set of objectives:

a) Cost;
b) Time;
c) Quality;
d) Client orientation;
e) Communication skills;
f) Response to complaints.

Almost all the factor objectives are equally important for the client, and only quality and client orientation differ from each other, according to the correlation analysis. All the factors together make up the client satisfaction model. On the other side, contractor parties also have their objectives and performance goals, which must be aligned to achieve a collaborative environment with a win-win situation. All the possible client objectives are listed in Table 2 according to the literature.

Objective	Boyd (2008)	Newcombe (1994)	Spenser & Winch (2020)	Ward (1991)	Richards et al. (2005)	Ofori (1998)	Ahmed & Kangari (1995)
Value for money	**x**			**x**	**x**	**x**	
Budget control/cost	**x**			**x**	**x**	**x**	**x**
Quality	**x**			**x**	**x**	**x**	**x**
Relationship	**x**				**x**	**x**	**x**
Value of asset		**x**					
Improvement of service		**x**			**x**	**x**	
Profit (private client)			**x**				
Self-use (private client)			**x**				
Time				**x**	**x**	**x**	**x**
Satisfaction (users, stakeholders)					**x**	**x**	
Environment						**x**	
Communication skills							**x**
Response to complaints							**x**

Table 1. Client objectives

Findings indicate that traditional financial measurements are no longer the sole determinants of the success of a contractor (Hani et al. 2013). Other performance indicators, such as customer satisfaction and long-term relationships are becoming increasingly important. Therefore, objectives and agendas have changed for contractors.

To measure the performance of a contractor, key performance indicators (KPIs) are critical and must be established. KPIs are the compilations of data used to assess the performance of a construction project and

ultimately aid in reaching the goals of the contractor. Hany (2013) aimed to make a key list of the 10 most important KPIs that can be used for the performance of construction companies. The full list of indicated factors can be found in Appendix A. The research consisted of information from different authors to set up the full list for determination by a survey. The next 10 KPIs presented in Table 2 can be classified into three perspectives – (1) financial, (2) customer and (3) internal business – and the ranking of the KPIs is shown per perspective.

Perspective	**Ranking**	**KPI**
Financial	1	Profitability
	3	Growth
	4	Financial stability
	5	Cash flow
Customer	2	Quality of service and work
	6	External customer satisfaction
	9	Market share
Internal business		
	7	Safety
	8	Business efficiency
	10	Effectiveness of planning

Table 2. Performance objectives by Hany (2013)

Hany stated that traditional financial measurements are insufficient for present construction projects, which leads to an increasing interest in non-financial measurements such as customer and internal business. Profitability is still the most important criteria, but this is also logical because construction companies are business organisations. Growth, which can be seen as a measure of success, is another economic objective that is interesting for a construction company. An additional way in which to consider economic objectives is through cash flow criteria. In some specific situations, for a construction company to survive, it needs to create cash flow instead of specific profitability. These financial performances are a logical consequence of improvements in the non-financial performances and therefore major objectives for a construction company as well.

Construction companies are currently shifting to corporate, client-centred objectives. Contractors focus on how they should perform for their client (Hany, 2013). There is no doubt that construction organisations depend on client satisfaction (Cheung et al. 2004), which is necessary for gaining success and being profitable. Client satisfaction translates into tangible benefits such as market share. The third perspective, internal business, plays a key role because of the currently increasing complexity of and rapid rise in construction activities. Safety is highly important for the image of a construction company and the satisfaction level of the client (Wong, 2004). The research done in Saudi Arabia therefore lacks environmental performance. In other countries or parts of the world, environmental performance plays an even more important role (Roberts & Latorre, 2009).

Aligning these previously mentioned objectives is the core success factor to create willingness and share pains and gains. In Rose's (2010) research, he explicitly mentioned the importance of aligning the motivation to perform better than usual, stating that this starts with aligning the motivations and objectives in the procurement approach. Negative motivation drivers must be turned into positive drivers by setting up a contract. Negative motivation drivers include inconsistency between the project performance goals and incentive goals, inadequate price negotiation, inequitable contractual risk allocation, late involvement of key stakeholders, inconsistency between contract intentions and relationship intentions, and unfair and inflexible incentive performance measurement processes. Many of these motivation drivers relate to gain-and-pain-sharing arrangements, which not only can tackle these negative drivers, but also can be influenced by the drivers themselves. A careful approach with a well-designed contract is required to successfully align a construction project. Figure 2 depicts the common ground and objectives.

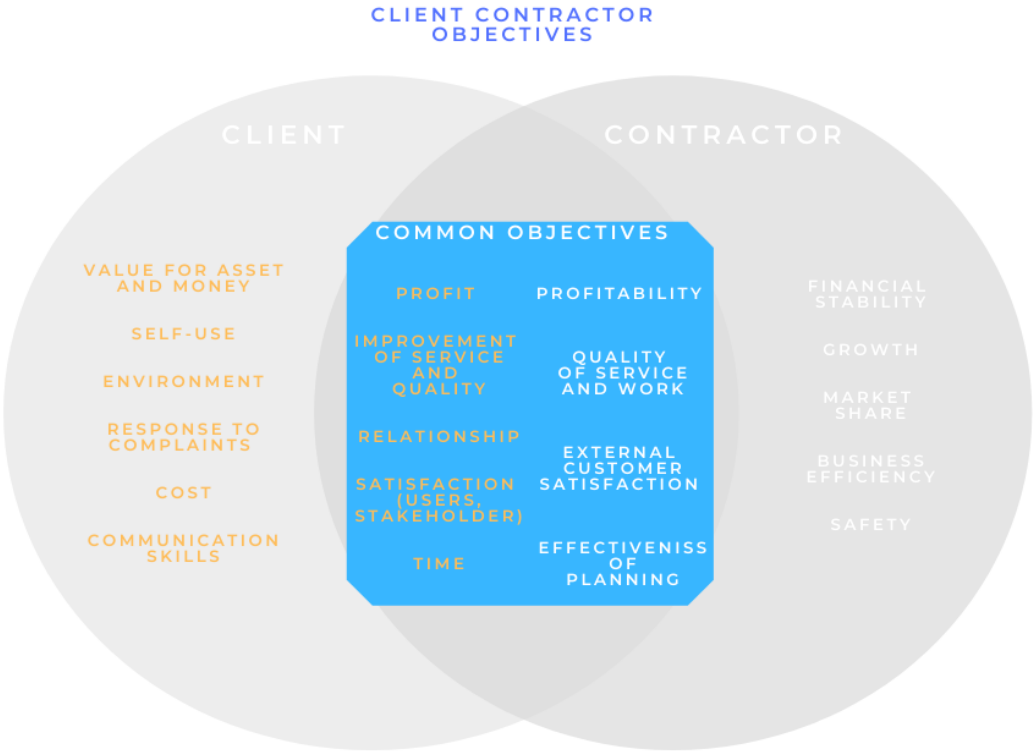

Figure 2. Client vs contractor objectives

The figure illustrates that first, there are shared objectives between the client and contractor, but second, there is also a possibility for multiple different objectives in a project. Bringing the objectives together with the related sharing of gains and pains is a key element for collaboration (Hughes et al. 2012). In conclusion, Figure 2 can help us to understand which shared or different objectives the client and contractor might have. In Section 2.2, the ideology of bringing objectives together and improving collaboration by partnering is discussed to offer insight into the starting point of gain-and-pain sharing.

2.2 Partnering

In many countries, interest in partnering environments is on the rise. Partnering environments are collaborative relationships such as an alliance or other forms of contracting in the construction industry. The idea is that partnering should decrease adverse objectives and conflicts (Ling et al. 2006). To create this type of environment, trust between parties must be established. In 1991, the Construction Industry Institute (CII) first defined partnering as follows:

'A long-term commitment by two or more organizations to achieve specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services' (CII 1991).

The construction industry is associated with low efficiency, cost overruns and complex situations where the focus is on transactions (Winch, 2000). By focusing on relationships rather than transactions, partnering facilitates increased efficiency, eliminates adversarial relationships and avoids conflicts (Naoum 2003, Chan et

al. 2010). Unfortunately, the literature does not provide a definition of the concept, and without a defined concept, it is still difficult to implement. Limited knowledge about the concept will result in failures in the project, which is the opposite of the ideal situation in the partnering concept. What is known about partnering is that it always consists of hard elements (e.g. contractual/formal elements) and soft elements (e.g. informal actions). In the common literature, soft factors are seen as deal breakers in the success of a construction project (Larson, 1997). The purpose of partnering is to create a strong relationship and a gain-and-pain-sharing mechanism to ultimately achieve success for all participants (Naoum, 2003).

In various studies, different elements are mentioned. Figure 3 shows the purposes of partnering, adapted from Hosseini (2018).

Table 2. Partnering Purposes

Benefit	Eriksson (2010)	Bennett (1995)	Larson (1995)	Naoum (2003)	Cheung et al. (2003a)	Chan et al. (2010)
Increase Efficiency	X	X	X	X	X	X
Increase Quality	X	X	X	X		X
Innovation	X	X			X	X
Reduce Litigation / Dispute Resolution	X	X	X	X	X	X
Increase Customer Satisfaction		X	X	X		X
Elimination of Adversarial Relationships	X	X		X		X
Sustainability	X					
Safety Performance	X	X		X		X
Reduce Risk / Risk Shared	X				X	
Enhance Communication						X
Continuous Improvement						X

Figure 3. Partnering purposes by Hosseini (2018)

The results reveal that some authors use similar elements, while others use different, specific purposes. More recently, authors such as Chan et al. (2010), Naoum (2003), Nyström (2005), Lu and Yan (2007) and Yeung et al. (2007) have investigated the relevant elements of partnering. Their results demonstrate that to fully understand this concept, a partnering definition cannot be separated from the presented elements. Furthermore, according to the most recent research from Erikson, having a real gain-and-pain-sharing mechanism and using a legally binding partnering charter are the most important hard elements, and communication, trust, long-term commitment and cooperation comprise the most important soft elements. In partnering, these hard and soft factors should ideally come together. Changing the natural habitat cannot always be achieved. Changing to a collaborative environment in projects requires knowledge, preparation and commitment, which will be hard work (Cowan et al. 1992). Moreover, the current absence of a standard agreement is an issue for the implementation of partnering.

To implement a partnering environment, the purpose, situation and context of a project must be considered in combination with the soft elements. However, no consensus exists, and there are numerous different elements with varying outcomes. To cope with this uncertainty, some clients operate with a minimum requirement for a project, assuming that a partnering project is a project that includes at least one of the partnering elements (Hoseinni et al. 2018). On this basis, it is one element that serves a previously mentioned purpose of partnering. An interesting observation in Hosseini's research is that some elements that were weighted by the respondents were not repeated in the projects (e.g. the target price, which is a major element in a classic gain-and-pain-sharing mechanism). These findings might imply that the implementation of this mechanism or element requires more available resources and practice.

The soft elements are, to a larger extent, present in successful construction projects. These elements are essential for the coordination of the hard elements. The key to success is to believe in the piece of paper (contract) one uses and to stand behind it. When utilising hard elements, projects sometimes automatically implement soft elements to build a more collaborative environment.

Partnering is not suitable for all kinds of construction projects. When a project is small, not unique, less complex and of low strategic importance, the set-up costs of partnering do not match the project (Eriksson, 2010). According to the transaction cost theory and literature, collaboration is better for complex, recurrent and customised transactions (Macneil, 1978; Williamson, 1985). A project should have the following characteristics: complexity, customisation, uncertainty and long duration, coupled with time pressure. These element scans differ; therefore, different levels of collaboration are needed. The first level is described as a low level of collaboration; it primarily includes joint objectives and a charter, while in other aspects it is based on the same procurement and contractual arrangements as traditional arm's-length relationships. Second, at intermediate levels, the focus changes from the short term to the long term, which heavily affects trust, openness, risk sharing and continuous improvements. Third, at high levels of collaboration, team members identify themselves with the project team rather than with their employing organisations. This is facilitated by a common performance measurement system and a joint project office (Thompson and Sanders, 1998). The client must conduct an estimation of the characteristics to decide which level of partnering is needed.

According to Erikson, the following mandatory core procedures exist (Table 3):

Core components of partnering	Optional components of partnering
Bid evaluation based on soft parameters	Early involvement of contractors in concurrent engineering
Compensation form based on open books	Limited bid invitation
Usage of core collaborative tools:	Joint selection and involvement of subcontractors in broad partnering team
Start-up workshop, joint objectives, follow-up workshops, teambuilding, conflict resolution techniques	
	Collaborative contractual clauses
	Compensation form including incentives based on group performance
	Usage of optional collaborative tools: partnering questionnaire, facilitator, joint risk management, joint project office, joint IT-tools
	Increased focus on contractors' self control coupled with limited end inspections

Table 3. Core and optional components of partnering

If we look to the core components with the optional components, a compensation form including incentives based on group performance is a useful tool to incentivise collaboration. Erikson argues that bonuses affect attitudes and behaviour; these bonuses must be relatively large to be useful. A project with a bonus of approximately 5% had more success than a project with a lower bonus percentage (Eriksson, 2010). Another important factor regarding compensation forms is that gain-and-pain-sharing arrangements and bonus opportunities should be tied to group performance rather than the performance within individual contracts. In projects where those arrangements and opportunities were connected to the individuals, they hampered collaboration between parties in the contract. In contrast, in projects where they were tied to group performance, there was a reason to optimise the performance as a whole (Bayliss, 2004). This led to better collaboration and project results and was perceived to be highly beneficial. It is difficult to see how traditional fixed-price compensation can work in a partnering setting, since it endorses a win-lose rather than a win-win situation (Walker et al. 2002). Therefore, an open-book reimbursement should be combined with a financial gain-and-pain-sharing mechanism, because when only using an open-book reimbursement, the client misses the opportunity to include an efficiency-enhancing driver. The open book should be viewed as a core component, while incentives and bonus arrangements based on group performance are optional components to complete the collaborative environment. This is the starting point for coming together and sharing gains and pains.

2.3 Gain-and-pain-sharing mechanism

In Section 2.2, the idea of partnering and the first possibilities to incentivise collaboration with a gain-and-pain-sharing mechanism were introduced. In Section 2.3, definitions of a gain-and-pain-sharing mechanism are presented to distinguish the concepts afterward for further research.

In the industry, forms of contractual relationships and behaviours are not suited to best meet project objectives in terms of cost, time and quality. Especially the previously mentioned confrontations involve alignment of the parties' goals, needs, interests, and resources are a big problem (Bayliss, 2002). Gain-and-pain sharing provides incentives to achieve project goals (Bayliss et al. 2004). The CIOB defines it as an agreement that allows the parties in a construction project to share profits or cost savings and to share losses due to errors or cost increases. Mutual benefits are achieved through gain sharing, for example a reward for delivered work, a bonus or recognition, and losses are the occurrence of risks. It is therefore also known as the risk/reward scheme (Rahman & Kumaraswamy, 2004). This also means that there are monetary and non-monetary rewards, with the latter including satisfaction and recognition (Bayliss, 2004). Walker further lists the following additional non-monetary rewards: access to learning and other factors that enhance the experience of the project decision-making. These rewards are difficult to make explicit but can be recognised in designing and evaluating partnering and alliancing relationship (Walker et al. 2004). In a study by Walker, the National Museum of Australia was selected as an example of the risk-reward scheme, which was made up of cost, time, design integrity and quality, with a significant bonus for time. A collaborative project depends on the objectives of both parties to succeed with a gain-and-pain-sharing mechanism. In some projects, the contractor took the extra costs to maintain a fruitful relationship with the client and increase chances for future work (Bresnen, 2000).

Most risk-reward arrangements focus mainly on costs, but for full alignment of goals and objectives, quality, time and safety should be incorporated as well. Incentives should be tailored to the project's KPIs because parties have a reason to collaborate. The main point to emphasise is the concern regarding indifference of the potential motivational impacts. Simple and difficult systems have their pros and cons (Walker et al. 2004). However, they can be difficult to implement because they are rigorous in comparison to the traditional arrangements (Bresnen, 2000). As already mentioned, creating a win-win situation is important, and to do this, understanding of different objectives is needed. Based on the earlier mentioned definitions of gain-and-pain sharing, the following concepts are identified: target cost, risk pot, new created benefits and bonus-malus. The concepts comply with the basic principles of sharing gains and pains by means of monetary and/or non-monetary options.

2.3.1 Target cost

Two types of target costs are known as gain-and-pain-sharing mechanisms in the market; they are the target cost principles from 1) an alliance and 2) the NEC. An explanation of the contractual agreements and details for settlement of the contracts can be found in Appendices B and C, respectively. The alliance contract works with a 'task-setting alliance budget' (TAB), which is equal to the expected total cost of the project at its time of delivery. The main difference with the traditional contract price is that the contractor will, in principle, have all of their direct costs, based on 'open book', reimbursed with a fee on top, which is the final total cost less the TAB; the difference between the client and the contractor will be divided according to a certain key. If the costs are ultimately higher, then they are partly for the contractor's account (albeit as a rule to a certain maximum). In this light, it is not lucrative for the contractor to search for additional work opportunities (Klijn, 2018).

The gain-and-pain-sharing arrangement by the target cost or the TAB is intended to ensure both the contractor and the client an equitable share of the gains and pains. The gain-and-pain-sharing mechanism in an alliance should be developed in line with the following guiding principles:

a) It should be either a win-win or a lose-lose result. Under no circumstances should it be a win-lose or neutral-win outcome – either everyone wins or everyone loses;
b) Pains and gains should be linked to outcomes that add or detract value from the owner;

c) Performance by the alliance which is better than the agreed target cost should lead to superior returns, and vice versa for inferior returns;
d) Client will always recover all their direct costs.

By linking the commercial interests of all participants to best achieve project outcomes, parties should be encouraged to work as an integrated team to identify, eliminate and/or mitigate risks, including higher risks that must be managed as a whole. A simple representation of the working of target cost gain-and-pain sharing is shown in Figure 4.

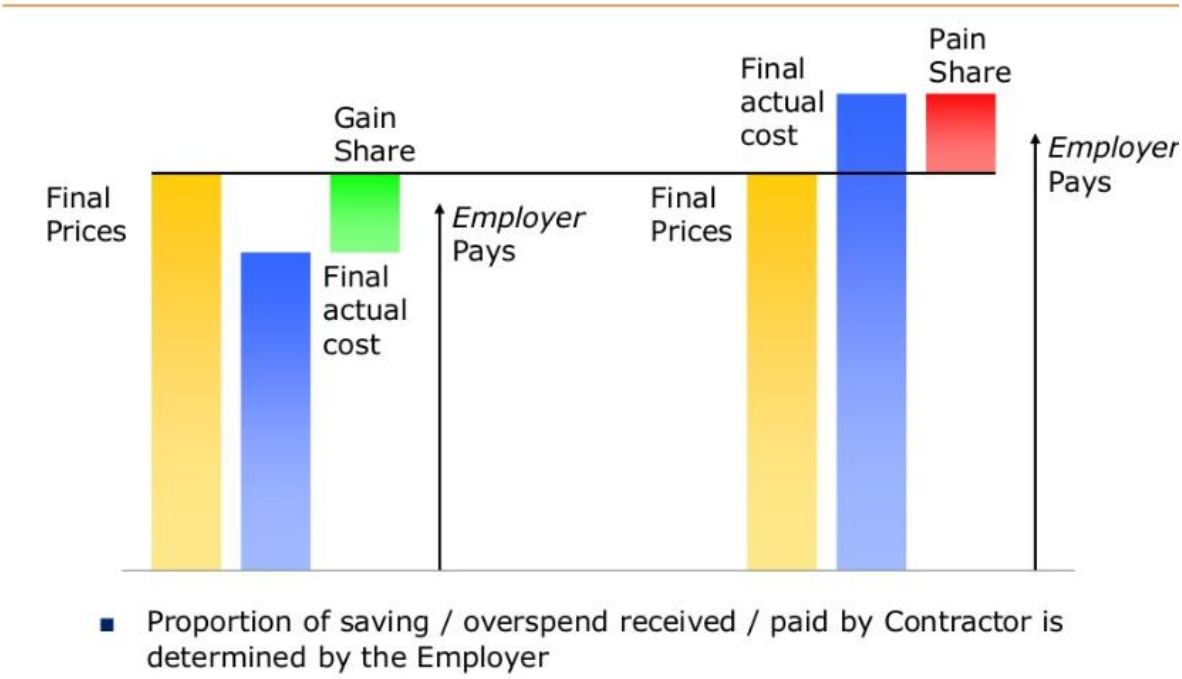

Figure 4. Working target cost (Expo, 2015)

Unlike the 'normal' contract price, the contractor is not solely responsible for the TAB establishment; the client and the contractor do this jointly in an alliance, regardless of whether they are supported by an independent third party (Koolwijk & Geraedts, 2006). The intended synergy of this collaboration should lead to a TAB that is as realistic as possible. During the TAB development process, there is much interaction between the client and the contractor. A detailed explanation of the setting of the TAB and the steps of the full process can be found in Appendices D and E, respectively. The contractor learns to understand what the client needs to be able to respond accordingly, and the client gains better insight into the contractor's possibly available design solutions (Berg et al. 2010).

This process is more than just a joint calculation exercise; it is rather a process in which the contractor's design will be further elaborated jointly (Berg et al. 2010). Activities that can also be performed in connection with this entail drawing up a risk analysis including control measures, performing value engineering, determining the implementation methodology and planning, and drawing up purchasing planning. Various variants or options can be 'calculated'. When consensus has been reached on the scope, risks and TAB, it is important to determine the allocation key by which the client and contractor will share the gains and pains (Klijn, 2018). This basic idea of sharing the project cost can be adjusted with KPIs to incentivise the contractor in certain areas. Using KPIs makes it possible to include a non-monetary gain-and-pain-sharing option (Ross, 2003). A detailed description of working with KPIs in the target cost gain-and-pain-sharing mechanism can be found in Appendix F.

According to the NEC, a target contract is a contract option where the contractor works with an activity schedule. Payments are based on incurred costs and not on the completion of activities. Target contracts are a combination of a lump sum price and an open-book cost-reimbursable payment, and they are developed from a cost-reimbursable contract. The advantage of a target contract, which has already been discussed in

earlier papers, is that it provides price certainty with the incentive to generate cost savings for the benefit of the client and contractor (NEC, 2017).

In contrast to an alliance contract, the NEC supposes that the client is able to clearly define the scope of work so that the contractor can price and prepare an activity schedule. Benefits are created by sharing the risks and opportunities to collaborate with the contractor, thereby encouraging collaboration. Furthermore, financial risks will be shared proportionally between the contractor and the client. NEC shares the ideology of partnering (King, 2016).

The contractor tenders a price and includes the activity schedule. When the tender is accepted, the contract price will be the target price. The contractor also tenders their percentage of the fee, and the target price is referred to as the total price at the contract date. A few details must be specified:

a) The target price is the direct cost, indirect cost, overhead cost and fee;
b) The fee is a percentage of the direct cost;
c) During the contract, the contractor is paid the direct cost and fee;
d) The target will be adjusted for scope changes and inflation;
e) The difference in the final target cost will be shared according to a share profile.

A full explanation of setting the target can be found in Appendix G. For both concepts, the gain-and-pain sharing is based on a share profile, which is an agreement on the extent to which profits and losses will be shared The choice of a share profile is a culmination of a series of decisions made to attain an appropriate contract strategy. Broom (2002) suggested the following working description of the purpose of a contract strategy:

'The alignment of the motivations of the parties to maximize the likelihood of project objectives being achieved, taking account of the constraints and risks that act on the project and the strengths and weaknesses of the parties to it'.

When all previous phases are set, the real gain-and-pain-sharing mechanism can be set. Various mechanisms are available, from simple to complex. A simple share would be a 50/50 split between clients and contractors, enhanced by a series of share ranges in which the employer allocates increasing amounts of gain- and pain-sharing to the supplier (e.g. a pain-sharing cap of 120% of the target costs and a gain share of 80% of the target costs). This share profile must be balanced for the contractor to be motivated to act in the best interests of the project to create a win-win situation (Broome, 2002). The client and the contractor can negotiate the share profile to align their objectives. A simple example is presented in Figure 5, and additional examples can be found in Appendix H.

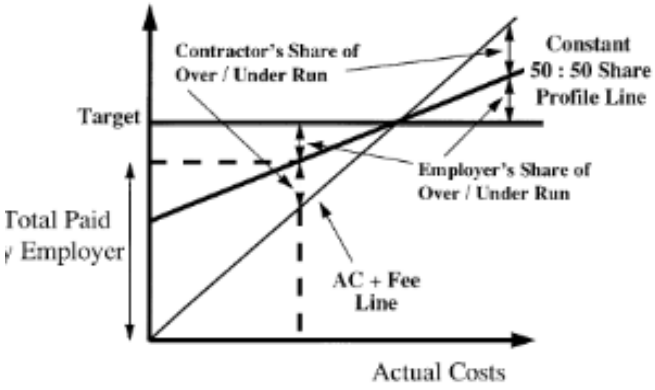

Figure 5. Standard split share profile

2.3.2 Risk pot

A risk pot can be found in contracts such as alliance and Bouwteam contracts. A risk pot is a gain-and-pain-sharing mechanism where gains can be acquired by joint prevention of risk, and the pains from occurred risks can be shared (Klijn, 2019). Paying based on a risk pot means that agreements are made in advance regarding the distribution of costs and returns for certain risks and opportunities. See also below, under the tender incentive. This is especially attractive if:

a) The client and contractor agree to jointly manage certain risks;
b) Both parties can contribute to reducing the risk and/or the financial or planning consequences of the occurrence of the risk.

New financing arrangements are deployed within those alliances, such as agreements about a joint risk pot between client and contractor, and additional work is paid from the risk pot. While parties used to try to pass the risk ball to one another, it is now a common interest to ensure that the risks are identified and controlled at an early stage because the money that is left over is divided and thus flows back to the partners. The agreement also applies the other way around: if the risk sum turns out to be too small, the contractor will only be reimbursed for half of their costs (Transitiepraktijk, 2020).

This cost element is characteristic of alliance projects. This provision is established after extensive analysis with many assumptions about the unknowns and uncertainties. As for the TAB as a whole, also applies to this provision that this is the expected value upon completion of the project should form. Techniques such as Monte Carlo simulations and benchmarking can support this (Department of Infrastructure and Transport, 2011).

According to Bayliss, the share of risks with and profits from a risk pot is part of an incentivisation agreement. This agreement identifies the risks which will be born solely and shared. For shared risk, a gain-and-pain-sharing formula will be agreed on. The idea is that the incentivisation agreement should reduce uncertainty regarding responsibility and promote an active and open partnering commitment. It also resolves claims, according to the cases in the research by Bayliss (2002), where the parties believed that the incentivisation agreement was useful in bringing the parties together and focusing on a common objective. Objectives from a client's and contractor's perspective must be considered because they are being brought together to collaborate.

An example of the risk pot can be found in Project DOEN (2017). Project DOEN has identified the joint risks for the project as one team, with quantified, allocated and control measures determined. The joint risk file is drawn up in accordance with the RISMAN method. For all risks, preventive and corrective control measures are determined. Preventive measures ensure that the chance of risk occurrence or the effects of the occurrence are reduced, whereas corrective measures (partly) eliminate the effects of a risk that has arisen. Preventive measures are incorporated into NU DOEN's working method and, if necessary, in the offer price.

The allocation of risks are based on the premise that the party that can control the risk best, bears the residual risk of that risk. This incentivises that party to control the risk as well as possible. However, this does not mean that the other party cannot contribute to controlling the risk. Three categories were used for the allocation:

a) Client risk (residual risk is borne by the client);
b) Contractor risk (residual risk is borne by the contractor);
c) Joint risk (residual risk is borne by joint risk pool).

The joint risk pot is designed for risks which have negative consequences of occurrence, where no direct focus lies within the client or contractor. Real cooperation risks exist where both the client and the commissioning party bear responsibility for control. If these risks do occur, then the corrective control measures are paid from the joint risk pot, which is filled by both the client and the contractor. The contractor's contribution is included in the contract price. When the risk pot is empty, additional corrective measures for joint risks are paid by the client and by the contractor. If money is left in the risk pot after completion of the project, then it will be shared

between the two parties. This appointment stimulates the contractor to properly manage the risks preventively and correctly (Projectteam DOEN, 2017).

2.3.3 Sharing of new created benefits

A relatively new way of sharing pains and gains is the sharing of new created benefits. This is joint enterprise where the contractor and client jointly invest to make a profit. A joint enterprise means that the contractor and the client share the proceeds together, for example certain realised savings (Koster, 2008). This is especially attractive if:

a) the client and contractor both have an interest in realising these revenues;
b) both parties have bonded for a longer period.

This primarily concerns situations in which the contractor manages to generate additional income from the operation of the project. A solution to acquire this in a contract would be to apply benefit sharing if additional income is generated. To this end, a mechanism must be included in the contract that gives the client insight into the nature and size of the additional income and that establishes the distribution key and the payment method (Koster, 2008).

An interesting example of this idea is the Harnaschpolder, where a new water treatment installation is built and benefits of the new created phosphate are shared. A distribution key was drawn up for allocating these benefits, based on a win-win situation, and the majority of the investment costs were paid by Delfland, spread over time. The operational advantage will return based on a distribution of 75% for the water board and 25% for Delfluent. In this way, the water board stimulated its contract partner to make optimisations that benefit both the water board and the contractor.

2.3.4 Bonus-malus

Another identified basic principle of a gain-and-pain-sharing mechanism is a bonus-malus structure. Paying based on bonus-malus means that the client rewards certain performances and/or sanctions performance in case of failure. In theory, the bonus-malus principle can influence opportunistic behaviour because the contractor's interest is associated with the interest of the client (Hogendoorn, 2010). This is attractive, for example, if:

a) the client incurs extra costs if the desired performance is not achieved, such as crossing milestones;
b) the contractor has a financial interest if a certain performance (for example a milestone) is achieved earlier;
c) the client runs additional risks if performance is not delivered or is delivered inadequately, such as limiting nuisance or damage.

The agreements made between the parties involved are laid down in the bonus-malus scheme. To integrate the bonus-malus principle into forms of collaboration, a bonus or malus is applied to the management aspects. Schol (2008) indicates in his research the application of the bonus/penalty principle only from the combination of the three management aspects of time, money and quality. This means that the application of the bonus/penalty principle is not possible for the individual management aspects or for a combination of just two of them. The three management aspects of time, money and quality are seen as communicating vessels. It is expected that linking a bonus-malus to two management aspects will result in the plan being optimised by the contractor only in respect of those two management aspects. This optimisation will be at the expense of the time schedule, the project budget or the desired quality (Hogendoorn, 2010).

The bonus-malus principle can be classified under incentive alignment because it is a financial performance incentive in the contract which aims to achieve a target agreement. The importance of the contractor must be linked to the interests of the client; this can be done by including measurable and verifiable performance incentives in the contract. Better performance is boosted by the bonus, and a drop in quality becomes unattractive by the malus (Schol, 2008).

Since the performance incentives are contractual agreements, when including them in the contract, several factors must be taken into account. First, the performance incentives must be measurable. Measurability also implies perceptibility, and the actual performance can thus be determined (Ibbs, 1991). Second, the performance incentive must be verifiable. In the event of a dispute, an organisation can resolve conflicts that determine the actual delivered performance (Rose, 2005). In addition, the bonus and/or malus are linked to the performance matters. The better this link is, the less discussion can arise about any bonus or malus associated with the (actual) performance. A meaningful contract consists of 'agreements that are both observable and verifiable' (Hendrikse, 1998).

By promising a bonus for the contractor, the contractor is, in principle, stimulated to display desirable behaviour. After all, the contractor receives the bonus by fulfilling the client's wishes. The aim of the bonus is to shift the final performance of the contractor to a more desirable performance for the client; see Figure 5. The bonus has the effect of the contractor setting a higher goal or ambition. For the client, the chance of a better actually delivered end result consequently increases (Schol, 2008). A wish can be linked to a requirement, but this is not necessary. In this case, the requirement is the zero point, and the wish is linked to a performance beyond this zero point. Three different variants of the bonus can be found in Appendix I.

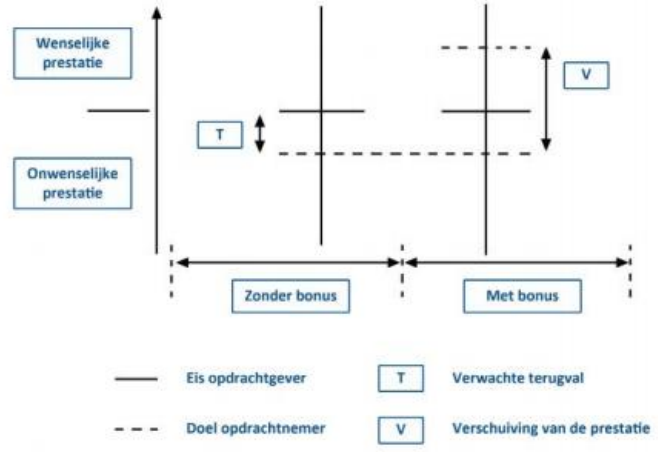

Figure 6. Bonus principle (Schol, 2008)

The Wieringermeerdijk case is a prime example that can be referred to as a gain-and-pain-sharing mechanism with monetary and non-monetary rewards. In the tender for the Wieringermeerdijk and Stonteldijk project, the specifications contained a provision where the client wanted to focus on preventing complaints and handling them as well as possible when they did occur. A flow chart was included in the contract that described how the complaints should be handled and when a complaint was justified. Depending on the number of justified complaints that occurred during the execution of the work, the contractor could earn a maximum of €50,000 as a bonus (with zero complaints) and a penalty of €12,500 for four to six justified complaints. If more than six complaints occurred, a different malus scheme came into effect (UVW, 2008).

Experience with applying this stimulus in practice was variable. Despite the flow chart, there was a difference of opinion as to whether complaints were justified or not. At the end of the construction period, there were no more complaints in the register, and the full bonus was paid to the contractor. The conclusion from this example is that the complaints register must be placed on the agenda continuously during the duration of the project (UVW, 2008). This is a useful example of bringing the objectives from both parties together and sharing the gains and eventual pains.

Apart from the internal factors of the mechanism, in practice there are various factors that influence the effect of the bonus and the malus. The client determines the bonus-malus amount in favour of better performance and the broader picture. This means taking into account the influence of the area of tension between the interests of the contractor and the budget proportionality. When creating this complete picture, the client

must consider the method of offering, the business cycle, the trust relationship and the capacity in the market (Rose, 2008).

2.4 Conclusion

Based on the literature research, Sub-questions 1 and 2 are answered.

Sub-question 1: Which concepts of the gain-and-pain-sharing mechanism can we identify in the current literature?

Collaborative work is defined as working together to effectively and efficiently accomplish a project. Key criteria which make collaboration successful are parties knowing, understanding and sharing their project or company objectives. The gain-and-pain-sharing mechanism is often stated in the literature to facilitate collaboration and aids in aligning project objectives.

The CIOB defines gain-and-pain sharing as an agreement that allows the parties in a construction project to share profits or cost savings and to share losses due to errors or cost increases. Mutual benefits are achieved through gain sharing. Benefits could, for example, also be a reward for delivered work, a bonus or recognition, and losses are the risks. Therefore, gain-and-pain sharing is also known as the risk/reward scheme (Rahman & Kumaraswamy, 2004). This also means that there are monetary and non-monetary rewards. Non-monetary rewards can include satisfaction and recognition (Bayliss, 2004) and, according to Walker, also access to learning and other factors that enhance the experience of the project decision-making. These rewards are difficult to make explicit but can be recognised in designing and evaluating partnering and alliancing relationships (Walker et al. 2004).

In the current situation, the different contract forms have signs of the basic principles of the gain-and-pain-sharing mechanism, but none of the contracts refer to it as a gain-and-pain-sharing mechanism. The most elaborated gain-and-pain-sharing concept is the target cost concept, but this is a monetary reward mechanism that can be incentivised by different criteria. Other options are a risk pot, bonus-malus and the sharing of new created benefits, all of which have the basic principles of the gain-and-pain-sharing mechanism. Non-monetary gains and pains are especially difficult to define and conceptualise for implementation. The only option found in the literature is via non-monetary-based KPIs. However, the gain or the pain when achieving the desired performance is still monetary in the end. Therefore, it is even more interesting to enrich the process to share non-monetary gains and pains that can arise from healthy collaboration.

Table 4 lists the gain-and-pain-sharing concepts identified in the literature according to the definition of gain-and-pain sharing.

Gain-and-Pain-Sharing Mechanism	Concepts	Elements
	Target cost (alliance) 	• Based on a full alliance • Monetary reward system • Performance on non-cost areas (non-monetary) • Task-setting alliance budget • Sharing through cost over- and underruns • Incentivise collaboration and create mutual objectives
	Bonus-malus 	• Suitable for all contract forms • Gain-and-pain sharing by bonus or penalty • Monetary reward system • Achieving objectives
	Risk pot 	• Based on partnering contracts • Risk sharing • Shared risk-cost over- and underruns • Monetary risk system • Incentivise collaboration and create mutual objectives
	Sharing of new created benefits 	• Suitable for PPP • Joint enterprise • Sharing profit through sale of product or rental • Monetary reward system • Incentivise collaboration and create mutual objectives
	Target cost (NEC) 	• Based on the NEC • Monetary reward system • Sharing through cost over- and underruns • Addition: performance metric (non-monetary) • Incentivise collaboration and create mutual objectives

Table 4. Theoretical framework

The table also shows the important principal elements of the concepts found in the literature. Next, the principles and important factors of the concepts are elaborated to answer the second sub-question.

Sub-question 2: Which factors of the concepts are important according to the theory for realising a gain-and-pain-sharing mechanism?

Target cost (alliance and NEC)

The principle of the target cost concept is sharing costs through a target cost ceiling price and the arranged share profile based on transparency and an open-book economy. The concept is intended to incentivise collaboration and create mutual objectives. Using the financial mechanism as a discussion point for meetings makes it possible to openly discuss all risks and opportunities and to create mutual understanding.

By combining responsibility through the sharing of costs, a win-win situation can be created instead of an I/you relationship. In this setup, mutual trust can be established, which eventually can contribute to more willingness for a client to take responsibility for risks and to properly control things together with the contractor.

Estimating the target cost as precisely as possible is key for the success of the target cost concept. With the wrong estimated target cost, the project will not incentivise collaboration, because of friction in the amount of money that is or can be spent. It is therefore important that the target price is agreed on together to bring the client and contractor to the table. The process to determine the target cost is hence of great importance. Bringing the parties to the table as early as possible with or without a design is essential because both parties need agreement on the scope, risk and budget. Together, they agree on a ceiling amount for the target costs, which then become the final contract price. In this system, the client ultimately pays all costs. A realistic amount is hence necessary, otherwise the project will face cutbacks afterward, and quality will be sacrificed.

The sharing of pains and gains is possible due to the sharing profile. A client must consider what message they want to send to the contractor: is it about time, quality or costs and their risk aversion. Espling and Olsson (2004) indicate that the message of pain sharing is extremely important for collaboration. The distribution key sends a message in the share profile, which is ideally designed together. According to the literature, parties must consider the following criteria for designing a share profile: alignment of the motivations and project objectives, constraints due to project criteria, risk, and the strengths and weaknesses of the client and the contractor. Taking those criteria into account, a functional share profile can be designed.

As the third factor according to the earlier mentioned literature, the target cost concept can be expanded with performance indicators, so that a contractor does not solely manage the total costs. The target cost is about the entire project's costs; to make a distinction here, the gains or the pains could still be split into percentages for performance on other goals. As a result, there is more control over certain performance indicators, and a contractor can only earn the full gain when all other areas perform well. The downside of this system is that it is much complex and expresses little less confidence in the contractor.

As the last factor and the basis for possibilities for the target cost concept, the project must be of a sufficient size to manage the risk and implement optimisations. If the project is small without any optimisation possibilities, then it would be too expensive to implement because of the extra administrative actions.

Risk pot

A risk pot can be found in partnering contracts such as alliance and Bouwteam contracts. A risk pot is a gain-and-pain-sharing mechanism where gains can be made through the joint prevention of risks, and the pains from occurred risk can be shared (Klijn, 2019). The concept aims to incentivise collaboration and create mutual objectives. Paying based on a risk pot means that agreements are made in advance regarding the distribution of costs and returns for certain risks and opportunities. The client and the contractor agree to jointly manage certain risks when both parties can contribute to reducing the risk or the financial and planning consequences.

A risk pot can be financially organised in different ways. The purest risk pot is when both parties deposit money into the pot. Other options are a risk pot which is part of the contract price or simply a list indicating that when a risk occurs, both parties make a payment. In the case of a physical risk pot containing both parties' money, both parties are eager to collaborate and give all attention to preventing a risk from taking place. Moreover, in this gain-and-pain-sharing concept, costs must be clear in order to agree on a solid risk pot. Based on the adjusted pot, the gains and pains will then be shared by means of a share profile. This can be done according to an agreed percentage distribution or fixed percentage of what may be spent as space for the contractor. As already mentioned, both parties should be able to contribute to reducing the risks; this means both parties should seek room for optimisation. Having no room for optimisation leads to a low level of motivation to input one's best effort.

Apart from the risk pot itself, the whole process with constant dialogue brings the parties together to collaborate, beginning with an initial meeting and then follow-up meetings where the risks will be defined and further discussed. Risk analysis with project and cost management is part of every standard meeting. As the last important factor, this gain-and-pain-sharing concept should be realised in a completely transparent and open-book manner. In this set-up, mutual trust is gained.

Bonus-malus

The bonus-malus principle can be classified under incentive alignment because it can be implemented through financial performance incentives in the contract, aiming to achieve a target agreement. The importance of the contractor must be linked with the interests of the client. This can be done by including measurable and verifiable performance incentives in the contract. Better performance is boosted by the bonus, and a drop in quality becomes unattractive by the malus (Schol, 2008). This concept helps to achieve project objectives.

Bonusses and maluses can be based on performance or milestones. Different variations of the system are possible according to ambitions and the expectations of the outcomes. The first choice that can be made is to prevent undesirable behaviour by means of a bonus or malus. In the case of the desired performance, the reward is either issued or increases with better performance, and the requirement is a minimum. In addition, it is also possible to work from a wish instead of a requirement.

A number of preconditions and external factors are involved when using a bonus-malus. First, when using a bonus-malus based on KPIs, the concrete requirements will be verifiable and demonstrable. This helps to make the entire process as transparent as possible to bring a contractor fully on board. Understanding of another will create mutual objectives.

Second, according to the literature, for a bonus or malus to work, it should be of a substantial amount. What must be kept in mind here is that it is important for the client to be able to link the bonus-malus and the assignment to the financial picture. This means the effects of a bonus-malus in the exploitation what it can yield for the client.

Third, the moment of initiation is an important moment for the effect of a bonus-malus. A perverse incentive possibly exists when the contractor includes a known bonus in advance in the contract price. The result is that if the bonus is not met, then it is actually a malus because the contractor has already assumed the reaching of the bonus by adjusting the contract price. If a bonus is determined afterwards, it becomes a revenue model, and the contractor looks at what investments they will make. However, this is a gray area from a legal point of view.

Sharing of new created benefits

The sharing of new created benefits is a gain-and-pain-sharing concept where the client and the contractor collaborate as a joint enterprise. New created benefits focus on gains through a new created business. This means the selling of a product or service which can be made available during the construction or operations. The idea is that there is better collaboration and goals are achieved because both parties experience a win-win situation when they perform better. With better performance of both parties, they should earn more, which is a gain and a win-win situation for both. A pain can be a dysfunctional joint enterprise which incurs financial losses. The newly created product or extra service can be adjusted with KPIs to encourage a contractor. This principle is interesting when

a) The client and the contractor both have an interest in realising these revenues;
b) Both parties have bonded for a longer period.

Due to a lack of information in the literature, it is especially important to collect information from a case and extend the science.

By establishing the definition of gain-and-pain sharing with the associated concepts in the literature, it is possible to choose the cases and investigate the practical implementation of the gain-and-pain-sharing mechanism. Establishing the conditions and criteria for use of a gain-and-pain-sharing mechanism can help clients to incentivise collaboration and the achievement of mutual project goals via the correct implementation of the mechanism.

3

DATA COLLECTION

In this chapter, deeper insights into the data collection are provided. The data collection utilises the literature framework from Chapter 2 to clarify the gain-and-pain-sharing mechanism and the possibilities to implement it. Therefore, the goal of this analysis is to evaluate the connections made in Chapter 3 in relation to the Dutch construction sector and incentives for collaboration by the gain-and-pain-sharing mechanism.

3.1 Case study methodology

As described earlier, this research has an exploratory character, and exploratory research is mostly done in the initial phase to explore the areas that correspond to the research objective. Several options are available for the design of a case study. According to Yin (2009), four main types of design exist, depending on the nature of the analysis of the case. There are multiple options for a gain-and-pain-sharing model with multiple degrees of implementation in integrated contracts. This means there are multiple units of analysis. Figure 7 depicts the possible case study designs according to Yin (2009).

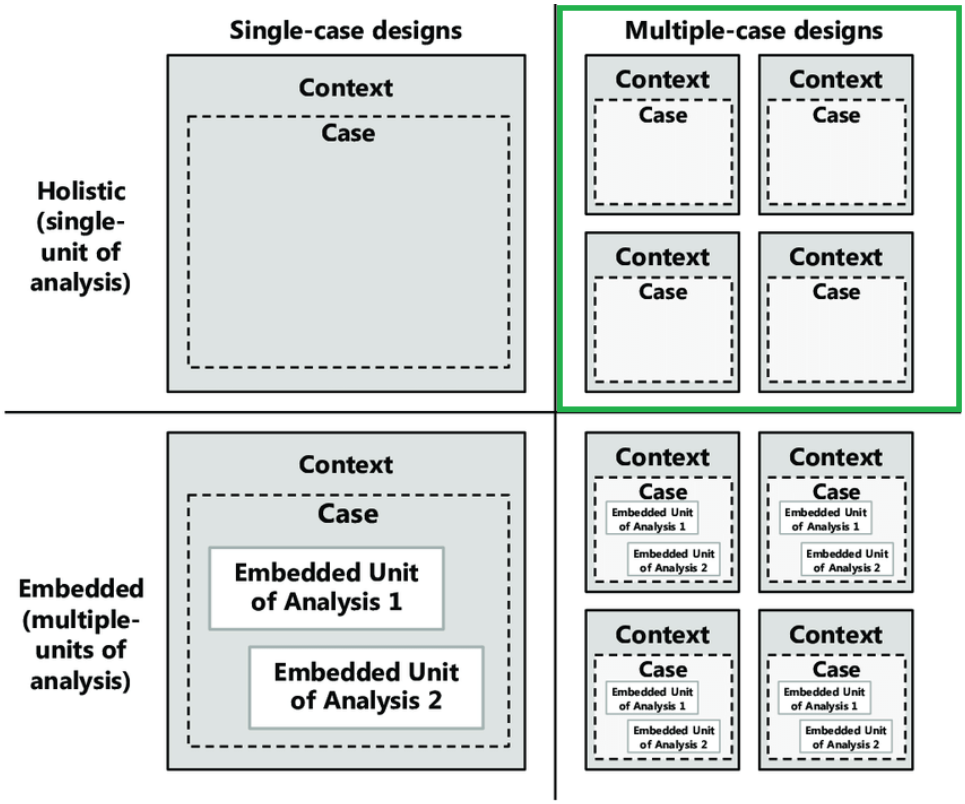

Figure 7. Types of case design (Yin, 2009)

For this research, an embedded multiple unit analysis was chosen (marked one). Multiple case studies were conducted in this research, and they were compared using a cross-case analysis to improve the accuracy of the findings (Yin, 2009).

For qualitative data collecting during the cases, a semi-structured interview was employed. This method was chosen to explore the potential of the gain-and-pain-sharing mechanism and focus on specific parts of its implementation. Semi-structured interviews help to determine whether a method or clause can work in practice because the interviews can be used to understand how certain things or people work or behave (Easterby-Smith et al. 2002). To successfully conduct the semi-structured interviews, a protocol was followed, entailing the following:

a) Interview selection: Different concepts of gain-and-pain-sharing cases were selected. The goal was to focus on the client side because the client has the first option to choose a gain-and-pain-sharing mechanism in the contracting phase, but ideas and the vision regarding the mechanism from the contractor side are optional for future research. This research can be used as a starting point for further research.
b) Interview protocol: Each interview consisted of three parts and can be found in Appendix J. The interviewees were provided with brief insight into the research. During the interviews, the interviewees did most of the talking and provided examples and opinions to illustrate their experience. 'Why' questions were asked to gain deeper insights. When wrapping up the interviews, interviewees were told what would happen to the data. With snowballing, new interview candidates could be selected to provide extra information regarding the research.
c) Validating protocol: The obtained results would be shared with the interviewees to validate their answers. When statements are approved, the results can be used as research input.

The definition of a case is described in Section 3.2. After the results from the cases are validated, the cross-case analysis can be conduct. For cross-case analysis, there must be similar units of analysis for each case (Yin, 2009). The units which will be asked should be similar to every interview and the structure of embedded nature for comparison. Sub-conclusions to the cases can then be drafted.

The case study was designed to contribute to the following sub-research questions:
- *Which conditions are important for successful implementation of the gain-and-pain-sharing mechanism to incentivise collaboration in a construction project?*
- *What steps must be taken during the contracting phase to choose and implement a gain-and-pain-sharing mechanism?*

In the cases, the reasons why one gain-and-pain-sharing concept was chosen over a different one are explored, to identify the considerations and determining factors for the choice of a concept. In addition to the choices, to obtain a complete picture of the gain-and-pain-sharing mechanism, working about the practical method and preconditions is asked.

3.2 Case study selection

In Chapter 1, the scope has already been defined, but for the selection of the cases, a thorough description of the scope is presented in this section. Available cases were chosen from Witteveen+Bos or connections through an expert. A case is a project where, according the literature, an identified gain-and-pain-sharing mechanism is used (i.e., a project where profits [gains] or losses [pains] are shared between the client and the contractor). Cases are from national ground because the roadmap is for national use.

Furthermore, to obtain insights into the gain-and-pain-sharing mechanism, partnering contracts should be the basis. In the literature, examples are presented of possible gain-and-pain-sharing models, but the common ground for all aspects of the gain-and-pain-sharing definition cannot be found. The examples share parts of the full concept of gain-and-pain sharing. For non-monetary rewards in particular, few theoretical implementations are known. In summary, the following scope case criteria were applied in this work:

a) The case has an identified gain-and-pain-sharing concept according the literature;
b) The case is from national ground;
c) The case is already completed.

The cases listed in Table 5 were selected.

Abbreviation	Role/Function	Case	Concept
HR	Contract manager	Maasvallei Waterschapsbedrijf Limburg	Risk pot and bonus-malus
SD	Contract manager	Spoorzone Delft Witteveen+Bos	Risk pot
MM	Contract manager	ICC Brink	Target costs
JG	Contract manager	Calandkanaal Havenbedrijf Rotterdam	Bonus-malus
JR	Contract manager	Harnaschpolder Delfluent	Sharing of new created benefits

Table 5. List of interviewees and cases

Contract managers were selected from the client side, since they initiated the mechanism and have the most know-how. They managed the process over time and are best able to describe the collaboration in the case. Second, they are able to explain how it could be improved and what went wrong or well in the project. We aimed to find cases where the contract manager was involved from the start to the end of the project, because of the full picture where the implementation and the results of the mechanism can be discussed. Unfortunately, only one case was available with a target cost mechanism and one case with the sharing of new created benefits. For the other concept, two cases were found. Due to the scope of the research, the contract manager is the key professional in this mechanism; therefore, only the contract manager was interviewed.

3.3 Case study semi-structured interview processing methodology

As stated in Section 3.1, the methodology used in this research for the case studies was a semi-structured interview based on the interview protocol in Appendix J. In this section, we elaborate on how the interview findings were processed and how the results were presented.

The findings from the interviews were processed by using Atlas software. With Atlas.ti, it was possible to code the interviews to collect all quotes for comparison of the different subjects from the concepts. Correct coding yielded an overview of similarities and contradictions, which led directly to a cross-case analysis by coding the concepts with similar codes. For an overview, the results of every case are presented in the next chapter, where the following concepts are discussed:

1 Target cost;
2 Bonus-malus;
3 Risk pot;
4 Sharing of new created benefits.

The questions were intended to clarify the concepts, meaning any positive or negative effect of the concept, the implementation process, the preconditions and collaborative performance. To end every case, a short conclusion was drawn to summarise the outcomes. With the results and the cross-case analysis already performed in Atlas.ti, the clarification of every concept was then drawn. At last, the conclusions were compared with the literature and validated before a final conclusion was drawn. By means of these measures, we limited the influence of misinterpretations of the statements. The next step was to design a strategy for the implementation of the gain-and-pain-sharing mechanism and validate this strategy with a group of experts. This process is discussed later on.

3.4 Case 1 – Maasvallei Waterschapsbedrijf Limburg

Case	Water treatment plant Weert
Concept	Risk pot and bonus-malus

Table 6. Overview of the case – Weert and concept

The project was a sewage wastewater treatment plant (WWTP)(figure 8) in Weert that was radically modified by building a Verdygo installation. Verdygo is a new type of sewage treatment plant divided into modular blocks. The blocks are uniform and can be implemented everywhere according to the same standard. By means of this technique, the installation can be expanded and maintained more quickly. The project was awarded based on a framework agreement signed between the Limburg Water Board and TBI companies Mobilis and Croonwolter & Dros. The Weert project involved the design and realisation of a modular sustainable sewage treatment plant by a construction team following the Verdygo principle that purifies the wastewater from the Weert connection area at a level under the effluent requirements of the Water Framework Directive (WFD). This means that the existing biological treatment after the pre-settling tank would be replaced by a new biological treatment. This project also included an expansion of the treatment with a partial treatment and storage of surplus sludge. In addition, renovation work/replacements to existing facilities were underway, but existing installation parts (including sludge digestion, pumping) would be retained. Part of the scope was also the operation during the start-up phase of the WWTP.

Figure 8. Water treatment plant in Weert

3.4.1 Case 1 - Concept

In this case, risk pot and a bonus-malus gain-and-pain-sharing concepts were used. The former was chosen because the client and the contractor wished to jointly manage certain risks. There was significant uncertainty surrounding the new innovation, and both parties could contribute to reducing the risk and/or the financial or planning consequences when a risk could occur. In addition, the client wanted the opportunity to influence the project in this area during the development and construction. The client sought an open collaboration based on mutual trust and not a detached contract that would have been thrown over the fence. The risk pot and the entire process afforded the opportunity to increase collaboration. In addition, the client wanted to reward performance in a fair way and to be motivated to keep as much of the pot as possible so that the highest possible quality installation would ultimately be delivered at the best possible price.
Apart from the risk pot, a bonus-malus was used for several elements, especially safety performance and milestones. The parties agreed on the bonus-malus because they wanted to finish the project in a certain period of time and with specific desired behaviour that they wanted to promote by means of a bonus. They

did not use the sharing of new created benefits because they did not create a physical product for sale, which should be in a joint enterprise. A further concept that could have had potential was the target cost mechanism; however, they did not want to share the gains and pains over the whole project, but only for the risk part due to the innovation. They knew what they wanted from the contractor and only wanted to steer the Verdygo part in particular; therefore, a risk pot was a better suite.

The concepts stemmed from a framework agreement. For each framework agreement, three parties were chosen to divide the projects. To steer collaboration, the role of price was fully allocated in the tender, and each party had equal opportunities. Competences were more important for the vision that the client had. When a contractor obtained a project through the framework contract, a Bouwteam was set up with a start-up meeting as a first step. With the preliminary design (VO), the risks were determined by both parties to jointly commence with the risk pot as soon as possible. The Bouwteam then proceeded to the final design (DO). During these steps, constant follow-up meetings were held where the collaborative behaviour of both parties was discussed. In managing the project, the risks were constantly discussed. This was done through meetings where the risk analysis as well as the project and cost management components were the central point of attention.

During the first steps, it was important to list the probability of occurrence and its effect. When the entire list of risks that fell under the risk pot had been inventoried, they were estimated by a Monte Carlo analysis to form the most likely risk amount. Then, it was possible to finalise the risk pot. The gain-and-pain-sharing part in this case was a passive form. In this risk pot, general costs, profit and risk (AKWR) were added. The risk pot was part of the agreed Bouwteam contract price. This meant, for example, 10% general costs and 5% profit, in which case one would normally say that there is 15% storage over the pot. To provide positive incentives, the client decided to pay the 5% profit in advance. If the risk pot remained at its initial amount, it still had a 5% profit, with overrun; only the general costs would have been covered; and the 5% profit could be used for the pains. In this way, the client tried to motivate the employees to keep the pot as full as possible from both sides. If there was still anything left in the pot, it would fall back to the client, because the contractor had their 5% pre-agreed profit.

Other practical factors which were used to work with the risk pot were masterclasses about collaboration, because mutual willingness and understanding should be created. Furthermore, to create a positive mindset, an independent collaboration coach was employed who supervised the teams. Financially, the project was realised in a completely open-book manner to create openness in the project. For this, cost quality and knowledge had to be ensured on both sides. In this case, a condition was that cost expertise should play a major role on both sides, otherwise there could have been a perverse incentive to mislead a party. To tackle a misleading contractor, the principle of a bench was utilised in the framework agreement.

The bonus-malus principle was implemented after the contracting phase through client-agreed KPIs and milestones. The client created a financial picture of what the yield would be with an earlier delivery or better performance to also reward the contractor. In practise, this meant a bonus-malus for earlier or late delivery and a small bonus-malus for performance criteria such as safety. The idea of the small performance bonus-malus was to keep the work tidy. The bonusses and maluses were fixed, meaning that when a milestone or performance was not been achieved, it directly became a penalty.

3.4.2 Case 1 - Conclusion

The gain-and-pain-sharing concepts used in this case were the risk pot and the bonus-malus principle. The following conditions have been identified for the risk pot in the case.

As a basis, a partnering environment makes it possible to work together. In this case, first, selecting a party from a framework contract on the basis of collaboration worked out positively, which meant that there was a willingness to share risks. Second, it worked well that there was now a possibility for the construction team to quickly pick up the risk session to commence with the risk pot, which brought the parties closer together. The effect was visible that, from the client's side, people delved deeper into how the contractor worked and what their earnings model and project goals were. It encouraged employees to keep the pot as full as possible to

create a win-win situation. The risk pot thus stimulated employees to keep the pot as full as possible. Third, an important prerequisite for a risk pot is cost expertise on both sides. In this case, there was a high degree of cost expertise, also with regard to Monte Carlo analysis, such that risks were priced as precisely as possible. In addition to the cost analyses, the cost had to be kept according to the open-book economy principle. It was unusual for both parties at first, but it did result in the openness and trust that the client was looking for.

One of the most important conditions is the agreement regarding gain-and-pain sharing with respect to the distribution key. In this case, a fixed percentage was agreed, so that the allocation key was fairly passive and did not send a complete message to actually share all profits and losses. Confidence is currently not high enough for large contract sums. In addition, the mechanism was drawn up in accordance with UAV-GC, which sometimes made it difficult to maintain collaboration during implementation. This could be improved by using an alliance or NEC contract. In terms of support by independent coaching, it had a favourable outcome of bringing the parties together and also resulted in genuine interest in each other's project goals.

With regard to the bonus-malus principle, the most important conditions are the drawing up of the KPIs and the milestones based on the cost of the customer. In this case, the client was clear on which incentives would be offered by means of which bonus and/or malus. The conditions for determining the KPIs were that they should be clear and verifiable. Determining these bonuses and/or maluses before contracting can lead to a perverse incentive; however, since a framework contract was used where price was not controlled, this was prevented, and the bonus-malus principle worked out well. A condition which normally applies to a bonus-malus principle is that the parties should know what the bonus-malus is in advance. Given that this project was awarded based on a framework agreement, the condition was met.

The last important precondition for both a bonus-malus and a risk pot is a well-functioning escalation model at various levels. Different levels have different interests, and there is a different culture behind this.

3.5 Case 2 – Spoorzone delft

Case	Spoorzone Delft
Concept	Risk pot

Table 7. Overview of the case – Spoorzone and concept

The project entailed the construction of two railway tunnels and an (underground) station on behalf of the Ministry of Infrastructure and the Environment (figure 9 and 10). In the spring of 2015, the new railway tunnel, the bus square and the (underground) station in Delft came into use. In preparation for the High-Frequency Rail Transport Program, a second railway tunnel is under construction and will be put into use in 2023. A high-quality future-proof public transport connection has been realised for Delft and the entire region.

The total project was divided into a number of contracts, the largest of which was a design construct contract for the construction of the tunnel, including the associated installations. This also included the layout of the public space and the underground part of the station. In addition, the city office together with the integrated station hall were above ground. This part was just a traditional design assignment for which an architectural competition was held. The last major part of the project was the construction of the railway infrastructure. In this case study, we focus on the railway tunnel component because a risk pot was utilised for this part.

Figure 9. Construction area – Spoorzone Delft

Figure 10. New station

3.5.1 Case 2 - Concept

In this case, a risk pot was used as the gain-and-pain-sharing mechanism because the uncertainty regarding the risks on a technical level was high. This great uncertainty, combined with the fact that the project setting was a densely populated urban environment involving many stakeholders, meant that the client and the contractor would constantly need each other to successfully implement the project. In this case, the risk pot offered the possibility of constantly tackling and managing the problem together. Since the risks were often in the technical field, the risk pot motivated the parties to optimise the design, so that they could also be rewarded (gains). The reason the sharing of new created benefits was not chosen had to do with the fact that no new product had been realised for sale during implementation. Another option could have been the bonus-malus principle; however, while a bonus-malus could have motivated the contractor to improve performance, the uncertainty and mutual dependence were significant in the project, thus making a bonus-malus an inviable solution to tackle the problem unilaterally. Moreover, a target cost may have come closer to addressing the problem on a technical level, optimising the project and rewarding the other party for this, but the risks were too great and more manageable together, which meant that when dividing into a target cost in principle, the target cost amount would have been uncertain and high, thereby leading to a chance that the mechanism would not function.

In practise, this resulted in the Spoorzone Delft railway tunnels project being realised by different contract forms. The parts that were certain were included as part of a D&C contract, whereas for a number of parts, an alliance was formed to realise a risk pot. The project was initiated as a D&C contract, after which a decision was later made to cast a number of parts into an alliance. Afterward, negotiations took place, and through several workshops, an alliance risk pot was reached. All parties – clients, everyone's supporters and stakeholders – were involved in this process to arrive at an ideal solution.

In this case, the risk pot was financially extracted from the agreed budget in the D&C contract for the risk components. This risk pot was fully transparent and organised according to the open-book economy principle.

To share gains and pains over this agreed amount, a share profile with a distribution key was agreed. For under- and overruns in this project, a 50/50 distribution key was set, where both parties would make the same profit or loss. The risks contained in this risk pot had to have a high degree of complexity and the possibility of optimisation; in addition, they had to be manageable by both the client and the contractor.

Another precondition that was utilised to realise a risk pot was the involvement of stakeholders. The idea was to create a cooperative constituency that would support optimisations. To guide this process, an independent alliance manager was appointed to keep the parties in line and track collaboration. The alliance manager ensured coordination with all parties and monitored whether work was done transparently. Dialogues were organised, and settlements of agreements were checked.

3.5.2 Case 2 - Conclusion

The mechanism in this case to share gains and pains was the risk pot. The following conditions have been identified for the risk pot in the case.

The basis was a partnering environment that made it possible to work together. In this case, creating an alliance to make a risk pot possible worked out positively, otherwise risks would not have been managed properly. The risk pot did not lead to cost overruns; the whole project still did, but the overruns would most likely have been much higher if the project had been executed in a D&C contract as a whole. What was striking was that there was much additional work on the interfaces between the alliance components and the other project components. . Communication problems arose, which led to higher costs for the standard parts due to changes in the alliance parts. Collaboration in this area was less successful. To solve this in the future, a possibility could be to put the project in a full alliance to decrease transaction costs. Furthermore, the distribution of the pains and gains were shared completely proportionally, which was a real signal of collaboration. Gain-and-pain sharing resulted in the parties constantly searching for better solutions, regardless of whether the parties were in the pain or gain zone. The contractor and the client were much more involved and motivated to collaborate. The positive side effect was that the risk pot led to a constant need for communication between the parties.

Another important precondition was the process to arrive at a risk pot and its control. The workshops and frequent meetings led by an independent alliance manager were important in this case for a successful result.

The most important condition that has already been mentioned as an important factor of the risk pot is the possibility of optimisation. This condition influences not only the risk pot but also the entire project. Without optimisation, there will be no concerted effort. The risk pot stimulates to incorporate as a client in the project organisation. As a client in the project organisation by stepping into the risk pot the stakeholders will feel acknowledged. The risks that are shared will have to be worked out with sufficient quality. This therefore applies to the designs, planning and budget within the technical field. To conclude, the risk pot in this project made a significant contribution to improving collaboration and joint work on risk management.

3.6 Case 3 – the International Criminal Court (ICC)

Case	ICC
Concept	Target cost

Table 8. Overview of the case – the International Criminal Court (ICC) and concept

The project was the construction of the International Criminal Court (ICC) by Visser & Smit Bouw and Boele & van Eesteren. They signed a contract for the realisation of the ICC's permanent premises in The Hague (the Netherlands, figure 11). The building was designed by the Danish architecture firm Schmidt Hammer Lassen architects. Visser & Smit Bouw and Boele & van Eesteren were then selected to construct the permanent premises for €147 million. In this project, not only was the new building itself unique, but the contract form was also new in the Netherlands.

The Engineer & Construct part is set up under the conditions of an NEC (New Engineering Contract) 3 target contract. NEC3 is, in fact, a system of agreements that you can apply to several types of construction

organisation forms. It comes from England. British public contracts have been managed using this system for about twenty years. The variant chosen for this is comparable to the Dutch UAVgc (Uniform Administrative Conditions for integrated contract forms). Also intended for making agreements within an integrated contract. However, the NEC3 does this in a different way. The premise of NEC3 is clarity and emphasises trust and collaboration. Which is supported by the sharing mechanism, with which savings are shared. The gain-and-pain sharing is according the target cost principle.

Figure 11. The International Criminal Court (ICC)

3.6.1 Case 3 - Concept

In this case, a target cost principle was used as the gain-and-pain-sharing mechanism, accomplished through the use of an NEC contract. The reason the target cost principle was chosen is because there was a high degree of scope, cost and risk certainty, but the client wanted to motivate the contractor to further optimise the design for the highest possible quality at a competitive price. The project was of a sufficient size to actually be able to make optimisations. Using the target cost principle enabled the opportunity to jointly optimise the design and reward the other party for this. In this project, there was still a suitable design assignment in which optimisations could be implemented. Due to the optimisation reason, the bonus-malus and sharing of new created benefits concepts were not applicable. Moreover, potential optimisation by means of a risk pot would have been possible, but there was such a high degree of certainty of the risks that they could be evenly distributed within the target cost. The focus was therefore more on optimising the design and management of the project cost than on the management of specific risks.

In practise, this resulted in a gain-sharing concept with a graduated scale, meaning that in this project, the client gaped the pains. The full pains were completely for the contractor – the graduated gain for the first part was larger and decreased if the contractor saved more money, meaning that the gain would decrease and the allocation key would change. This had to do with the fact that the contractor would otherwise look too far for cutbacks instead of quality optimisations. Clear agreements were made in advance as to who would bear which risks. therefore, no risk pot was created; instead, everything was included in the target cost with an unforeseen item that was independent of the scope changes.

To determine the target cost, the following steps were followed in this case. A project budget was designed by a chosen designer around this budget. The architect made a preliminary design, after which tendering began and was awarded for a final design. Within the tender, an NEC3 advisor was brought in to shape the contract. In advance, both parties entered contract data on both sides regarding where risks should lie. Then, together, they agreed on the ceiling amount for the target costs. The target costs became the final contract price. In this system, the client ultimately pays all costs.

One of the principles of the NEC3 is that the client ensures that the contractor does not have a negative cash flow. They pay in advance (read: there is a bank guarantee). The client's project manager determines what can be invoiced, looking at the progress of the work and 4 weeks in advance, and then records this in a payment certificate. The contractor may invoice this amount and receives the money when the product is made. To arrive at the most realistic target cost amount, a decision was made not to include a target in the tender. In this case, there was a high degree of cost expertise because target cost is a financial principle as a starting point for collaboration. Aside from the cost analyses, the cost must be kept according to the open-book economy principle.

In this process, the client and the contractor held constant risk sessions for the entire project to be coordinated to keep the actual costs as low as possible. Another factor was the opportunity sessions, which were held to determine which options were still left in the design or implementation. The contractor was challenged to devise proposals to spend less money and increase the quality.

3.6.2 Case 3 - Conclusion

The target cost principle was the mechanism by which to share gains and pains in this case study. The following conditions have been identified for the target cost in the case.

A few basic, important preconditions are applicable when using a target cost mechanism, such as ensuring that the project is of a sufficient size to manage the risks together and allowing 'extra' administrative actions to be paid. The client should be willing to make concessions, so as to enter into discussions about both risks and opportunities (best value for money) in which, based on trust, efforts are made to collaborate, and this trust can be expressed, followed up and somewhat recorded (client's commitment to collaboration). There should be a suitable design assignment in which optimisations can still be implemented. Furthermore, there must be sufficient scope certainty to be able to price the project in parts and to draw up a solid target cost. Without scope certainty, the target cost will be high due to unforeseen circumstances.

The contractual conditions used in the partnering contract, such as the NEC3, worked out well. The entire NEC is aimed at working together and was therefore a conscious choice for this. The NEC3 emphasises trust and collaboration, which is supported by the gain-and-pain-sharing mechanism by which savings are shared in this project.

A condition for the functioning of the mechanism is that the stimulus one wants to give is linked to the project goals. In this case, it worked well by including a graduated scale for the gains as a share profile. This resulted in an optimisation and no cutbacks; however, no allocation key was agreed for the pains, and the client hence did not fully cooperate to achieve the highest quality. In the future, a fair distribution would be desirable here. While doing this as a client means losing some grip on finances, it sends a better signal that, as partners, both parties are involved. Costs must then be assessed and controlled well. Cost expertise is a key condition for the success of this mechanism in combination with risk and optimisation sessions where cost control is central. What worked out in this case was that the client was responsible for the forecast based on an open-book economy and constantly discussed it with the contractor. In this way, the client remained involved with a high level of project knowledge. Moreover, because no target price was included in the tender in this project, but the contractor was allowed to quote a price based on the design provided by the client, a fair price was given. The client was chosen on the basis of collaboration and optimisations. To conclude, the target cost principle in this project led to an intensive collaboration aimed at joint control of costs, in which the contractor could realise extra profits through innovations.

3.7 Case 4 – Port of Rotterdam Authority

Case	Calandkanaal Port of Rotterdam Authority
Concept	Bonus-malus

Table 9. Overview of the case – Calandkanaal and concept

This project involved the construction of three new berths in the Calandkanaal (figure 12), suitable for the transshipment of goods from one seagoing vessel to another without having to be moored at quays or jetties and without the oil or other bulk products having to be taken into intermediate storage on land and then transferred again into larger or smaller vessels for further distribution. In the old situation, the berths were equipped with anchor posts and mooring buoys. The major disadvantage of this method of mooring is that the moored ships move back and forth in the busy Caland Canal as a result of current, wind strength and wind direction at the berth. In addition, the chance of breaking loose in strong winds is greater than with fixed mooring facilities such as the currently used dolphins and truss posts. To make the berths suitable for these ships, dredging was carried out on both the slope and the existing bed. The water depth is now more than 24 meters at low tide, sufficient for safe loading, after which the largest ships can sail to sea at high tide.

Figure 12. Berths, Calandkanaal

3.7.1 Case 4 - Concept

The project was tendered as a D&C contract with a bonus-malus principle as the gain-and-pain-sharing mechanism. A bonus-malus was chosen in this project because has to do with the fact that client wanted to motivate the contractor to deliver the berths on time and possibly even faster, since this would generate significant income for the Port of Rotterdam Authority. As a result, the Authority was prepared to issue a significant bonus. In addition, the Authority wanted a) to avoid late delivery in connection with the storm season in which construction was not allowed and b) to steer on best behaviour by means of bonuses linked to performance. A sharing of new created benefits was not chosen because the port authority will operate the berths itself. Moreover, a project- and/or risk-driven gain-and-pain-sharing mechanism, such as a target cost or risk pot, was not chosen because the Port of Rotterdam Authority itself has a great deal of in-house knowledge of such projects. It was hence able to determine the scope and the associated requirements, so that there were few uncertainties that both parties should or could share.

In practise, this meant a pre-defined bonus-malus in the D&C contract for milestones and KPIs.
The bonus-malus is determined on the basis of a financial picture, which in turn is based on possible gains and losses in case of deviating performance and delivery. As mentioned, a substantial bonus was used to motivate the contractor to work harder and to realise a high profit for themselves and the port of Rotterdam authority.

The bonuses on the milestone were drawn up in a decreasing way; that is, non-achievement of a milestone would not immediately become a fine, and the contractor would remain motivated to still earn the second bonus. In addition to a large bonus for milestones, small bonuses were offered based on KPIs to keep the work tidy – literally and figuratively protecting the contractor from making a mess. The KPIs with a bonus-malus schedule were predetermined and communicated publicly via the tender, so that the contractor could anticipate them during the tender.

3.7.2 Case 4 - Conclusion

In this case, the mechanism by which to share gains and pains was the bonus-malus principle. The following conditions have been identified for the bonus-malus in the case.

According to the procurement law, a condition is that a bonus-malus must be known to the parties in advance. On the one hand, if it is not communicated in advance, the parties could appeal that it is not valid. On the other hand, the disadvantage of a previously known bonus-malus is that a contractor can pre-calculate the bonus in their contract price. When pre-calculated bonuses are not achieved, the bonus becomes a penalty with negative possible consequences for the collaboration. In this project, the bonus worked out well, but one must be vigilant against any perverse stimulus. This perverse incentive could be tackled by agreeing the bonus-malus after the contract has been awarded. This would mean that certain facets of the project would have to be put into a bouwteam or alliance to be able to determine the bonus-malus after further consideration.

The second precondition is that a bonus must be of a certain size to provide extra motivation for a contractor. The financial picture is important here (i.e. what the bonus or malus can deliver to both parties). Since the port authority had a clear financial picture in mind here and was open about it, there was understanding and mutual extra motivation. In addition, when the first milestone was not reached, reducing the bonus and not immediately turning it into a fine worked out well. This sent a positive message to the contractor. However, this decision depends on the financial capacity of the client and the space available for it. This is also in line with the fact that it is highly important to consider which stimulus one wants to give to a contractor to achieve project goals. For the bonus-malus according to the KPIs, a precondition was that these KPIs were concrete requirements (i.e. verifiable and demonstrable).

The last important precondition for a successful bonus-malus concept is a well-functioning escalation model at various levels. Different levels have different interests, and there is a different culture behind this. Optimal escalation is important in collaboration concepts such as a bonus-malus. An escalation model is purely at the contract manager level, where more or less work discusses the risks. If an agreement is not reached at a certain point, then decision-making moves to a higher level for a different perspective/context. Such models often work to look at the project's importance and the spirit of the contract. Higher levels have other powers and mandates. This is necessary for the success and continuity of a project and, above all, is managed by the pains. In conclusion, the bonus-malus principle in this project led to a desired commitment from the contractor, focusing on milestones and performance that resulted in a win-win situation for both parties.

3.8 Case 5 – Harnaschpolder and Houtrust Delfluent

Case	Wastewater treatment plants (WWTPs) Harnaschpolder & Houtrust
Concept	Sharing of new created benefits

Table 10. Overview of the case – waste water treatment plant (WWTP) and concept

This project was about the expansion of two WWTPs to produce biogas. In 2000, the Houtrust treatment plant became outdated and was no longer able to adequately treat the wastewater flow from households and companies in The Hague. The WWTP was unable to meet the stricter European requirements, which was a sufficient reason to thoroughly overhaul it after the completion of the new WWTP, Harnaschpolder (figure 13). In 2007 and 2008, AWZI Houtrust was therefore radically renovated. This combined with the fact that Delfland has the ambition to be energy neutral by 2025 and wants to supply green energy to third parties, the production of green gas on the Harnaschpolder and Houtrust WWTPs was initiated. Bright Biomethane has previously realised a green gas installation for Delfland through which its green gas systems make an important contribution to the sustainability of the transport sector and the energy transition in the Netherlands. Delfland and Delfluent have entered into a Public Private Partnership (PPP) together. The PPP started a DBFO contract for both WWTPs. There was no gain-and-pain-sharing mechanism within the project, and it was purely based on collaboration. To introduce a biogas installation to the WWTPs, a joint enterprise was created.

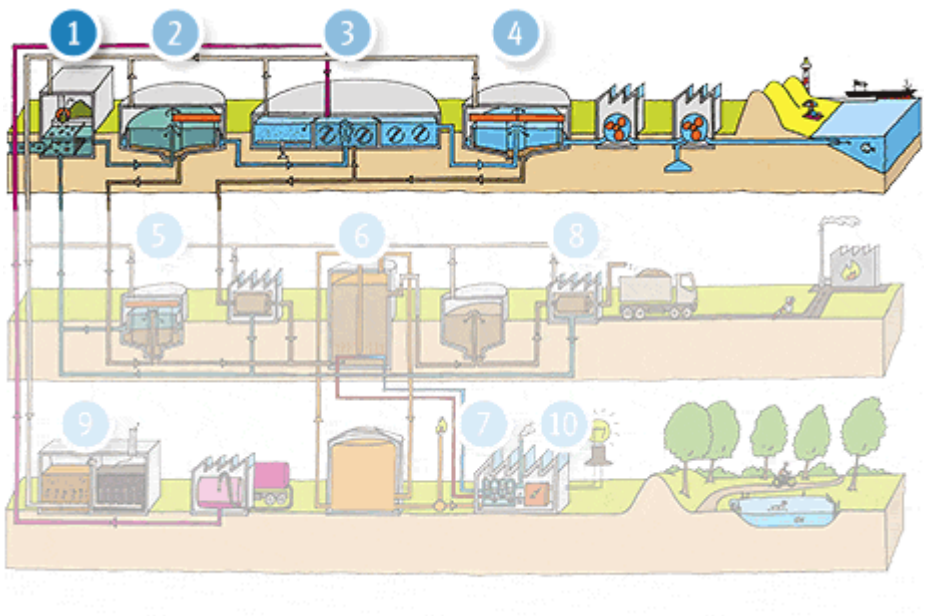

Figure 13. Wastewater treatment plant – Harnaschpolder

3.8.1 Case 5 - Concept

In these projects, the sharing of new created benefits principle was used to create a gain-and-pain-sharing mechanism. It was chosen because of the lucrative production of biogas for both parties and because Delfland wanted to offer Delfluent a performance incentive not only to optimise the production but also to realise mutual goals. If Delfland itself were to make all of the investments, then it would also have taken all the profit and there would have been no incentive for Delfluent to optimise the production of biogas. A bonus or performance incentive has not yet been given because this would be a static bonus and would not align with the current PPP. By means of a joint enterprise and the sharing of new created benefits, an active incentive was established that the parties could benefit from. From this point of view, there was also no reason to allocate the risks or costs by means of a target cost or risk pot principle. The business case was clear, and risks were evenly distributed.

In practise, this meant the co-financing of a sub-project with joint proceeds. In this case, Delfland would bear 75% of the investment costs, and Delfluent, 25%. The distribution of profits was also done according to a share profile with a 75:25 ratio based on the investment percentages. To share the profits, a completely transparent, open-book profit-and-loss account was established where both parties contributed. Both operating costs were charged against Delfland's sales proceeds and divided according to the agreed distribution.

To implement the joint enterprise through the sharing of new created benefits, the parties used the option in the DBFO contract for changes in current operations – a change in activity was only allowed when this resulted in a cost reduction. Due to the procedural change of conditions, it was possible to legally change the conditions for revenues as well. To start this procedure, the parties opted for a positive business case as a starting point for collaboration through the sharing of benefits due to biogas. To operate together in this joint enterprise, a separate BV was established.

3.8.2 Case 5 - Conclusion

To share gains and pains in this case, the sharing of new created benefits principle was employed. The following conditions have been identified for the sharing of new created benefits in this case.

A first basic condition for the sharing of new created benefits is that a product must be created for sale. In combination with a positive business case, it can then be initiated to share gains and pains according to the sharing of new created benefits principle. In addition to the basic condition of possibility to sell a new created product, a certain level of collaboration is needed. This is not a difficult pre-condition to meet, but it is helpful because the parties already have a certain level of collaboration. Since the parties in this project were already operating in a PPP, certain change procedures were needed to make the concept happen. Without these change procedures, a sharing of new created benefits would not have been possible. Another pre-condition is that both parties must have shared mutual objectives. In this project, both parties had sustainability goals, which brought the parties together to collaborate in the sharing of new created benefits with a sustainable purpose. It is important to keep in mind that the choice of party one works with can therefore determine the possibility of using the mechanism. Furthermore, there is also a precondition that the client must be open to the fact that the contractor may make a profit. Delfland's attitude in this regard made it possible to get the sharing of new created benefits off the ground.

A condition for sharing of the gains or pains is the open-book economy with a share profile. Both parties must have insight into the situation to collaborate. To further cover the risks, in addition to a clear procedure, a separate BV is advisable; the project is then separated from the other business activities if it fails. To conclude, the sharing of new created benefits principle in this project led to a lucrative and intensive collaboration through the production of biogas that has led to the achievement of the sustainability goals.

4

CROSS-CASE ANALYSIS

In this chapter, a cross-case analysis is carried out based on the results of the cases presented in the previous chapter. The goal is to compare the practical knowledge from the cases with the theoretical knowledge from the earlier mentioned literature to design a guideline or roadmap for using a gain-and-pain-sharing mechanism. This means that the cases are compared with one another in terms of similarities and differences, which are then compared with what is written in the literature in order to draw conclusions for making a roadmap.

In this cross-case analysis, two separate cross-case analyses are performed because the risk pot and the bonus-malus are separate concepts. Due to the previously stated fact that no cross-case is possible for the concepts of a target cost and the sharing of new created benefits, an extensive literature study was performed in Chapter 2 to sketch as complete a picture as possible of the concepts to be incorporated into the roadmap.

4.1 Cross-case risk pot

The similarities and differences between the cases with the risk pot principle are listed in Table 11. In this section, they are compared with what the literature prescribes.

Case Spoorzone Delft	***Case Maasvallei***
From D&C to alliance	From framework agreement to Bouwteam (according UAV-GC)
Focused on technical risk	Focused on innovation risk
Start-up and follow-up meetings	Start-up and follow-up meetings
Independent alliance manager	Independent bouwteam advisor
Risk pot part of the contract price	Risk pot part of the contract price
50/50 share profile for gains and pains	Fixed amount paid in advance for gains and pains
Open-book economy	Open-book economy
Monte Carlo cost analysis	Monte Carlo cost analysis

Table 11. Similarities and differences between cases – risk pot

The cases indicate that the partnering environment is the starting point for the gain-and-pain-sharing mechanism, as shown in the literature. In both cases, a partnering environment was created. In the Spoorzone Delft case, after the awarding of the project, the parties discovered that a D&C contract was not sufficient to control certain risks, and a decision was made to cast part of the contract into an alliance. In the Maasvallei case, a partner could be chosen for a construction team directly from a framework contract. In both cases, a partnering environment was chosen, but with a different initial intention to ultimately realise joint risk management. In the railway zone delft case, the approach was to control the technical risks that arose from the design and the many environmental factors, whereas in Maasvallei, the risks that arose from the innovation needed to be controlled. The structure and process of a risk pot has hardly been mentioned in the literature.

The cases demonstrate that the development of the risk pot therefore starts from the project objectives, project specifications and desired collaboration, which lead to a choice of partnering, after which the specific incentive that the client wants to give in response to the contractor objectives is examined to create mutual goals. Both cases subsequently highlight the importance of meetings in which planning, costs and risk management are constantly discussed to form and then manage the risk pot jointly. In this process, an independent party or

person is chosen who brings the client and the contractor together during the process and who will look at the risk pot objectively. Where both cases also correspond, but not with the purest form of the risk pot, is the financing of the pot. From the literature, the purest form of financing a risk pot is a pot that money is physically put into by both parties and then controlled together.

In both cases, a middle ground was chosen where the risk pot held a more symbolic value of the contract price. This has to do with the fact that in both cases, the parties found it scary that someone else could physically spend their money. For 100% trust, the purest form from the literature would suffice, but in practice, both parties were not yet set up for this and feared the rules surrounding it. A solution to this that was already applied in both cases is payment by means of an open-book economy, whereby the direct costs, indirect costs and/or profit are paid on the basis of an open-book administration. The open-book economy makes it possible to control project and risk costs together. Without it, a risk pot where no physical money is invested by both parties is of no use.

To calculate the costs for the risk pool, the literature speaks of a certain cost expertise that is required by both parties. In the cases, this was shaped by hiring cost experts and arriving at the amount according to a Monte Carlo analysis. The key difference between the cases is in the actual distribution of the gains and pains. In the railway zone, the profits and losses were divided according to a proportional 50/50 share profile, meaning that the profits and both the differences were borne equally by the client and the contractor. In the Maasvallei case, the choice was made for a pre-paid profit margin on the risk pot that the contractor had as a gain if the risk pot was not exceeded. If it was exceeded, this pre-awarded gain could then be used to compensate for the losses. This motivated the contractor to manage the risk pot as well as possible. If the amount was undershot, the money would be returned to the client, who had already paid the gain to the contractor. In addition, it was not an active risk pot that included money, and the client would pay the costs according to the open-book principle. The second method is a more passive form, in which security for the client and the contractor is built in. The literature mentions many different options for a share profile. It can be concluded that the main consideration that must be made here is which incentive the client wishes to give to the contractor. In the cases, it is evident that the client in Spoorzone Delft wanted to manage the technical risks as well as possible, and the better this was done, the more all parties would be rewarded. In Maasvallei, the focus was on innovation risks and they wanted the highest possible quality, so that parties did not want to over-optimise and the quality would turn out lower. The money was allowed to be spent to such an extent to achieve the highest possible quality at a competitive price, which is why a fixed profit percentage was chosen for the contractor.

4.2 Cross-case bonus-malus

The similarities and differences between the cases with the bonus-malus principle are listed in Table 12. In this section, they are compared with what the literature prescribes.

Case Calandkanaal	***Case Maasvallei***
Bonus-malus agreed before contracting	Bonus-malus agreed after contracting
Focused on milestones and performance	Focused on milestones and performance
Based on financial picture	Based on financial picture
Graduated scale for bonus-malus	Fixed bonus-malus
Substantial bonus-malus	Small bonus-malus
Bonus-malus set on (or in accordance with) the requirement.	Bonus-malus set on (or in accordance with) the requirement.
Escalation model	Escalation model

Table 12. Similarities and differences between cases – bonus-malus

In connection with the Procurement Act, a tendering party must be aware of all conditions and requirements, including the use of a bonus-malus. However, when a bonus is made in advance, it can provide a perverse incentive where the bonus is included in the contract price and subsequently becomes a direct penalty if not achieved. In the Calandkanaal case, the approach was to select a contractor on the basis of quality first, and to

a lesser extent on price, in order to tackle this perverse incentive. In addition, the port company has much in-house knowledge to know approximately what the project would cost. To counter this possible perverse incentive, in the Maasvallei case, the construction team was formed after contracting from the framework contract. As a result, certain agreements could be concluded by both parties in consultation after contracting with regard to a bonus-malus. This is unusual, but presents an opportunity to make a bonus a true bonus. However, a disadvantage is that it is now more difficult to pass a malus scheme.

What is reflected in the cases, and which also emerged explicitly from the literature, is that the financial picture that must be formed on the basis of which incentive one wants to give to the client, is of great importance for the operation of a bonus-malus mechanism. By means of the three communicating vessels – quality, costs and time – management was done in both cases. Both clients examined whether the bonus-malus provided the right incentive for the right amount. In the case of Calandkanaal, this was a substantial amount in connection with the completion of the berth. The size of the bonus related to financial capacity. In the case of client Calandkanaal this capacity was larger than client of Maasvallei. This will have to be taken into account when drawing the financial picture. Since this bonus was of a substantial size and the client did not want to focus solely on it, a decision was made to turn this into a descending bonus and not directly into a fine. This way, the contractor retained a high chance of earning that bonus. In addition, according to the literature, it is important that the vessel quality and costs are also included. In the Maasvallei case, a financial picture was also drawn up by means of the three communicating vessels based on the possibilities and desired incentive.

In the case of Case Maasvallei, a financial picture was also drawn up by means of the three communicating vessels based on the financial possibilities and the desired incentive. In this case, the client wanted to agree on some strict bonuses and maluses with regard to quality, safety and time to achieve the highest possible quality. This meant several small bonuses and maluses that immediately became fines if a milestone or performance was not achieved. Something that is not reflected in the literature, but that is reflected in the cases, is the term 'escalation model'. When bonuses are not achieved or maluses are imposed, the parties can rely on the fact that this was caused by certain circumstances beyond their control. Hence, it is important to establish an escalation model when this happens. Different levels have different interests within a company, and there is a different culture behind this. An escalation model is purely at a contract manager level who discuss more or less work and the risks. If an agreement is not reached at a certain point with the contracts, then the decision moves to a higher management level for a different perspective or context, since higher layers have other powers that can possibly solve the problem.

To strengthen the research and answer the research question, a roadmap is designed in Chapter 5 to provide insight into the steps and possibilities of the gain-and-pain-sharing mechanism. The explanation of the construction of the roadmap is also described in that chapter.

5

ROADMAP

The objective of this research is to build a roadmap of the gain-and-pain-sharing mechanism as a starting point for conversation about the possibilities to incentivise collaboration and create mutual objectives. It is designed to generate a strategy for the client to use in the first phases of a project or in the implementation phase after contracting. The roadmap is about when, how and what to implement as a gain-and-pain-sharing mechanism and offers answers to the following sub-questions:

- *Which conditions are important for successful implementation of the gain-and-pain-sharing mechanism to incentivise collaboration in a construction project?*
- *What steps must be taken during the contracting phase to choose and implement a gain-and-pain-sharing mechanism?*

In Section 5.1 the methodology to design the roadmap is explained.

5.1 Roadmap methodology

As already mentioned, the roadmap was designed as a kick-starter for investigation of the possibilities for a gain-and-pain-sharing mechanism in a project. The explorative character of this study is reflected in the absence of a sufficient theoretical framework and in a broad rather than an in-depth focus. This is also reflected in the roadmap, where the generic steps should give direction to the thinking steps and possibilities of the gain-and-pain-sharing mechanism.

The steps in the roadmap stem from the cross-case study, case analysis and extensive literature review. Since no cross-case analyses could be performed for the concepts of a target cost and the sharing of new created benefits, we used the analyses from the cases supplemented with literature. For the risk pot and bonus-malus steps, a cross-case study can be used, which is already challenged in the current literature. To be able to answer the sub-question with the roadmap, the steps in the roadmap are shown on the basis of what can be done and when it can be done. An explanation of the construction of the roadmap is presented in Section 5.2, and a substantive explanation of the steps in the roadmap can be found in Appendix N.

5.2 Roadmap construction

The roadmap starts at a higher abstraction level of choice / thinking steps that the client must take to choose from the identified gain-and-pain-sharing concepts. To arrive at this choice, the conditions that apply to the implementation of the concepts are also described. This chapter provides a step-by-step explanation of the roadmap and why it was made the way it has been made. The first steps are illustrated in Figure 14.

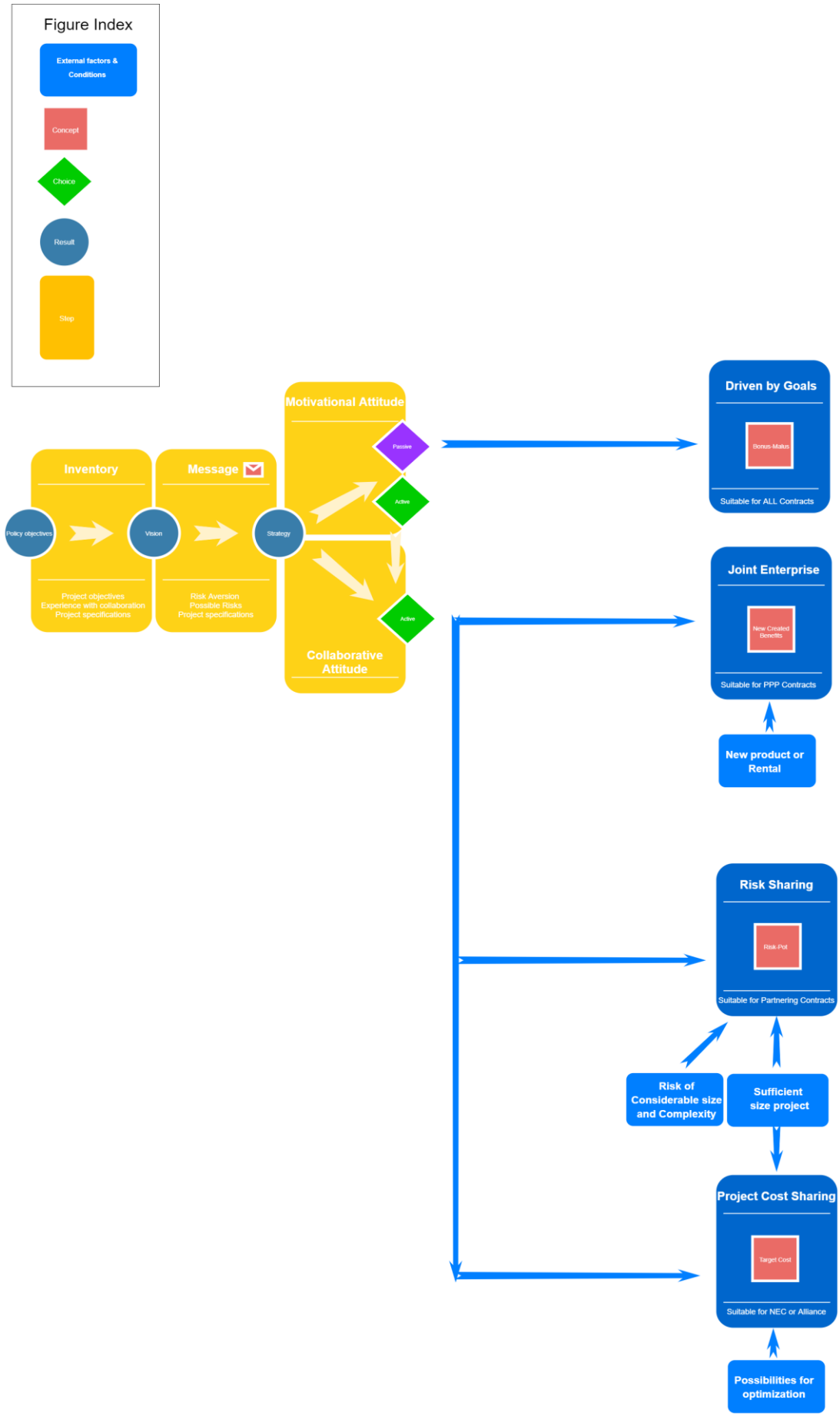

Figure 14. First steps for choosing a concept

Inventory

Before a choice can be made regarding which concept(s) are suitable for a particular project, the client must make an inventory of its own policy objectives. The literature and the cases have demonstrated that implementing gain-and-pain sharing and achieving common goals requires a certain degree of partnering. Clients haves the first choice to decide what they think they need in terms of collaboration to successfully complete the project. In conjunction with the project objectives, project specifications and experience with certain forms of collaboration, the vision is then formed on how to market the project. According to the cases and literature, this is the first step (i.e. the client creating a vision before a choice was made for a particular gain-and-pain-sharing concept). When a client opts for a detached traditional division of roles, the concepts that require a partnering environment with a collaborative attitude will not be possible.

Message

The vision is where the client considers how basic collaboration should take place. The next step that clients took in the cases was to translate the vision into a strategy based on the project specifications, the degree of scope certainty and the ability to control this. All these factors together creates a picture of the project and forms the direction in which the client is going. The reason this should be done is to identify where problems and opportunities lie that can be worked on together. In the cases, it was mentioned that risk aversion now determines the choice of which concept to follow. This refers to whether the client is willing to share risks, which can result in pains or gains. The next step must therefore deal with the final hurdle regarding the correct setting needed to implement a gain-and-pain-sharing mechanism.

Motivational/collaborative attitude

The next step is more of a condition that the client must meet to choose a particular mechanism. The cases indicated that the client must conform to a partnering environment, which requires a certain amount of effort from the client. If the client wants to be further removed from the project but still wants to motivate the contractor, then the option exists to apply a bonus-malus concept. A bonus-malus is also applicable to all contract forms and can be used as an extra gain-and-pain-sharing concept in addition to another method. Furthermore, to apply a risk pot, a target cost or the sharing of new created benefits, a partnering environment is needed in which the client will actively participate with the contractor.

Bonus-malus

The choice of a bonus-malus mechanism depends on the strategy and collaborative attitude identified by the client in the previous steps. The literature and cases have demonstrated the concept's suitability if the client wants to achieve certain project goals with regard to milestones and/or performance and wants to take a role from the sidelines; in this case, a bonus-malus concept is a means to achieve a win-win situation for both

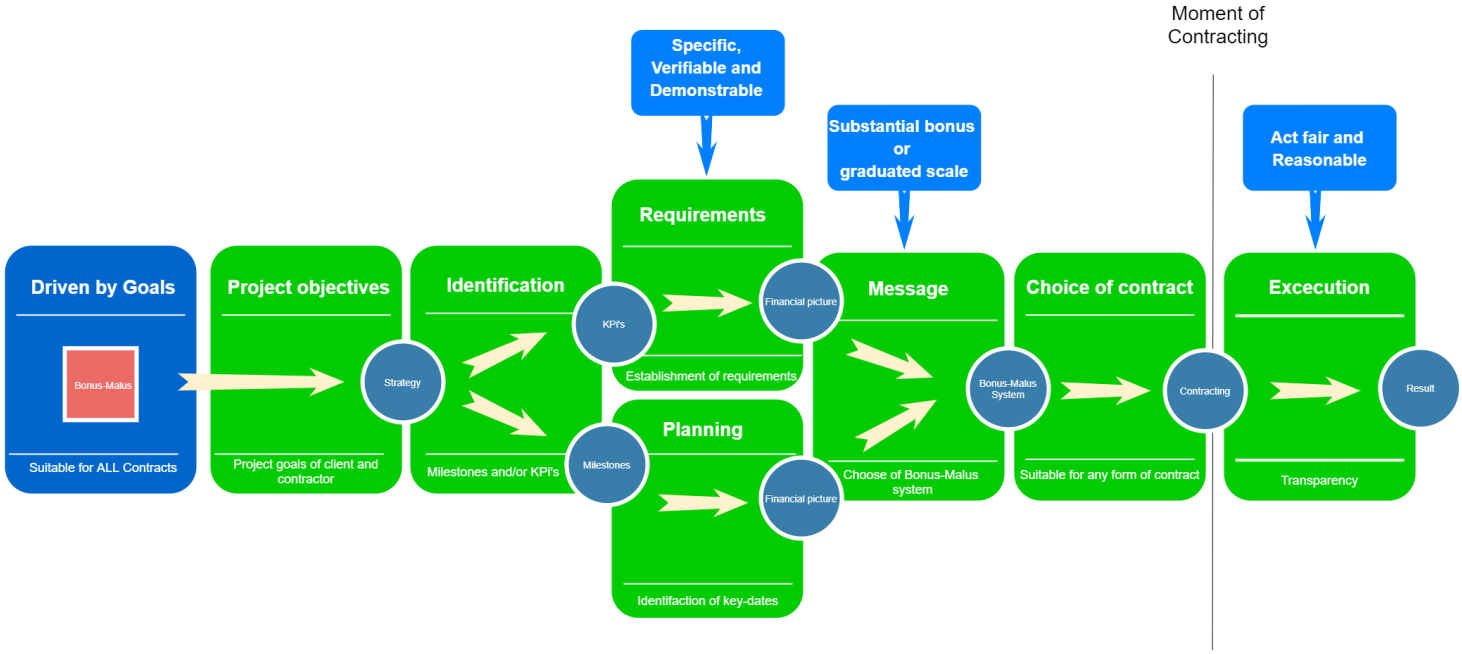

Figure 15. Bonus-malus steps

parties. The bonus-malus principle is suitable for every contract form and must be made known to the market before contracting.

Project objectives
Certain achievements or milestones from the previous steps have emerged as important goals that must be achieved, and it has become clear from the cases that these, in the first step of the bonus-malus concept, can be compared with the possible project objectives of the contractor. When connecting each other's objectives, a common good arises from which a win-win situation can result. This forms the strategy for the bonus-malus.

Identification (requirements and/or planning)
To continue the strategy, the identification step is necessary. The cross-case analysis revealed that aligning the requirements and planning with the strategy is essential for achieving the right goals. A mismatch here is counterproductive due to an incorrect stimulus. By aligning the requirements with the performance and planning of milestones, the picture can be translated to a bonus-malus in the next step.

Message
By aligning the requirements with the performance and the planning of milestones, the picture can be financialised in the next step. The cross-case analysis and the literature have shown that this is where the crux lies with regard to the incentive that the client wants to give to the contractor. First, it must yield something for the client and in return, reward the contractor considerably to steer and motivate them here. Second, the way in which the client steers is important for the functioning of the mechanism (i.e. is it based on bonuses or maluses, and is it a graduated scale; for example, is it used to allow the contractor to make choices?). The financial picture must match the aforementioned objectives that the client wants to achieve.

Choice of contract
The purpose of this step is to indicate that the bonus-malus principle is suitable for all contract types. According to the procurement law, the bonus-malus must be communicated to the market parties at the time of contracting. According to the literature, this is the usual way to implement a bonus-malus concept. However, to remove the perverse incentive that bonuses are included in the contract price, the cases previously contracted by joining the construction team and then going through process steps of the concept. Therefore, the choice of contract can determine the moment of contracting.

Execution
The last step involves executing the mechanism, and it is specifically mentioned because the cross-case analysis revealed that transparency about progress and a certain attitude (act of fairness and reasonableness) can still make or break the mechanism in the implementation phase. If bonuses are not achieved, the parties responsible for this non-achievement can be pointed out. An ideal escalation model can offer a solution.

New created benefits
The choice to adopt the concept of sharing new created benefits depends on the strategy in the earlier steps regarding the joint marketing of a product. The intention must be to jointly exploit a product; this is called a joint enterprise. This mechanism is currently used when an additional product, which can be lucrative to sell, is produced outside of the core business. When the client and the contractor jointly market the product, a long-term cooperation benefit and a PPP are recommended when implementing this concept. According to the literature, it is also possible to rent out temporary locations that are empty. This principle could also be applied to a core activity, but this has not yet been applied in practice.

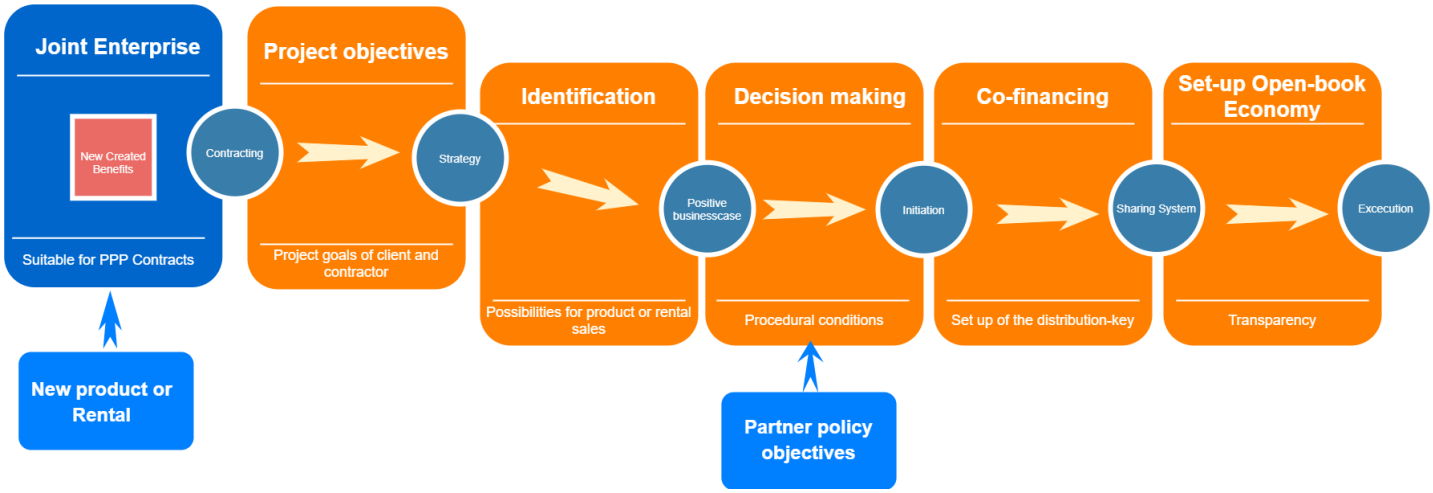

Figure 16. Steps – new created benefits

Project objectives

This concept is chosen when the production and sale of the product contributes to the achievement of the project objectives and even to a higher degree the company objectives. In this step, the previously formed strategy is compared to the project objectives of the contractor to determine whether a common good exists. The case studies have shown that there must be a clear agreement here if both parties are to invest in the joint enterprise; this first step is hence important for creating an inventory of the possibilities. Furthermore, it is possible to apply this mechanism at any time in PPP, and there is therefore no hard moment for when this has to be coordinated between the parties, provided that the contractual procedure offers the possibility to change the scope of the activities.

Identification

The identification step means developing a business case based on the strategy to start a joint enterprise. This step could be taken up by both parties to devise a positive business case for a product or rental and to enter the decision-making process.

Decision making

The decision process can be started from the business case. Here, the aforementioned contractual procedures must offer the possibility to change the scope of operational activities. From a higher management level, both parties will have to agree to apply the concept. Here again, the policy objectives of the partners come into effect, playing a role in whether the sharing of new created benefits contributes to the achievement of these goals.

Co-financing

Once the first decision is taken to proceed with the business case, co-financing will follow. The case studies have shown that this is an important step in which the agreements regarding gain-and-pain sharing are realised. The allocation key is adjusted on the basis of the investment allocation, and this results in the distribution system of the gains and pains.

Set-up of an open-book economy

Setting up an open-book economy is the last step in the process to make the concept feasible and to be able to share the profits and losses. An open-book economy makes it possible to jointly manage the joint enterprise completely transparently. The case studies have shown that an open profit-and-loss account is sufficient for gains and pains to be shared between the parties.

Risk pot and target cost

The choice between these two concepts depends on the strategy identified in the client's previous steps. When there is more demand for risk management because of uncertainty due to the aforementioned factors in the scope, a risk pot principle is appropriate. The conditions for this are that the risks must be of considerable size and complexity. In contrast, when the strategy indicates that there is a demand for optimisation with a degree of certainty in the scope, a target cost principle is appropriate. The literature and cases have demonstrated that for these concepts, projects must be of a certain size in connection with the additional implementation costs of the concepts. It will be necessary to consider whether this is worthwhile. To implement these concepts, partnering contract forms are required. For a risk pot, this means a Bouwteam or an alliance, and for a target cost, an alliance or NEC is suitable.

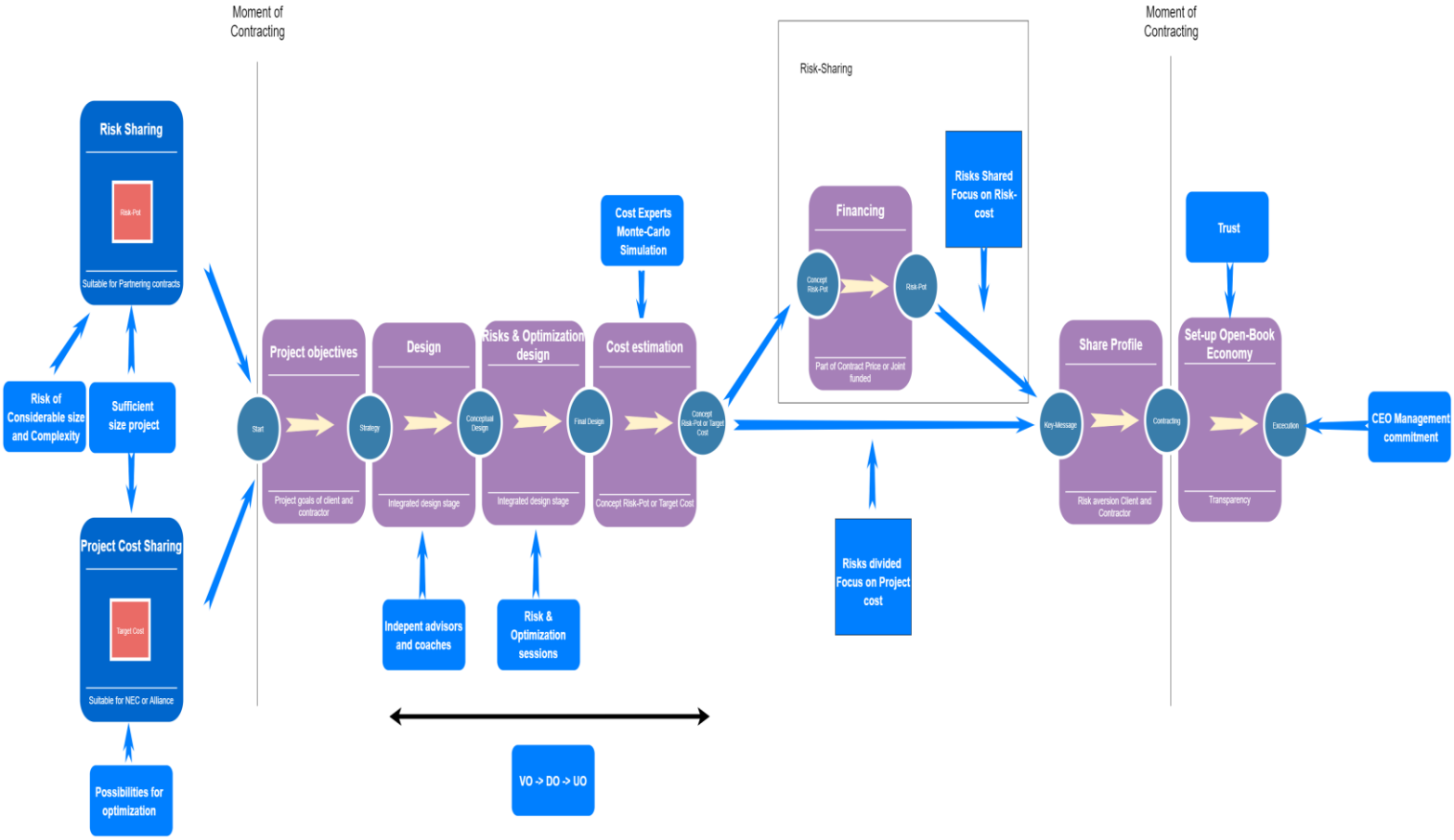

Figure 17. Steps – risk pot and target cost

Project objectives

After the client selects the strategy in the previous steps to develop the project in a partnering environment, the first step after contracting is to clearly put this strategy on the table to create joint objectives. The case studies have shown that considering both the client's and the contractor's ambitions and objectives leads to a joint strategy that can be further developed into a concrete implementation plan with a gain-and-pain-sharing mechanism. The joint strategy will be the starting point for going through the various design phases and working towards the implementation of a risk pot and/or target cost concept.

Design / risk and optimisation design / cost estimation

The next step is taken in the spirit of a partnering environment where the risks and room for optimisation are further identified on the basis of the strategy and design. The risk and optimisation design and the cost estimation are sub-steps of the design step and are performed synchronously per design phase. These sub-steps are repeated from the primary design phase up to and including the possible execution design phase. During these phases, the literature and cases have demonstrated that it is helpful to have independent advisers

and coaches with regard to collaboration and assessment of the documents in relation to gain-and-pain sharing. In the case of a target cost contract, it is possible that a design has already been contracted with a target amount as a starting point for later design phases and cost estimation. The same steps according to the roadmap will be followed.

The risk and optimisation sessions are used to identify the areas of shared common ground and therefore where gain-and-pain sharing could or could not be applied. The step that follows the design phases is a cost estimation to provide financial insight into the costs of the project and the risks. The cases have shown that cost expertise is of great importance for both parties to be able to calculate the correct amount for sharing gains and pains. In the case of unrealistic amounts, the mechanism can deliver the wrong incentives, which would result in a lose-lose situation for both parties from the beginning. After the cost estimation, the concepts of the risk pot and target cost are established.

Financing (risk pot)
Financing is needed to set up a risk pot. As the name implies, it is a pot and can be filled in different ways. A further substantive explanation of the concept can be found in Appendix N. After the financing of the risk pot has been adjusted, agreements regarding distribution can be made.

Share profile
The last step to complete the concepts is the coordination of how the gains and pains will actually be distributed, called a share profile. The cases and literature have shown that the share profile must be adjusted on the basis of the incentive that the client wants to provide. This incentive will have to be in line with the desired objectives that are jointly shared. An explanation of the various options can be found in Appendix H. This step will always be tailored based on the incentives that match the project objectives.

Set-up of an open-book economy
Setting up an open-book economy is the last step in the process to make the concept feasible and to be able to share the profits and losses. An open-book economy makes it possible to jointly manage the risk cost and project cost. All costs will be put into a shared account, which is transparent, and with an open-book administration, the account can also be managed by both parties. This step is done after contracting for a Bouwteam because it is possible that a new contractor will be assigned. If not, then it is done after the share profile step. For the other contract forms, the step of determining the share profile is also followed to make the gain-and-pain-sharing concepts feasible.

6

EXPERT VALIDATION

In this chapter, the roadmap drawn up in Chapter 5 is validated by experts. The validation offers insight into the validity of the roadmap. When, for instance, the experts agree with the steps of the roadmap, it increases the likelihood that the conclusion is true and ready for testing in practise. This process weakens or strengthens the conclusion if it indicates the functionality of a gain-and-pain-sharing mechanism according to the experts.

6.1 Validation methodology

The validation was based on three semi-structured interviews with experts in the contract management division. The interviewees were not involved in any of the case studies and are independent. The validation protocol is shown in Appendix H. By interviewing these experts from Witteveen+Bos, a wide perspective was used for the validation. These experts work for various clients and set up many different contracts; therefore, this roadmap can be used not only to implement gain-and-pain sharing as a client, but also as an advisory guide by a consultant. A summary of the interviews is included in Appendix I. The expert interviews provided the following results, which are included in this chapter:

- They validate the concept factors, conditions and steps.
- They validate the potential of the concepts.
- They analyse the applicability of the roadmap.

The following sections go into detail on the validation of the roadmap. This chapter concludes by providing an answer to the main research question: *How can a gain-and-pain-sharing mechanism be used to incentivise collaboration and create mutual objectives in a construction project?*

6.2 Limitations of the validation

This validation comes with two main limitations:

- The validation was done using a semi-structured interview; because of this, the number of experts for validation is low due to time limits. This limitation was overcome by allowing for the subjects to be discussed in more detail. Experts had the possibility to explain as much as possible and elaborated on the roadmap in detail.
- All experts worked at the same company, namely, Witteveen+Bos, and they could consequently have had the same coloured view by company objectives. To overcome this limitation as much as possible, we chose experts who were based in different geographical locations and who worked with different clients. This allowed for a broad view of experiences and knowledge to elaborate on the roadmap.

6.3 Validation roadmap

In this part, steps per concept were validated with the experts to determine whether they are substantively correct, considering the internal and external factors, conditions and exceptions of each concept. Apart from the concept, the entire roadmap in figure 18 was reviewed by the experts for generalisability. This means that we looked at the application of the roadmap for a client and whether a consultant can truthfully advise the client. If experts offered comments or advice about roadmap improvements, then they were adjusted in this chapter to form the final roadmap.

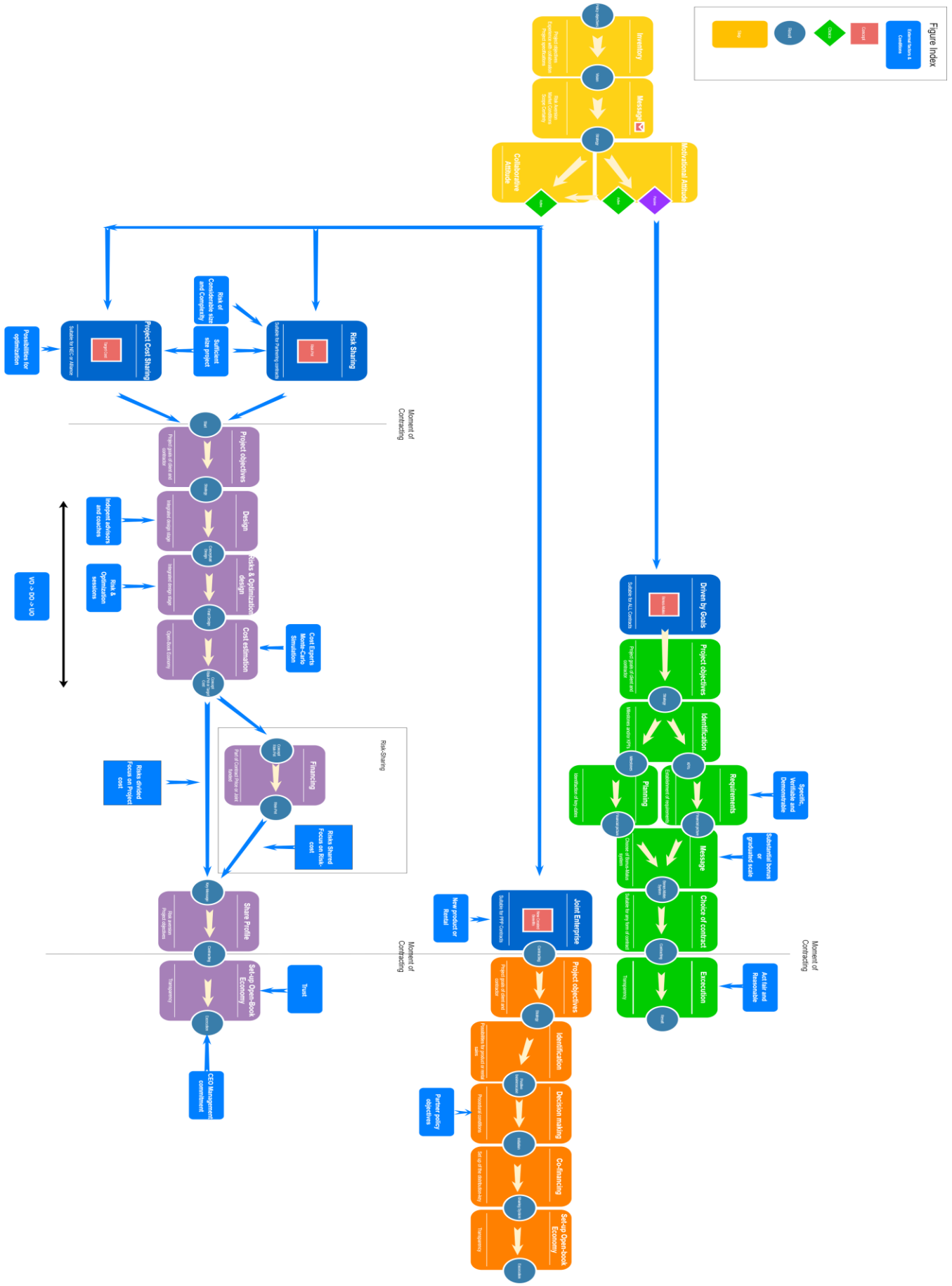

Figure 18. Roadmap gain-and-pain-sharing

6.4 The first steps for choosing a gain-and-pain-sharing concept

If a project cannot be priced by the client, then the client cannot tender the project with a standard contract. The client has the opportunity to split the project into a standard part and, for example, an alliance part or to tender it as a full alliance directly. Therefore, the scope is crucial for the choice of the gain-and-pain-sharing concept. The question the client needs to ask is whether the project is a package that can be directly launched in the market with specifications or whether it needs to be sorted out together with the market. If the answer is somewhere in between, then the following examples, among others, are intermediate forms that one could end up with: two packages where one is D&C for the part that can be calculated, and the other is an alliance or a Bouwteam for the part where uncertainties exist. This step regarding scope decision should be more included in the roadmap for choosing the right concept (Expert 1, 2021).

If there are many environmental factors, such as stakeholders, then an alliance construction is a wise choice because the client does not know what will happen during construction based on these environmental factors. No matter how many studies are done, in some projects it is not possible for everything to be laid on the table, and a gain-and-pain-sharing mechanism can thus offer a solution (Expert 2, 2021).

Mechanisms such as these should be discussed from Day 1. On the basis of the factors mentioned in the step-by-step plan, the conversation should be initiated early, and the right choice for collaboration should be made. In the current situation, this is done in an alliance or a bouwteam; then, during the implementation, an old-fashioned division of roles occurs, where everyone does their own part. The togetherness disappears again. The interests must be raised for discussion before going into details. The client must decide how they want the project to work, and starting points must be determined together because they determine the course and the details (Expert 2, 2021).

Buyers play a significant role in the field of gain-and-pain sharing because they write conditions for the contract. Since buyers do not actually have the right knowledge and especially based on negative conditions, the market often views these conditions as pains. Discuss the wishes, scope, vision, etc. to change is to gains Buyers do not undertake a construction project; it is not a product but a process. They carefully consider the purchasing conditions and how these are translated in the project. Management also plays an active role in thinking about which incentives are best for which project objectives to select the right party, otherwise gain an pain sharing makes no sense at all. For example, a day can be arranged internally where all departments sit together and ask questions about risk attitude, constancy and attitudes towards the project. Socrates' four areas of focus aid in making the right choice at the beginning of the process (Expert 3, 2021). The four areas of attention are as follows: first, the straightforwardness of the project, the type of project and the objectives; second, the project management aspects; third, the market; and finally, the environment (Expert 3, 2021).

6.4.1 Discussion

On the basis of the experts, there is agreement on the first steps that must be taken to choose the right contract form and desired collaboration in order to be able to make an assessment for a gain-and-pain-sharing concept. What clearly emerged from the discussions with the experts, which could be better incorporated into the roadmap, is determining the importance of scope certainty for the vision and strategy for the marketing of the project and determining the suitability of certain concepts. Scope certainty or uncertainty is a core component of the choice for a number of concepts. Within this scope of certainty, environmental factors play a role in the market that are not yet interwoven into the roadmap. The experts indicated that the stated sequence of steps would be the ideal situation; however, in reality, that sequence is not always followed, and steps are skipped by, for example, the buyers. It is therefore important that the ideal situation is visible in the roadmap, as it is now. Solutions that emerge for certain situations are project-related and are assessed per project. The roadmap thus also indicates the choice / thinking steps to be taken. It further indicates that every project is tailor-made and not a written rule. Adjustments to the first step are depicted in Figure 18.

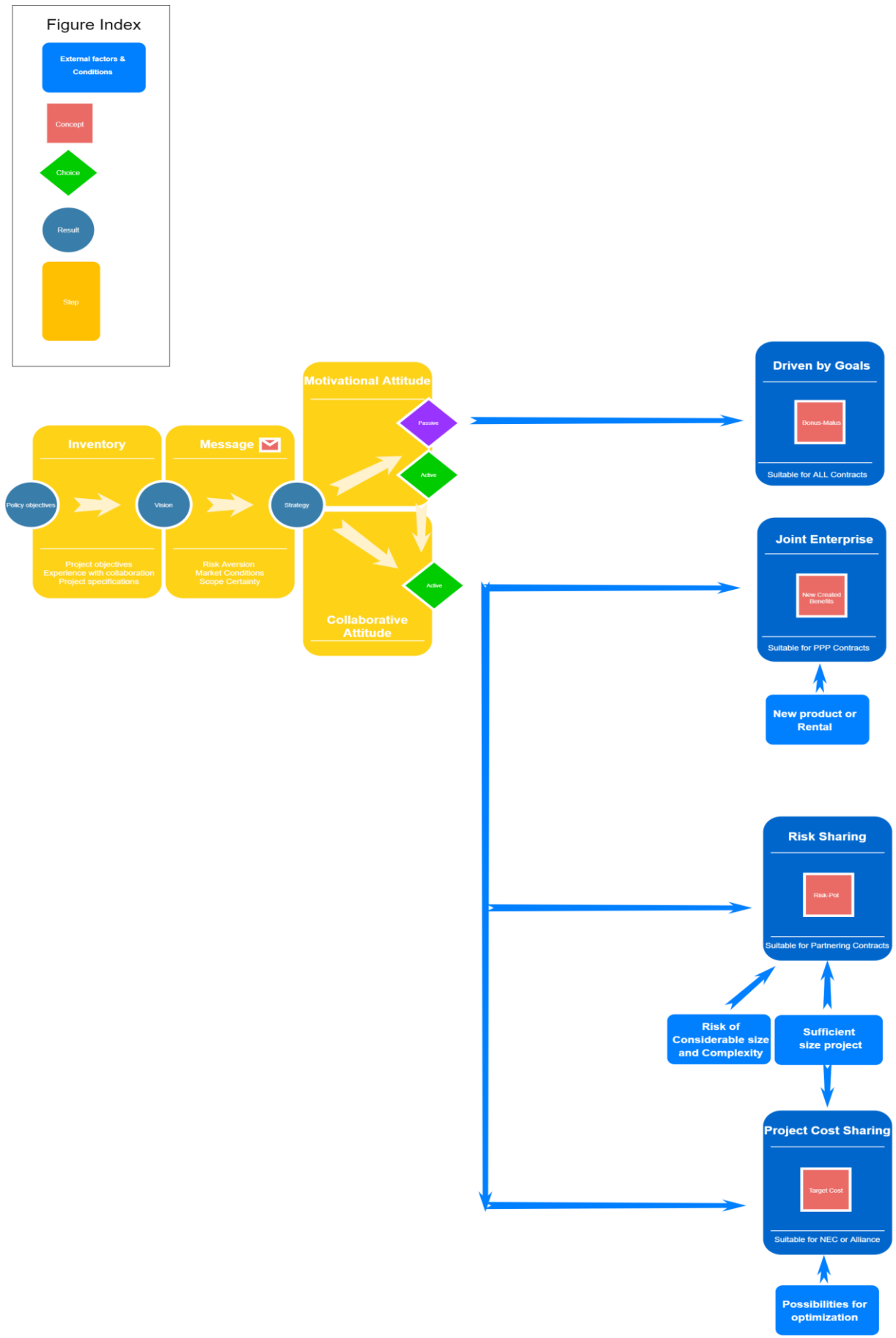

Figure 19. Adjusted first steps

Therefore, in the roadmap, a small adjustment has been made in the formulation of the strategy from the vision through which the message is delivered to the market. Market conditions will have to be included in the strategy to determine whether executing it according to a certain contract form and mechanism is also practically possible. In addition, the scope certainty determines the areas in which there are opportunities for a gain-and-pain-sharing mechanism and the contract type associated with it.

6.5 Bonus-malus

The development of a bonus-malus scheme always starts with matching the objectives to the performance and milestones. Much innovation is still possible in how the bonus or malus is given. In the largest case, this still occurs financially (Expert 2, 2021). Maluses can send wrong signals that are often unreasonable, but opportunistic contractors are also often unpunished. Maluses portray the idea of a fight in a contract, which does not benefit collaboration. If a client works without fines, then a fine is often no longer applicable at a later stage. An option to avoid this is to cast the project into an alliance or a Bouwteam to remove the perverse incentive because a bonus-malus is fixed after the tender, thereby creating a real bonus and a fine which are not included in the contract price. The effect of the described steps with a more positive starting point by means of bonuses does not always work, because the extra efforts required are included in the tender price, resulting in a disguised fine. Setting the right bonus-malus will always be customisation with the right incentives (Expert 1, 2021).

If a contractor wants to take on a role that is traditional and on the sidelines because there is a high degree of scope security and the client knows what they want, it is possible to create a win-win situation through a bonus-malus concept (Expert 3, 2021). A balanced assessment of the client is crucial in a bonus-malus where performance is assessed. The perverse incentive could be removed by reimbursing the contractors costs so that the bonus can be seen as a profit. If this is done over several measurement moments, then a high margin can be made over a certain time that could be translated into other projects (Expert 2, 2021).

With a bonus-malus, one must carefully consider which incentive to offer and how this will work out in the project. Creative bonuses do not always have to be in euros. For example, taking the gain-and-pain-sharing mechanism one step further with a publication or stage to present contractors work, framework contracts can play a role in the new method of gain-and-pain sharing with a bonus-malus idea. If the client nevertheless wishes to express it in euros, an option could be to allow the contractor to determine the bonus and malus when tendering (Expert 3, 2021).

6.5.1 Discussion

The steps taken to set up a bonus-malus scheme were confirmed by the experts, but the improvement lies in removing the perverse incentive and in how the client issues the incentive. The experts indicated that the mechanism would function well as a positive extra and as a possible big stick. The perverse incentive can be eliminated by removing the price element when contracting; this requires a different way of tendering. In addition, the option would be available to be creative by issuing a non-financial bonus. This would be tailor-made at all times with regard to the stimulus that the client wants to give. These steps do not require any adjustment in the current roadmap.

6.6 Sharing of new created benefits

The sharing of new created benefits is difficult from a procurement law perspective. It should actually already be under the conditions mentioned among the options in the first publication of the tender. Sharing of new created benefits is looking for the edges. This works better for Bouwteams, alliances or PPPs because innovations cannot be assumed in a D&C contract (Expert 1, 2021). The duration of collaboration will then have to be long term for a bouwteam and an alliance, which is unusual. Instead, PPPs will fit best. The sharing of new created benefits is ideal for extra income for positive business cases where there is room for development of a product (Expert 2, 2021).

The sharing of new created benefits is ideal not only for a production environment, such as water and energy, but, for example, also for innovation partnerships such as in Amsterdam with quay walls. Here, client and contractor develop together to bring the product to the market. This mechanism is sector dependent for the application (Expert 3, 2021).

In all cases, it is important that the parties present their objectives and possibly identify opportunities for a joint enterprise together (Expert 1, 2021). The business case drawn up by the client, the contractor or jointly will serve as the basis for the decision-making. To make gain-and-pain sharing possible, there will have to be an open-book administration. At present, this is increasingly becoming the norm (Expert 3, 2021).

6.6.1 Discussion

The experts agreed with the steps and mentioned factors that play into the decision-making process to implement the concept of sharing new created benefits. However, all experts were not familiar with this concept and therefore could not delve further into it. There is the potential to use this concept in production environments where long-term partnerships are available. In addition, an example already exists where a product is jointly developed for use in infrastructure. These steps do not require any adjustment in the current roadmap.

6.7 Risk pot and target cost

The UAV and UAV-gc offer little room for collaboration. A client can enforce unity through a gain-and-pain-sharing mechanism with the contractor, thus creating a natural stimulus to help each other (Expert 2, 2021). A project is sometimes already put into a D&C contract, and parts can be changed into an alliance later. The contractor has a contract price with a risk profile, and the client also has a price that is to be redistributed later. With redistribution, the contractor already has something to say. If an alliance is chosen, the contractor has nothing to contribute, because the risks are still with the client and are not yet included in the contract price. The mindset is changed then (Expert 1, 2021). After the contract is awarded, the conversion can make the risk pot or target cost more balanced, where a contractor has more to contribute. As seen in the roadmap, when contributing to this mechanism, both parties must have cost expertise, as it is not possible to apply such a mechanism without being able to estimate the costs correctly. Sharing these costs ultimately remains customisable with the share profile as the right incentive to promote collaboration. In addition, it is still extremely important that uncertainties and optimisations are possible, otherwise this concept has no added value (Expert 1, 2021).

Parties normally start with a Project Start Up (PSU) where their motives should ideally be on the table, but this often does not happen, because a certain factor has already been driven by the tender. The mindset of how the assignment is marketed is a factor in whether the client receives openness back. It remains a matter of attitude and behaviour. The approach can only succeed if the contractor can earn a reasonable living or has the prospect thereof. The contractor and the client both want certainty. If the client has sufficient scope certainty and the contractor has certainty about what to build, then the project can be priced. Furthermore, risks that can be jointly controlled should be put into a risk pot (Expert 2, 2021).

There is no fixed risk pot in the new Bouwteam model. A fixed profit rate is a useful security incentive in the new bouwteam phase. For a degree of certainty, asking for a budget of the preliminary design during the offers can work well, and this budget then becomes the ceiling amount after awarding of the project. After this step, a joint risk pot can be designed. The purest risk pot comes from the pure form of an alliance (Expert 1, 2021), where both parties must put money into the pot; however, this is still too scary for many parties because someone else also makes decisions about their money. With a construction team, a risk pot is often a paper shipment and more of a settlement item. The recommendation is to start with small projects to further develop this concept. Moreover, openness about risks is a key factor at all times. A variant of the risk pot is a risk list, where both parties agree on what they will bear pain for; this allows them to see for themselves whether they are reinsured or whether to create their own pot for it (Expert 3, 2021). After the design steps and cost estimation have been done, the financing of the risk pot can be considered (Expert 1, 2021).

Under the target cost principle, when too many risks are passed on to the contractor, the target cost will become high. The distribution of the risks is an important point within the mechanism. A target cost is a flexibility pot that should lead to better performance with higher quality. Forecasting of the costs during the project is important to know where one stands and whether the project is still proceeding according to plan. This requires openness in substantiating how the prices were established. Speaking the same language is also crucial when it comes to cost estimation, as it enables one to compare apples with apples using the contractor's estimate and the client's budget (Expert 2, 2021).

Furthermore, the attitude of both parties is important, meaning that there is a willingness to collaborate and share gains and pains. To coordinate a risk pool and its pricing, the parties must agree on the scope, risk file and price. For both concepts, a greater degree of uncertainty results in a higher price markup (Expert 2, 2021). A target cost is often seen as a fixed price for the contractor, who will make lists of what is in that cost and what is not, and a list of what does not belong in the cost. Those lists determine the value of the target price. A positive element of an open book and a target cost is that the subject is open and asks what the costs actually are. An ideal project manager plays a guiding role in this (Expert 3, 2021). Working with an open book will therefore have to take place from the cost estimation to be able to coordinate what the risk pot or target cost will be and then agree on the share profile. The share profile is the last step to be taken to complete the gain-and-pain-sharing mechanism (Expert 2, 2021); it is tailor-made based on a number of factors, such as the risk aversion mentioned in the roadmap. In addition, it is related to the client's objectives – quality, price, innovation or risk management. The distribution of risks is also key for the choice of distribution within the share profile. Someone who takes more risks will also want a higher reward for high performance (Expert 1, 2021; Expert 2, 2021).

6.7.1 Discussion

The experts indicated that the ideal process is essentially as stated in the roadmap. The only point is that, according to the roadmap, realisation of the open-book economy comes last. This step relates to the physical realisation for carrying out the work, but according to the experts this step must also be taken during the process of the risk pot or target cost to realise the concepts. The validation shows that the concepts have a high degree of customisation that can be arranged in many different ways per step. In practice, a cost estimate is often already requested before joining a Bouwteam, an alliance or an NEC contract, in order to have some guideline of the costs as a client. Clients do not dare to let go of this estimate and start after the awarding of the contract. According to the experts and theory, this estimate is not the ideal situation, but something that can be considered if there is a need for it. The choice for different practical implementations is described in Appendix P, where the recurring factor will always be the objectives that are translated into the mechanism on the basis of customisation. The steps will have to be followed on the basis of the objectives. Adjustments to the first step are displayed in Figure 19.

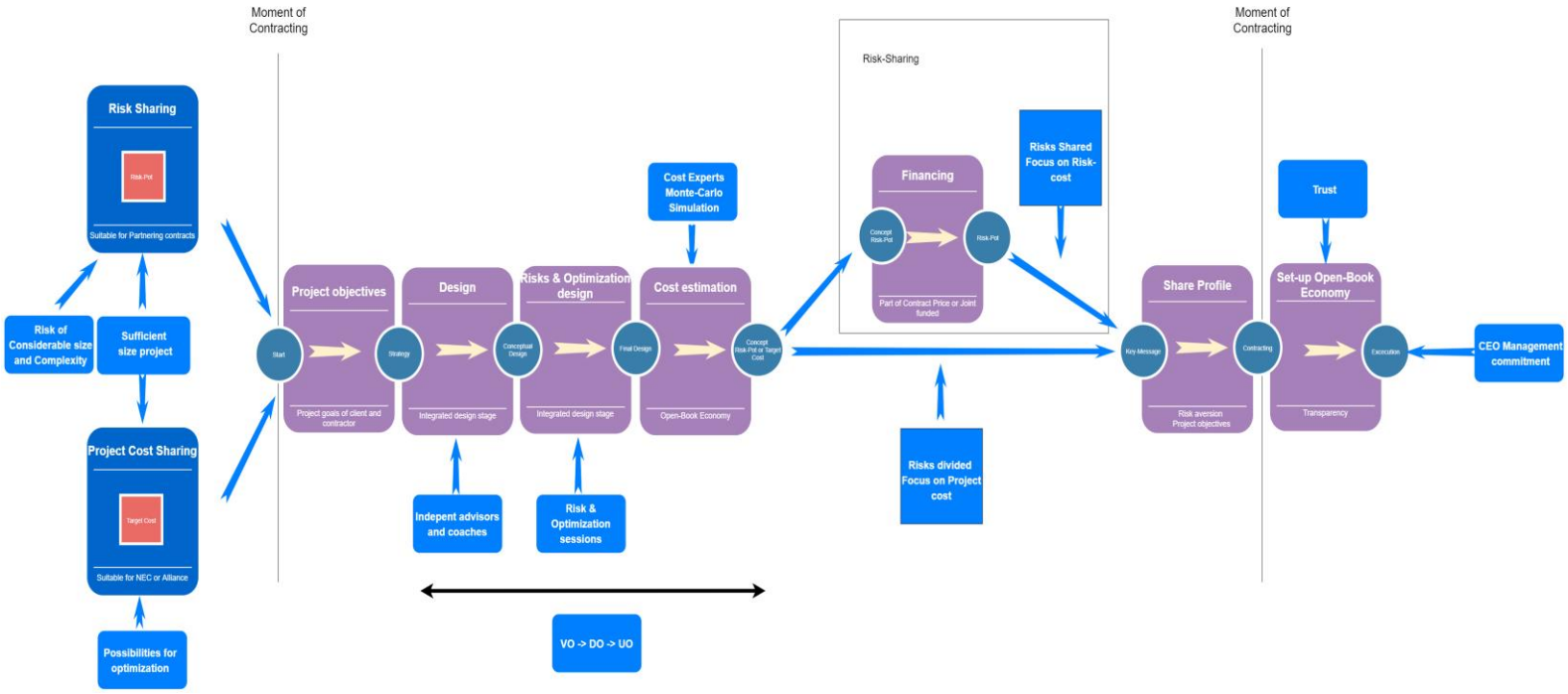

Figure 20. Adjusted risk pot and target cost steps

Small adjustments can be seen in the cost estimation step where an open-book economy should be the condition to proceed with the step. Another adjustment was made to the step where the share profile is realised. Here, the following condition applies: the objectives must be included in this step to achieve a solid share profile. This was not clearly reflected in the roadmap at first.

6.8 Generalisability

According to Expert 1 (2021), the roadmap can be generalised for use by a client, consultancy and engineering firms. It is a general, step-by-step plan that can be used to investigate and provide insight into the possibilities of gain-and-pain sharing. The steps mentioned are broad, with the possibility for customisation because this will always remain the case. The step-by-step plan can serve as a conversation starter to make the client aware of the possibilities. It identifies the steps to be taken into account and the areas where key knowledge is required (Expert 3, 2021).

7

CONCLUSION AND RECOMMENDATIONS

This chapter contains the conclusions of this research. Based on these conclusions, recommendations are provided for the Dutch construction sector and future research. Finally, the research's validity, relevance and limitations are discussed.

7.1 Conclusion

Based on the findings in the literature regarding the gain-and-pain-sharing mechanism, the case studies, the roadmap and the expert validation, an answer to the following research question is drafted:

How can a gain-and-pain-sharing mechanism be used to incentivise collaboration and create mutual objectives in a construction project?

To recap, a gain-and-pain-sharing mechanism is defined as an agreement that allows the parties in a construction project to share profits or cost savings and to share losses due to errors or cost increases. This research has demonstrated that there are multiple practical applications of the gain-and-pain-sharing mechanism to incentivise collaboration and create mutual objectives. The following concepts with regard to mechanism can be used:

1 Bonus-malus;
2 Sharing of new created benefits;
3 Risk pot;
4 Target cost.

The four concepts have different effects and different reasons for use as a gain-and-pain-sharing mechanism. The way in which to deploy the mechanism depends on the choice of concept based on the vision and strategy that the client has for the project. This vision and strategy depends on the *company and project objectives; project specifications; experience with collaboration concepts; risk aversion; market conditions;* and one of the most important conditions, namely, the *scope certainty*. These factors are used for custom work per project and indicates the direction of the project and the conditions for a suitable gain-and-pain-sharing concept.

Bonus-malus
A bonus-malus concept can be used to achieve objectives through a common goal based on performance or a milestone and combined with a bonus or malus. This creates a win-win or lose-lose situation. The bonus-malus is geared towards concrete, measurable performance and milestones that are weighed against a financial picture. It is up to the client which incentive this indicates to the contractor, but in principle, it must be based on the consideration of goals to be achieved. This gain-and-pain-sharing concept can be used in all contract forms. However, the disadvantage of a bonus-malus is that it can cause a perverse incentive when bonuses are included in the contract price. This can be prevented by removing the price award factor or by introducing the mechanism after awarding the contract. A post-award introduction cannot be done in the traditional way and will have to be done through another contract form such as a bouwteam or an alliance.

Sharing of new created benefits
The sharing of new created benefits contributes to collaboration and the achievement of objectives through a joint enterprise of a product or service, because both parties engage in long-term entrepreneurial activity to

achieve certain objectives. The mechanism ensures that in this business activity, profits and losses will be shared on the basis of an open-book economy. An open-book economy provides openness in finances so that both parties can control the risk pot. The profits and losses are then shared on the basis of a share profile. The concept is suitable for contracts in which parties are linked to one another for a long time, such as a public–private partnership – with a shorter collaboration, the investment costs are too high for implementation. The disadvantage of the sharing of new created benefits concept is that it only focuses on one part of the project and not on the entire project, so that the total effect will be small.

Risk pot
A risk pot contributes to collaboration and the achievement of objectives by means of joint management of the risks. The area of risk is a key determinant of the cost of the project. By joint management of the risks, an attempt is made to reduce costs and achieve optimum quality. A partnering environment is required to apply this concept, through a contract form such as an alliance, a Bouwteam or an NEC. That is, an environment is needed in which the objectives can be identified and where any additional project risks in achieving the objectives can be jointly tackled. The process of realising a risk pot already contributes to collaboration. Furthermore, when there is a certain degree of scope uncertainty, and when risks arise from this uncertainty that are more manageable jointly than alone, it is wise to apply a risk pot. In contrast, when risks are small and not complex, a risk pot has no added value due to the high investment costs and administrative burden. By means of an open-book economy, both parties can provide insight into and control the risks. Moreover, to motivate and reward parties to achieve the objectives, a share profile is agreed, which creates mutual financial dependence. The disadvantage of the current risk pot is that the implementation contract after a construction team is often drawn up in accordance with the UAV-GC and is not geared towards collaboration in the implementation phase, such as in the construction team, so that traditional behaviour can be encouraged.

Target cost
A target cost contributes to collaboration and the achievement of objectives through joint control of the total project costs. For this gain-and-pain-sharing concept, there must be a high degree of scope certainty to be able to properly discount the project and ultimately determine the target cost. By calculating the project in parts – direct costs, indirect costs, risks and profit margin – on the basis of an open-book economy, a joint overview of the costs is created. When there is joint agreement on the costs, a share profile is coordinated from a gain-and-pain-sharing ideology to motivate and reward the parties to achieve the best possible performance. This share profile creates a common goal to execute the project within budget and better than expected. It also gives the contractor and the client the space to optimise and improve the project. If there are no optimisation options, then the mechanism itself will not work, but the process already requires a certain degree of collaboration to be able to realise the mechanism, which is already a positive reason to start with. Based on the project objectives, it is then agreed which incentive the share profile should provide. To apply this concept jointly, a partnering environment is required, such as an NEC or a pure form of an alliance. The disadvantage is that the concept for a small project with few optimisation possibilities has high implementation and administrative costs. In addition, the degree of cost expertise is of great importance because if the estimate is incorrect, this mechanism will provide the wrong incentive and have a negative effect.

Success of gain-and-pain-share mechanism
It can be concluded that the gain-and-pain-sharing mechanism is deployed by different concepts for different purposes to incentivise collaboration and create mutual objectives. This coordination for the implementation of the mechanism is customised for each project based on a number of steps. The step-by-step plan that supports the implementation of the gain-and-pain-sharing mechanism can be found in Appendix P.

The case studies revealed that such a mechanism has worked successfully in those cases and is an added value for collaboration and the realisation of common goals. For example when the financial picture is correctly linked to a performance or milestone with a relevant bonus-malus, it creates a win-win or a lose-lose situation. In practice, it has turned out that in the cases studied, joint goals have been created and rewarded / punished for the relevant performance. In the case of the risk pot and target cost where a partnering environment was used, the process was already collaborative, but also the gain-and-pain-share mechanism itself, which has permanently linked both parties together through a financial dependence incentivise the collaboration. Clients were satisfied with the results achieved in their specific cases related to costs, time, quality, innovation and sustainability. In the case of sharing of new created benefits, the joint enterprise ensured more intensive

collaboration, because better performance of both parties achieved sustainability goals while simultaneously increasing income. In the selected cases, the collaboration has improved and / or contributed to the creation of mutual objectives where a win-win or lose-lose situation applied. The fact remains that due to the limited number of cases and the nature of the research, it is not possible to say that this is always the case and can be assumed for granted.

7.2 Recommendations for the Dutch construction sector

The completed roadmap with the steps for implementing a gain-and-pain-sharing mechanism is a helpful initial means to explore the possibilities. It can serve as a conversation starter within the client organisation regarding the possibilities of gain-and-pain sharing. In addition, it serves as a reference for whether the aforementioned factors and preconditions have been identified and assessed. By working step by step from the start, concepts can be crossed off. Not only the client, but also consultancy and engineering firms can use the roadmap to clearly explain concepts. It gives direction to the mechanism. When the first phase of orientation has been completed, the roadmap can also help to implement a concept. However, it must be noted that the steps are still in an explorative stage and therefore serve as a thinking step; they have not yet been fully worked out in detail.

During the interviews, while respondents and experts were enthusiastic about the mechanism, they often stated that the way of working is fundamentally different from normal. The research also revealed that the mechanism thrives in a partnering environment. The roadmap can contribute to awareness in the market regarding the process of working in a collaborative environment. The process that is possible through a partnering environment, such as in a Bouwteam, an alliance, a PPP or an NEC, ensures that parties work together to achieve goals and realise a high-quality product at an optimal price. Parties having mutual understanding and speaking the same language will further help to move the project forward. This starts with creating awareness among the client to present the project in the market in such way that there is room for collaboration.

Since the mechanism is fairly new in the Dutch market, it could be interesting to apply it to financially small projects that meet the requirements for the mechanism. This allows one to become accustomed to the mechanism without too great risk. With successful implementations, it can be translated into larger projects – the learning from small projects can be applied more broadly, and one can gain a head start in the market.

The presence of soft attributes is a prerequisite for establishing a gain-and-pain-sharing mechanism in a partnering environment. Therefore, establishing soft characteristics between the involved parties, such as a willingness to collaborate, trust and openness, is recommended. Trust and openness can be created through transparency. Especially one factor of gain-and-pain sharing can establish this transparency and that is the open-book economy. Working in a open-book economy creates a full transparent way of working which insults trust and openness. Without an open-book economy 3 of 4 concepts cannot exist. In this situation, the project team itself is essential as well. The functioning of gain-and-pain sharing is based on full openness and depends on the individuals involved in the project; people should thus be able to work more cooperatively in some respects compared to other project delivery methods. In the end, it is about sharing one another's money. As already mentioned the roadmap can be used as a conversation starter which can results in discussion. Especially opening the discussion is part of the soft area which is important for establishing collaboration. Therefor the roadmap can be used to incentivize soft conversation between the client and contractor. S4799f0f!

A more practical recommendation with regard to the bonus-malus is for the client to coordinate the bonus-malus after awarding the contract. According to the procurement law, this is a gray area, but it is already possible through partnering contracts and meant as an extra motivation. In addition, according to the definition of gain-and-pain sharing, the mechanism can also concern non-monetary rewards. While these were not reflected in the cases, the experts offered the opportunity to delve into non-monetary rewards from the client's perspective to motivate the contractor in a different way, which will be an advantage for both.

The sharing of new created benefits is a new concept in the market and is suitable for production environments with long-term cooperation. It motivates both parties to deliver optimal performance. The sharing of new

created benefits could also be used in innovation partnerships, where uncertainty exists or product has a chance of success, but through joint investment, a successful product could possibly be produced. Both parties will be keen to bring a considered product to the market, after which they can both benefit from it.

The process of realising a risk pot leads to mutual understanding of the risks in the project and highlights personal bottlenecks from the client and the contractor. In this case, consensus is likely to emerge when discounting the risks. In addition, this process does not have to lead to a risk pot, but through mutual understanding and trust, it can lead to one party taking on additional risks because the other parties take an extra step in another area. Therefore, identifying and estimating the risks together is highly recommended.

A target cost is known in the pure form of an alliance and in an NEC. Although we do not use these forms in the Netherlands, they have proven to function well internationally. The ICC project in the Netherlands was also a great success, but despite this success, it did not break through, due to traditional behaviour and entrenched patterns. These forms offer the possibility to jointly create the highest possible scope security, so that budgets can be closely aligned. The entire process within these contract forms is aimed at openness, collaboration and the creation of mutual objectives. The gain-and-pain-sharing mechanism plays a major role in this and offers opportunities for an equal cooperation where profits and losses are shared. The possibilities from these contract forms are therefore worth using more often in the Dutch construction sector.
Using an open-book economy in an active gain-and-pain-sharing mechanism is strongly advised. An open-book economy is the foundation of the mechanism, ensuring openness and transparency in the financial field. It also allows for the creation of mutual understanding with regard to cost calculations and costs incurred. Moreover, it gives the impression that people really work together, and it enables the possibility to compensate and optimise the contractor on the basis of direct costs.

7.3 Recommendations for further research

We have several recommendations for future research, mainly based on the fact that gain-and-pain-sharing concepts were barely used in the Netherlands during the execution of this research. When the methods and clauses are used more often, more and better data becomes available to test the influence of the methods on collaboration in the Dutch construction sector. The recommendations are as follows:

- The research is of an exploratory nature and outlines the implementation steps. The next step would be to draw up the assessment framework per concept and implement it at a detailed level. Follow-up research is hence recommended for each gain-and-pain-sharing concept.
- An extra translation step of the conclusion by use of (for instance) a decision tree can make the implementation of the identified gain-and-pain-sharing concepts easier in practice. This decision tree can include certain project scenarios that commonly occur. Based on these scenarios, a client could go through the decision tree to determine which concept would be beneficial for the situation in that specific project. Future research could investigate what this decision tree should include.
- The roadmap was validated by experts; the next step would be to apply this in practice to organise a project or game where the roadmap is used. The functioning of the roadmap could be tested live within the project. In a game, parties could also be monitored in terms of how they use the roadmap on the basis of a number of cases to test the operation of the roadmap.
- This study used five cases in different sectors to be able to focus the mechanism more specifically. Follow-up research could be carried out within a sector because there could be differences here.
- The number of case studies in this research was limited. The validity of the research could be increased if the research is conducted with a larger number of cases. The higher the number of studies on the subject, the higher the significance of the results.
- The research focused on clients because they take the first step to initiate the gain-and-pain-sharing mechanism. The implementation steps of the concepts are therefore also written from the perspective of the client. Follow-up research could include contractors' views of the gain-and-pain-sharing mechanism and how they deal with it as an organisation.
- In the research, non-monetary pains and gains were underexposed due to the lack of applications in the cases. The experts indicated that these types of gains and pains have a chance of success and are

interesting to focus on specifically. In further research, attention could be paid to how a non-monetary gain-and-pain mechanism can be implemented.

8

DISCUSSION

In this chapter, the reliability, validity, scientific contribution and limitations of the research are discussed.

8.1 Reliability and validity of the research

The reliability and validity of this research were tested based on the criteria of Bryman (2012) for qualitative research. Bryman used four criteria to define the reliability and validity: external and internal reliability, and external and internal validity .

External reliability relates to the extent to which research can be repeated by somebody else. This criterion is difficult for qualitative research because it is conducted in a social setting and has a high level of interpretability. In a different setting, other results could be obtained. This challenge can be addressed by a similar role of the author as an independent outsider in the sector – this role can be copied. With the use of interview protocols, another researcher can redo the research with different cases. Therefore, the external reliability of this research is relatively high.

Internal reliability relates to the extent to which the internal team has consensus about the results. Since the present study was carried out by an individual, this aspect is not relevant to the research. Nonetheless, the results were tested by a graduation chair to reach consensus. This indicates that the study is likely to have sufficient internal reliability.

External validity relates to the degree to which the conclusion can be generalised. External validation is a problem for a qualitative study with semi-structured interviews. It is based on a small set of case studies, and generalising the conclusion is difficult. Therefore, the external validity of the research cannot be determined. However, collaboration is known to be case-specific and dependent on numerous factors. Since this is general knowledge, the research aimed to guide a higher abstraction level. Generalization is not automatic, however when the theory is tested in another environment same kind of results should occur. The results might be accepted as providing strong support for the theory, even though further replication had not been performed. This replication logic is the same that underlies the use of experiments (Yin, 2009). The conclusion could be considered as a starting point for using a gain-and-pain-sharing mechanism. It will always be necessary to tailor methods to a specific situation. Thirdly a limited number of respondents were questioned per case. This was because the subject is new, and not much deep knowledge is available. Moreover, the research was conducted in a limited time frame. Conducting interviews is a highly time-consuming process. However, the interviewed respondents indicated that I interviewed the right persons for each case – the respondents dealt with the projects and processes on a daily basis and were the right people to speak to regarding the collaboration and therefore sufficient to generalise.

Internal validity relates to the match between theory and the concepts developed in the research. In this study, the theoretical concepts were strengthened by in-depth interviews with respondents. With this strengthened concept, the interpretation of statements was tested by experts for future implementation. To ensure that my interpretation is objective, each interpretation was explained and elaborated upon, and I could demonstrate my objectivity in interpretation. The validation was done via interviews, and a limited number of experts were questioned due to a limited time frame. The beneficial side of the interviews was that as an author could explain the full method and directly respond to the level of agreement of the experts. At the time of writing, all experts who validated the conclusion worked for the same company, Witteveen+Bos. The results could consequently have had the same angle of approach. However, the experts were in different geographical locations and had different types of clients. Apart from this, the experts were more likely to free up time to help me. Due to this congruence between observations and theory, the study has sufficient internal validity.

8.2 Scientific contribution

This research contributes to several existing knowledge fields:

- This research presents a clear image of the current collaborative problems in the Dutch construction sector. According to different studies, collaboration is still one of the major problems in the sector, but also the solution for other factors at the same time for example, cost and time overruns. The client and the contractor operate differently and do not understand each other. Contracts play a key role at the start of the incentivisation of collaboration. The cases suggest how to improve the situation through gain-and-pain sharing. This can be an inspiration for other projects.
- A clear description of gain-and-pain sharing connected with different concepts has not been presented before. Combining the different definitions clarified the selection of concepts. This combining of the definitions and concepts to obtain an overview of the total concept has not been done before and already fills a knowledge gap regarding the spreading of knowledge about the gain-and-pain-sharing mechanism in the Netherlands.
- Separate gain-and-pain concepts are investigated corresponding to the Netherlands. The possible concepts and their effects offer insight into the possibilities for the Netherlands. This research provides an overview of the methods and a spread of understanding.
- The effects of the different concepts in contracts are examined by means of a case study and validation. This has not been done before with this number of different gain-and-pain-sharing concepts. The insights obtained from this research highlight the possibilities of these concepts to positively influence collaboration. This knowledge can be spread and used practically for different clients, and it can aid in reaching the ambitions formulated in the Marketvision of 2019 (Rijkswaterstaat, 2019).
- The research provides a roadmap with clear steps and choices for implementation of a gain-and-pain-sharing mechanism. This has never been done in scientific research. It can create awareness of the mechanism and be a tool as a starting point for the client to implement a gain-and-pain-sharing mechanism to incentivise collaboration.

8.3 Limitations of the research

Every study has some limitations, and this one is no exception. Limitations can have a great impact on the conclusion of this research and are discussed in this paragraph.

- Due to a limited number of cases available, especially for the target cost and sharing of new created benefits concepts, this research is only exploratory. Unless it is of an exploratory nature, the roadmap can be used as a starting point for a client in the Dutch construction sector. Based on the conclusion, the client can start exploring gain-and-pain sharing in a way that suits their situation and develop it along the way.
- The different gain-and-pain-sharing concepts were used in different ways in the cases. Multiple uses and interpretations were therefore possible. The conclusion is therefore not the whole truth and can be used in different manners. The idea is to conceptualise gain-and-pain sharing as a starting point and adjust the concept to suit the client's purpose.
- Due to the nature of the research, the success of the gain-and-pain-share mechanism has been underexposed. In the cases it was asked and indicated that in the eyes of the interviewee it had had a positive effect on the aforementioned points of collaboration and achieving mutual objectives. It offers perspective to start the conversation and identify the possibilities, and then look at the success factors in the future.
- Lack of non-monetary gains and pains in the cases. The experts responded positively to this, but no client had incorporated this into the projects. Unfortunately, this means that nothing can be said about this from the research, but it does provide leads for further research.
- Soft attributes such as trust, openness, etc. are the basis for good collaboration. Due to the nature of the research, the process of gain-and-pain-share mechanism was the priority and was tried to include the most important soft attributes. However, the relationship between the mechanism and these attributes has not been investigated. The open-book economy part of the gain-and-pain share mechanism does respond to transparency, which incentivise trust and is a promising factor. In addition, the roadmap is intended as a conversation start and therefore contributes to an informal setting where soft attributes are given room for connection.

- The image of collaboration and the use of gain-and-pain-sharing has mainly come from the NEC as a starting point for research in the Dutch construction sector. However, the British view of the roadmap and described use of gain-and-pain-sharing has not been included in this study. Comparison between the researched view in the Netherlands could be a valuable addition.

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APPENDIX A. PERFORMANCE INDICATORS

List of literature about project level performance indicators made by Hany.

No.	Author and year	Country	Performance indicators	
1	Jastaniah (1997)	Saudi Arabia	1. Client satisfaction 2. Planning period 3. Staff experience 4. Communication 5. Safety	6. Closeness to budget 7. Profitability 8. Payment 9. Claims
2	Egan (1998)	UK	1. Predictability – time, cost 2. Construction cost 3. Construction time 4. Productivity	5. Profitability 6. Safety 7. Defects 8. Client satisfaction
3	Department of the Environment, Transport, and the Regions (DETR), 2000 Department of the Environment, Transport, and the Regions (DETR) (2000)	UK	1. Time 2. Cost 3. Quality 4. Client satisfaction	5. Client changes 6. Business performance 7. Health and safety
4	Pillai et al. (2002)	India	1. Benefit 2. Risk 3. Project status 4. Decision effectiveness 5. Production	6. Cost effectiveness 7. Customer commitment 8. Stakeholders 9. Project management
5	Cheung et al. (2004)	China	1. People 2. Cost 3. Time 4. Quality	5. Safety 6. Client satisfaction 7. Communication 8. Environment
6	Wong (2004)	UK	1. Staff experience 2. Resources 3. Site management 4. Safety	5. Contractor experience 6. Time 7. Cost 8. Quality
7	Constructing Excellence (2005, 2006, 2009) and Roberts and Latorre (2009)	UK	1. Client Satisfaction 2. Defects 3. Predictability cost, time 4. Construction cost, time 5. Variance cost, time 6. Contractor satisfaction	7. Profitability 8. Productivity 9. Safety 10. Social indicators 11. Environment
8	Rankin et al. (2008) and Canadian Construction Innovation Council (CCIC) (2007	Canada	1. Cost 2. Time 3. Quality 4. Safety	5. Scope 6. Innovation 7. Sustainability 8. Client Satisfaction
9	Luu et al. (2008)	Vietnam	1. Construction cost 2. Construction time 3. Customer satisfaction 4. Quality management	5. Team performance 6. Change management 7. Material management 8. Safety
10	Skibniewski and Ghosh (2009)	USA	1. Construction cost 2. Construction time 3. Predictability cost and time	4. Defects 5. Client satisfaction product
11	Toor and Ogunlana (2010)	Thailand	1. On time 2. Under budget 3. Specifications 4. Efficiently 5. Effectiveness	6. Safety 7. Defects 8. Stakeholders 9. Disputes
12	Construction Industry Institute (CII) (2011)	USA	1. Cost 2. Schedule 3. Changes	4. Accident 5. Rework 6. Productivity

Figure 21. Summary of available previous literature

APPENDIX B. ALLIANCE

Another concept of collaboration and sharing objectives is an alliance. Project alliance shares the principles of sharing pains and gains to fully collaborate to succeed with each other project goals. A project alliance is according to Ross '' is where an owner or owners and one or more service providers (constructors, designers, suppliers, etc.) work as an integrated team to deliver a specific project under a contractual framework where their commercial interests are aligned with actual projects outcomes''. This means that responsibilities lay at both sides facilitated by contractual agreements and soft elements. Under the traditional forms of contracts, risk and responsibilities are mostly allocated to different parties with legal and commercial consequences for the individuals.

Under a pure alliance Ross understands the following:

a) Assume collective responsibility for delivering the project;
b) Take collective ownership of all risk and opportunities with the delivery of the project;
c) Share in the pain and or gain depending on how actual project outcomes compare with the pre-agreed targets that they have jointly committed to achieve.

This risk allocation in an alliance will be done in a quite precise manner, according to the operation risk/reward arrangement, not through legal liability.

In the traditional risk transfer, the client did in extreme situations transferring risks to parties who are not in the best position to manage those risks. The idea is to allocate the risks to the party which can handle the best. Under the circumstances of complexity, the project outcomes of an alliance are more likely to be achieved. If all key parties assume collective responsibility for delivering the project under a collaborative arrangement where they all win or lose together. The gains or pains are depending on how the actual project outcomes compare the contractual target cost.

According to Ross the following features should have a project alliance:

a) The parties are collectively responsible for performing the work and generally assume collective ownership of all risks associated with the delivery of the project
b) The owner pays the non-owner participants for their services by the following 3- limb 100% open-book compensation model:
   - Limb 1 Project costs and project-specific overhead costs are reimbursed at cost-based
   - Limb 2 A fee to cover corporate overhead and normal profit
   - Limb 3 An equitable share of the gain or pain depending on actual costs compare with pre-agreed targets which they jointly want to achieve. Based on the idea we all lose or win some. Typically the downside risks to the non-owner participants are limited to the loss of their entire Limb 2 Fee.
c) The project is governed by a joint body called a project alliance board (PAB) or the alliance leadership team (ALT) where all decisions must be unanimous
d) Day-to-day management of the project is by a seamlessly integrated project team where all members are assigned to the team on a best for project basis. Without regard to which party they are employed by.
e) The parties agree to resolve issues within the alliance with no recourse to litigation except in the case of a very limited class of prescribed ''events of the default''

Under the pure alliance, the uninsurable risks are not allocated in the traditional legal sense but shared according to the gain and pain model. The gain pain mechanism in the alliance is also called the Risk or Reward regime and part of the commercial arrangements.

The Commercial Arrangements are documented in the ADA and the PAA and summarized in other contract documentation. It includes a compensation framework that encompasses the NOPs Fee and a Risk or Reward regime designed to incentivize the parties to perform better by aligning their commercial outcomes/objectives with success for the Owner.

As the preferred design and scope of work are defined, the risk register can be refined and treated in detail to more accurately reflect the project's risk profile. The draft commercial terms and associated guidelines for reimbursable costs can be reviewed in light of this risk profile and a Risk or Reward regime. The Contract terms finalized and agreed upon in Commercial Framework workshops. These workshops are very important to set up the gain and pain sharing mechanism (Department of Infrastructure and Transport, 2011).

As sufficient cost estimates become available the commercial terms and risk profile can be finalized and the PAA as well. Finally, potential scope change and variation scenarios, often referred to as 'Target Adjustment Guidelines' are agreed to. The TAG provides the future alliance parties with guidance to resolve issues regarding the scope of work for the alliance team (Department of Infrastructure and Transport, 2011).

In this way, risks will be shared equally and the pains will be shared equally up to the point where the participant's fee has been lost. Beyond that risk, the owner will bear the risk losses. The parties except the owner can participate with full confidence that, apart from insurable risks or an event of default, That the liabilities are limited to the agreed pains share arrangement. Ross has found this approach to be the most effective and perhaps the only way to remove the barriers to a total collaborative environment. This mechanism fits a pure full alliance and this is not always possible for an owner to adopt in all cases, according to the case-specific situations and the ideal situation for an alliance.

One of the most important things to do when establishing and mandatory for public sector practices is an alliance auditor. An alliance auditor validates all the payments under the alliance under a fully open book and under the terms of compensation. The alliance auditor plays a big role in conducting the iPAA/PAA to finalize the audit plan. The payment system of the alliance and the gain pain sharing is explained in Appendix B with a short explanation of the real gain pain sharing by the limb 3 payment in the next subchapter.

Limb 1

The basic principles of reimbursement of the projects are shortly explained by the figure below and describe de Limb 1/2/3 with the important part as limb 3 the gain pain sharing.

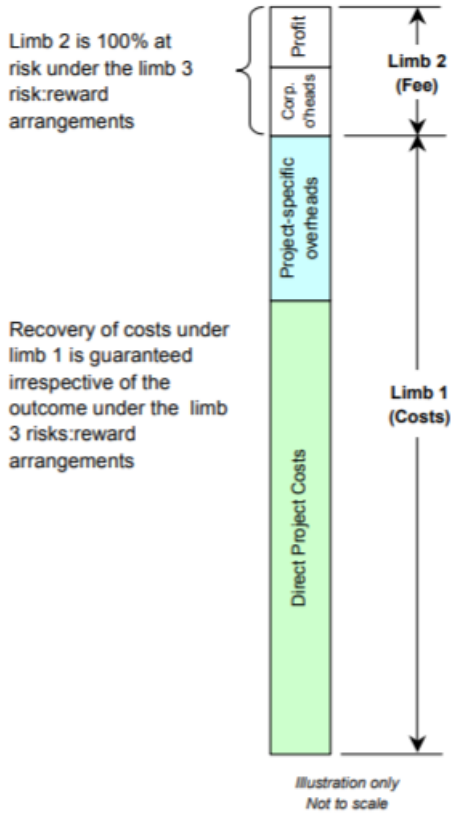


Figure 22. Reimbursement system

The Limb 1 is straightforward and I the reimbursement for the actual cost incurred on the project, including costs associated with rework. The reimbursement under limb 1 does not include any hidden corporate overhead or profit. The transaction and costing should be 100% open book and subject to audit. The procedures that ensure the reimbursement will be established with the alliance and the alliance auditor. An important part of this system is the Target Outturn Cost (TOC) The Participants of the alliance jointly develop the TOC. The TOC leas at the heart of the compensation model because it is used for determining the Limb 2 fee, which needs for the paying of the non-owners and as the target against the actual costs for under / overruns that should be shared as gain pain mechanism.

The TOC should be as already said a reasonable estimate of what it should take to deliver the agreed scope of work taking into account that:

a) The outcomes the alliance committed to achieving (Delivery schedule, Quality, Performance specifications);
b) Current best practices for construction and commissioning;
c) The nature of the risks being assumed collectively by the participants of the alliance.

Summarized the Total project budget should be therefore the sum of:

a) TOC
b) The sums of Limb 2
c) Provision for non-cost gain shares
d) Other project-related costs incurred by the owner.

If you look at these systems it would seem in the best interest of the owner to keep the TOC as low as possible and for the non-owner participants as high as possible. However, there are several factors in play that counteract this conflict.

a) If the TOC is too high the project may not proceed;
b) Transparency, It's jointly developed and on a fully open book basis. Nothing can be hidden;
c) If they do not proceed the non-owners can't forfeit any Limb 2 fee's
d) Reputation a future business-wise.
e) The sheer momentum

In public projects, it's normal to engage an independent estimator to undertake an independent estimate or at least do a sanity check.

Limb 2 Fee

For the non-owners participants, a paid fee recovers a fair contribution to their corporate overhead costs plus a margin for profit. There are two options to do it as:

a) A fixed lump sum by applying fee% to elements of the TOC; or
b) As a % of actual costs by applying the fee% to components of actual costs.

Using the fixed lump sum fee approach some points need to be taken into regard.

1. The fee is not subject to adjustment regardless of actual costs expended.
a) The fee is only adjusted in case of scope variation
b) The fee will be paid progressively

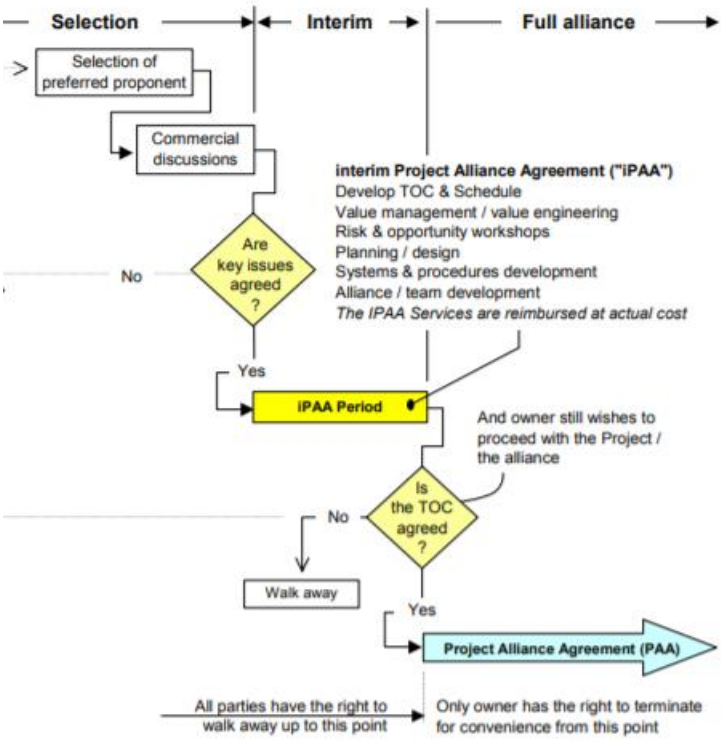


Figure 23. Decision flowchart For Alliance (Ross, 2003)

First phase *selection*. The client/owner must select the right partner and align on the framework and primary commercial parameters.

Second phase *iPAA*. iPAA is an alliance agreement where a simple consultant agreement whereby non-owner participants are reimbursed at the cost to work on pre-construction activities including development of target outturn cost, target costs, and other non-target costs for the project.

Third phase *PAA*. PAA is a full project alliance agreement. When parties want to proceed with each other.

One of the most important things to do when establishing and mandatory for public sector practices is an alliance auditor. An alliance auditor validates all the payments under the alliance under a fully open book and in accordance with the terms of compensation. The alliance auditor plays a big role in conducting the iPAA/PAA to finalize the audit plan.

APPENDIX C. NEC ''NEW ENGINEERING CONTRACT''

A third contractual option with real monetary gain and pain sharing is the New Engineering Contract. NEC is an international collaborative oriented contract that can be applied in the Dutch GWW-sector. A possible NEC contract is the NEC ECC (New Engineering Contract). This contract already has been used for 20 years and is still new in the Netherlands. The NEC3 ECC has been used in several leading foreign construction projects, such as the extension of London's Heathrow Airport (terminal 2), the extension of the Indira Gandhi Airport in New Delhi (Terminal 3), and the Olympic Velodrome in London. 3 In The Netherlands has used this model at the International Criminal Court in The Hague. This ECC Contract should drive collaboration, proactive management, and risks share-based mechanisms. It's for the Netherlands something completely new and therefore a lot of time familiarity is chosen. NEC is a partnering contract where a lot of soft skills are required which needs a lot of changes in way of working to reach success, but in general, it has shown a lot of potential as a collaborative performance contract. Recently the new NEC4 contract has been introduced, but with the new contract, there aren't a lot of cases and information available right now.

The idea of NEC contracts can be kept in three main characteristics (Chao, 2016):

a) Its use stimulates good management of the relationship between the two parties to the contract and hence of the work included in the contract;
b) It can be used in a wide variety of commercial situations, for a wide variety of types of work, and in any location;
c) It is a clear and simple document – using language and a structure that are straightforward and easily understood.

Based on this research about gain pain sharing mechanisms/models the following contract can be used (Hughes, 2018):

a) Option C – Target contract with activity schedule
b) Option D – Target contract with bill of quantities

APPENDIX D. TOC DEVELOPMENT PROCESS

Figure 15: Generic Alliance TOC Development Process

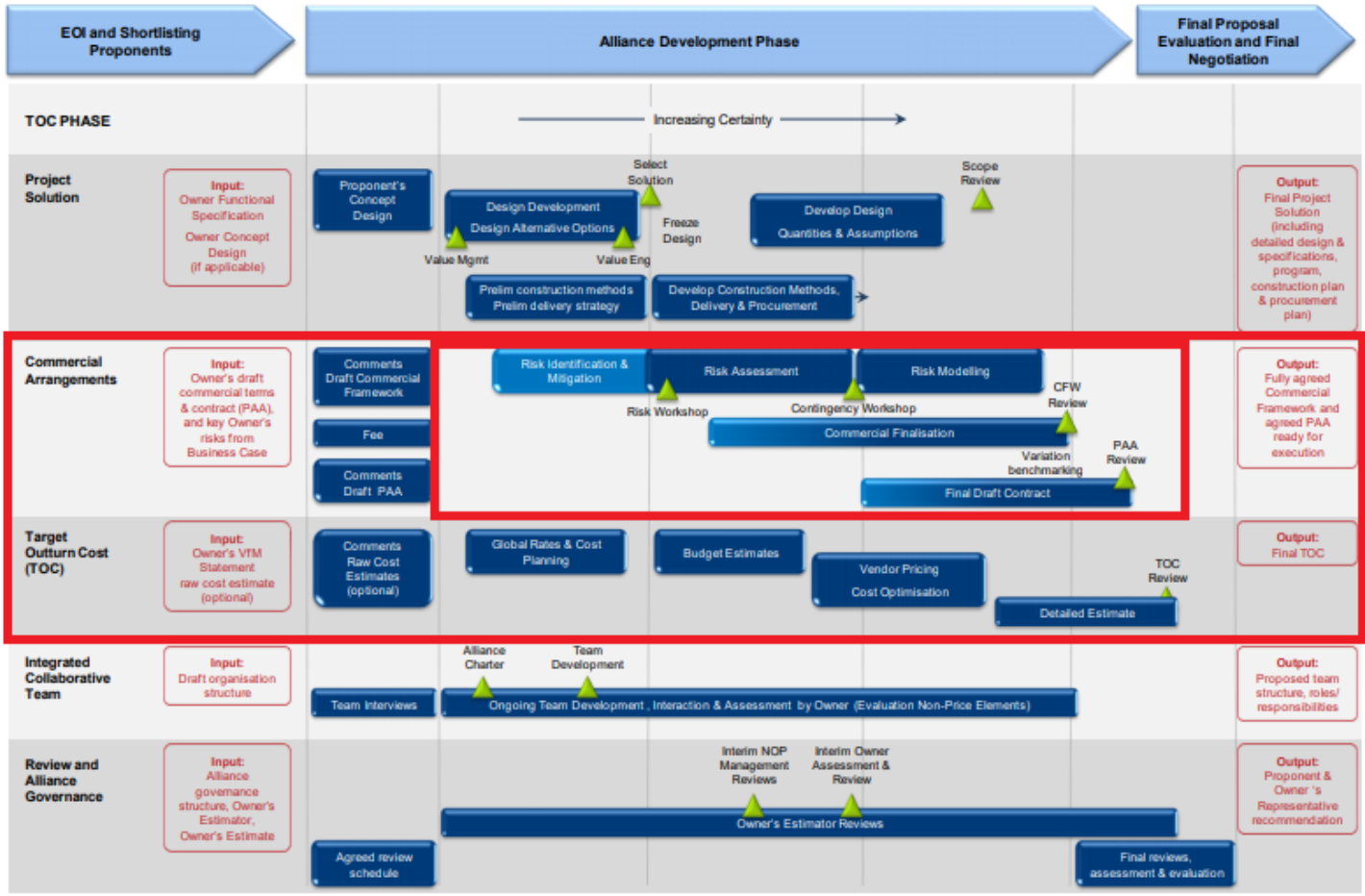


Figure 24. TOC development process (Department of Infrastructure and Transport, 2011).

The process of establishing the TOC in combination with the important moments of establishing commercial arrangements, which are important for the actual gain and pain sharing. Important moments in this process are a risk workshop, Contingency workshop, CFW review, and PAA review.

APPENDIX E. THE DEVELOPMENT OF TAB

The TAB development process therefore ultimately results in the following parts:

d) the technical project solution (the 'design');
e) the corresponding TAB;
f) the commercial framework.

These parts are the main building blocks of the alliance. These are listed below collectively referred to as the 'Project Proposal'

To adopt the Tab three forms can be distinguished here.
1. The TAB shall be established after the tendering procedure, together with only the contractor as the winner of the tender. The TAB plays no role during the procurement, not even in global form;

2. The TAB development process is an integral part of the tendering procedure, with as parts of each tender - in any case - the final TAB (together with the client), the design (elaborated to a greater or lesser extent) and the commercial framework. After the award, the Project Proposal is not necessary or only necessary limited adjustment or further elaboration before the alliance agreement is concluded can become;

3. The TAB development process is only partially completed during the tendering procedure, with each tender containing a global Project Proposal. Which means a global design (elaborated to a greater or lesser extent), a TAB with a certain bandwidth, and a concept commercial framework. After the award, the TAB development process will be continued with the winning tenderer

APPENDIX F. KPI'S IN TARGET COST

Before entering into the pAA the alliance needs to agree on how pains and gains need to be shared. Preferably the arrangement should be agreed upon for the start of the iPAA. Normally to start the negotiations the normal suggestion would be sharing the pains and gains by their respective Fees. These ratios could vary significantly depending on the actual Fee for the non-owner participants. This approach underpins the fundamental alliance principles of collective responsibility to facilitate a collaborative environment.

The generic model is sharing the cost under / overruns. In practice this means the actual outturn cost (AOC) compared against the TOC. In the research from Ross, the model from PCI is suggested as the providing model as a framework, which can easily be customized to suit the project alliance.

It is suggested that:

a) Cost overruns are shared 50/50 by owner and non-owners;
b) Underruns are shared 50/50 when performance in the non-cost areas is neutral. It can be adjusted up or down where the performance in non-cost are is inferior or superior to what was allowed for the TOC.

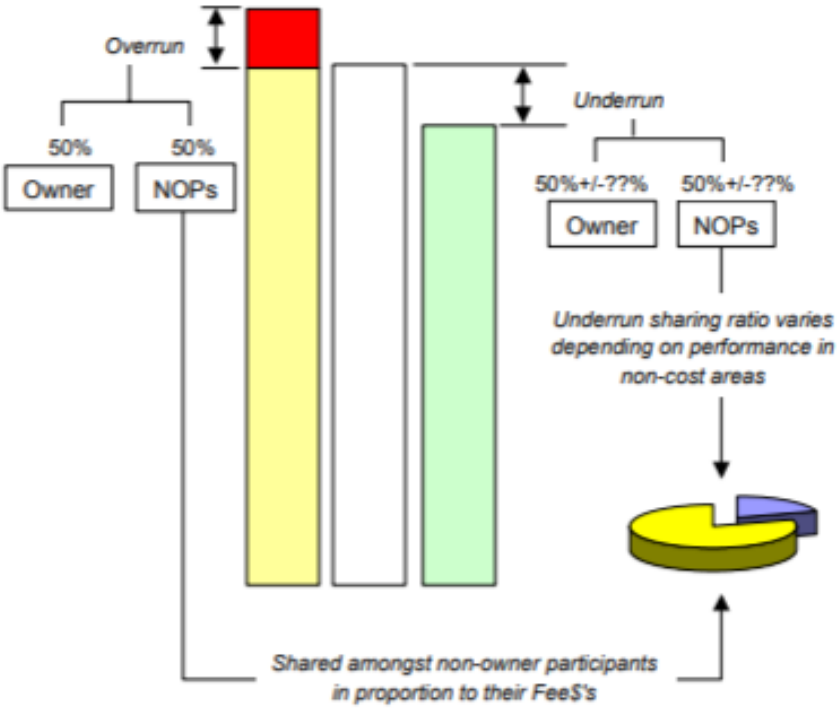


Figure 25. Gain Pain Share (Ross, 2003)

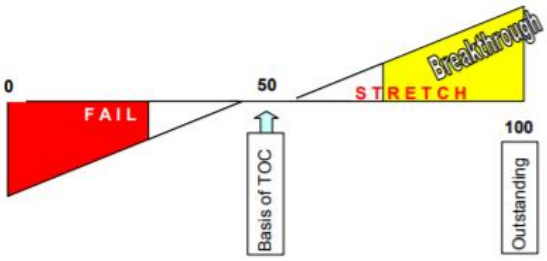
The gain pain share mode requires measurable KPI's for the performance indicator for non-costs. Inferior or superior performance is seen to add or to detract value from the owner. Think of the social environment, stakeholder management, etc. This ensures the owner that the non-owner participants share in the pains and gains depending on their performance.

Performance is expressed by the Overall Performance Score (OPS) with a scale between 0 and 100. According to Ross, the owner needs to declares what the key areas of importance are to define the KPI's. After that, the alliance participant develops a benchmarking and measurement system to determine a score to work with the OPS. Further explanation can be found in Appendix B.

(a) In the first instance the owner declares what are the key areas of importance to it.

(b) During the iPAA period the alliance participants develop a detailed benchmarking and measurement system to determine a score between 0 and 100 in each KRA across a performance spectrum whereby:

0 = Bottom end of failure
?? = Poor
50 = Basis of TOC
?? = Transition to outstanding
100 = Top end of outstanding



The OPS is calculated as the weighted average of the scores from the different KRAs (using weightings to be pre-agreed during the iPAA period), as illustrated below:

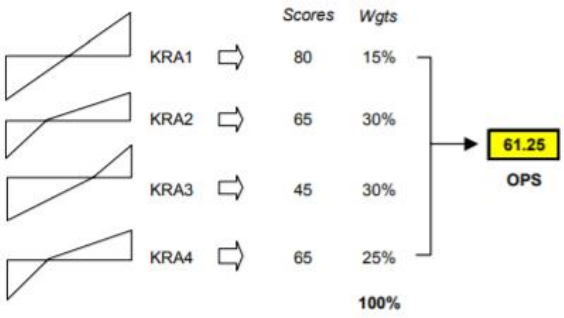


Figure 26. Overall Performance Score (OPS)

The OPS is part of two extra separate gain pain share mechanisms. The first mechanism is based on a maximum amount which will be put at stake based on the OPS score. This will be independent of the cost outcome. It works as follows:

a) If the OPS is more than 50% it means that the gains were associated with additional value that the alliance delivered. The owner makes an extra payment based on a sliding scale OPS% x Target cost, Where OPS% figure is agreed in the iPAA period;
b) If the OPS is less than 50% it is associated with poor outcomes of delivering by the alliance. The amount is reduced by the sliding scale;
c) If the OPS is neutral the outcome is in line with expectations and the agreed amount will be paid.

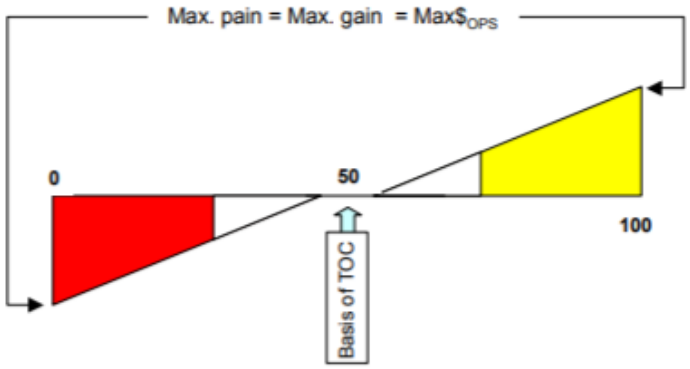


Figure 27. OPS Share Mechanism (Ross, 2003)

As an additional mechanism to ensure the performance in non-cost savings, the non-owner participants share of the gains is modified up or down from the default 50% up to a pre-agreed % deviation on a sliding scale in proportion to the actual OPS. The combined effect of the two OPS gain pain mechanisms is that when participants of the alliance move further into an underrun situation the amount at stake increase markedly, which ensures that there is always a significant amount at stake on the non-cost performance regardless of the cost outcome and continuous cost savings below the TOC are not achieved through compromises in non-cost areas. Non-cost areas as project management stakeholder management, environment, communication are mostly soft skills in alliance and therefore key success as well (Ross, 2003).

It is broadly accepted that the goal of the incentive should cover performance areas (Hughes, 2012). Currently, the main incentive is the pain and gain share mechanism. This means that the incentivization under the current Target Cost Contract has limiting goals to financial performance alone. When offering multiple incentive goals increased the incentive intensity and motivational power to deliver successful projects. (Rose and Manley, 2010).

Based on the literature Williams designed the following incentive framework for NEC target cost based on KPI's:

Performance Metric	Target Cost Percentage	Example Key Performance Indicator	Completion Percentage	Contractor Share (50%)	Client Share (50%)
Time	40%	Programme	0%	£-	£20,000:00
Cost	20%	Target Cost	20%	£5,000:00	£5,000:00
Quality	20%	Zero defects	20%	£5,000:00	£5,000:00
Health and Safety	10%	Zero accidents	10%	£2,500:00	£2,500:00
Sustainability	10%	BREEAM Excellence	10%	£2,500:00	£2,500:00
Overall Gain				£15,000:00	£35,000:00

Figure 28. Example incentive framework

According to the research of Williams, such an incentive framework could work, although some were sceptical about the ability to implement the metrics in the industry. Adding time which could lead to time savings and therefore cost savings could make the project better if parties do not rush. It's a fine line of time and negative incentive to over rush a project. But taking into account quality and sustainability the parties could get an extra incentive to get the full gain share. However, there was a strong suggestion from the interview data that it's a requirement to align the objectives of the project team. Secondly, the designers should become more commercially aware and highlighted the importance of information to be provided on a timely basis. This could potentially drive innovation which in turn could generate greater gains. The flexibility of the incentive frameworks would allow designers to be included in the share arrangement, with the overall motivation for

collaboration and integration of the supply chain. Further investigation is needed to give a better insight into the balance between the incentive factors.

APPENDIX G. SETTING THE TARGET COST NEC

According to Turner & Townsend, it's not yet known when to set the target cost. The earlier it is done the greater the uncertainty but the greater the potential for savings. In the feasibility phase, there is more potential for savings than when the contractor already started the construction phase. The difference to make in the target cost and actual cost is of course bigger in the feasibility phase than the construction phase. According to Turner & Townsend, there are two approaches to set the target cost.

The first approach is the single-stage approach where parties need to be able to set a robust target cost at the earliest possible state. This is only possible for certain types of work. It's an approach by programming the work. The target cost will be set at the outline design. Detailed design will follow and during the way, parties will be incentives to gain from the target cost to a lower detailed design cost to completion where the gain share is the savings/risk reduction or can see as defined cost + fee.

The second approach is the two-stage approach. The two-stage approach starts with an early contractor involvement. At the outline design, an initial estimate is made and savings/risk reduction will be converted to a sufficient detailed target cost at the detailed design. It's a challenge in agreeing on a robust target cost and to succeed the client should engage more than one contractor. With the first estimate to the detailed design, the first savings/risk reduction will already be made, but the contractor will withhold innovation/savings until after the target cost is set to get his extra gain share which is again the defined cost + fee (Expo, 2015).

Target costs may be set via the tender process, negotiation, or set by the client. It's a play at a level which offers value for money for the client and is achievable by the contractor, but still with room for gains to be earned by innovation or efficiencies. The target cost is the key to make it challenging and a successful arrangement. Unfortunately, there are no contractual provisions on how to set and agree on the prices. There can be guidance taken from the ECC and the accompanying guidance notes, but employers will have to set a process for agreement by themselves to negotiate the Target Costs.

The costs that the contractor makes are named the Defined Costs. The Defined costs are principally comprised of the physical work required to deliver the works as defined in the work information. This include:

a) The measured work;
b) Subcontracts;
c) All temporary works;
d) Preliminaries are both fixed and time-related.

The base cost should be priced net of risks or they should be clearly identified. For the fee, the overheads, profit, and insurance need to be taken into account. The contents of the Fee are not defined by the contract and should be discussed. For the risks, there is a shared risk pot of the contractors' risk allowance. The allowance for the contractors' risk is those risks that are not for the employer. These risks are not grounds for a compensation event. An allowance will be made by a traditional contractor tender (NEC, 2017).

The next step is to maintain the target costs. Target costs move with changes both positively and negatively and need to be evaluated by the contract. The following figure will explain the parts of the costs.

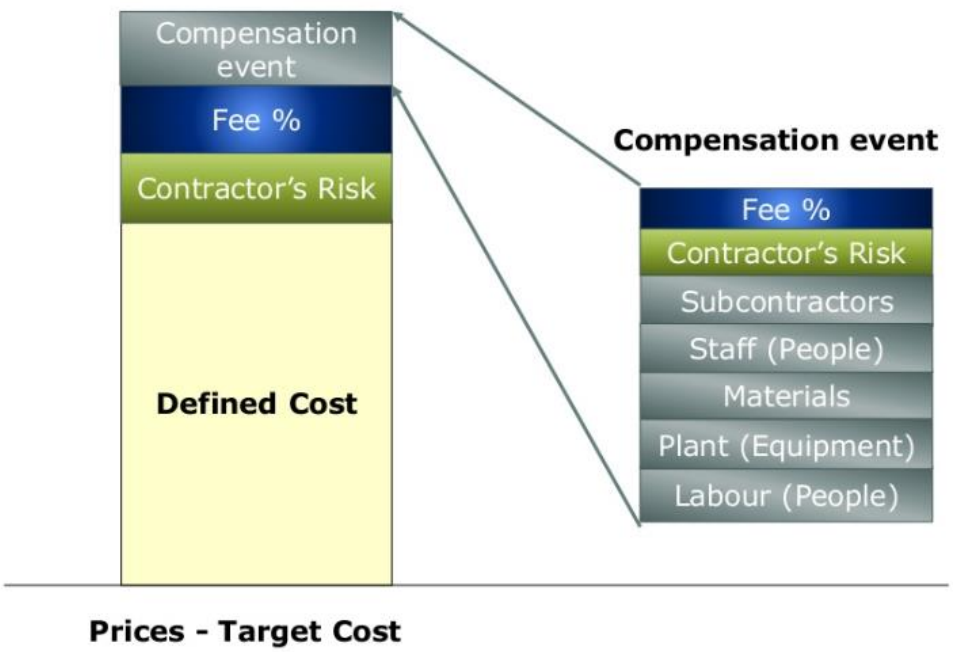


Figure 29. Cost Parts

Changes need to be agreed on when they are known or occur, this enables the pain and gain collaboration to still work. Verifying the defined cost need to be audited by a process to validate the costs. A sample audit is a common approach or forensic cost assurance. It needs to drive efficiency in the supply chain of the contractor. The NEC approach consists out of Defined Costs at the open market of competitive tender prices with deduction of discounts, taxes, and rebates. Material on-site need to be monitored and reviewed. Value for Money should be driven by the gain pain mechanism. Sometimes contractors try to incorporate Disallowed Costs. It may be costs which the contractor has incurred and fall under the definition of actual costs but have only be incurred due to some failure or defaults by the contractor. The employer can reject payment and therefore cost are borne entirely by the contractor. The definition is difficult and can be subjective. Identification and capture can be an issue. It creates behavior as hiding defect and snag-free handover. For the employers who are used to fixed-price contracts, paying for costs such as pre-completion defects and rework is a hard pillow to swallow, because it is part of the Defined Costs. But it's the philosophy of the NEC target contract to reach a collaborative environment (King, 2016). Permitting the recovery of the costs for the correction of defects pre-completion has, arguably, an indirect benefit to the Employer because when the Contractor is paid for remedying the defect, his Defined Cost increases. As a result, the Contractor's potential for making a gain share is reduced. If the Target Cost is exceeded, then the Contractor may have to give this money back. Therefore, the Contractor is incentivized to minimize the defects to keep Defined Cost down in the hope of ensuring a bigger gain share (King, 2016). Communication and open book basis should tackle this with trust in a collaborative environment.

APPENDIX H. SHARE PROFILES

In this appendix, the different examples of share profiles are explained.

Another practical option is to share to cost underruns 50:50 split and the overruns 100:0 due to the fact there wasn't any incentive for the employer to prioritize the maintenance which will lead to cost savings for the contractor. The contractor incentives the employer and itself to prioritize the maintenance and take on the first-hand attractive share profile for the employer.

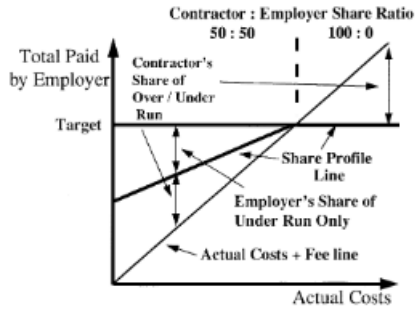


Figure 30. 50:50 - 100:0 share profile

This was especially for a project which was not that big and otherwise, there would not be any win made.

A variation on this scheme was made especially for bigger construction projects with large budgets and risks. There was a budget restraint by the employer at 110% of the target, which is a small gap and therefore gains and savings are wanted to succeed. To balance this a large share of the savings would be given to the contractor below the 90%. This is also a major saving to reach that and therefore the contractor was predominantly responsible for the initial design and detailed design. The idea then was that the savings would be re-invested to make the project better. The re-investment would be seen as a scope change and therefore raise the target cost. This allows the contractor to still get his saving gains. To motivate the employer again the employer will share more pain in the overrun to a certain level.

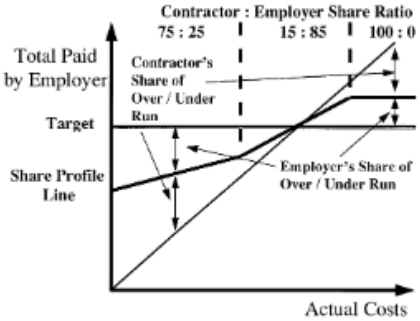


Figure 31. Share profile with savings, employer commitment, and re-investment

An addition can be done to this risk profile to get the contractor motivated to manage the risk for overruns as well, through the introduction of a progressive cap on framework contract. With a progressive cap, the contractor takes a greater share of any overrun until, at above 30% of the target. He will take 100% of any further cost overrun. This sounds unfortunate for the contractor, but in this play, the contractor is familiar with the work and is a party to set the target.

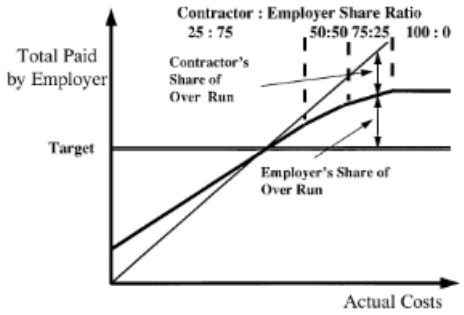


Figure 32. Share profile with progressive cap

These above-mentioned share profiles are for relative risk save projects. Having a relatively risky project the following risk profile would help. In this case, the work was subject to numerous constraints and risks. For example noise, vibration, traffic, etc.

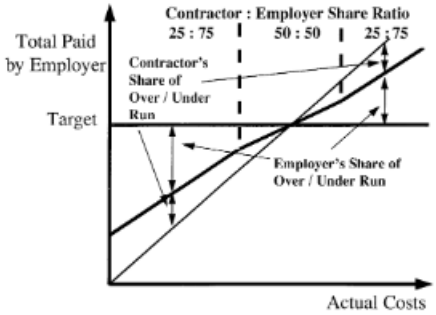


Figure 33. Share profile medium risk project

The target was developed with the contractor on an open book basis. This gave the employer insight and confidence in the design. If a significant underrun would happen the target cost would be wrongly calculated and unreasonable for the contractor to gain. Therefore the client gets the most of the underrun but also shared with the biggest part of the overrun because the employer was financially stronger than the contractor.

When using a new technique for a project with high risk another suggestion for a share profile can be made. Also here the employer was financially stronger but doesn't want to take all the risk and still want to motivate the contractor a share of pains of 20:80 was agreed on. The gain share either was 50:50. thinking behind the large share of any savings below the target being allocated to the contractor was that it allowed him to make a comparatively large profit if no breakdowns occurred. This would lead to a competitive tender target with the con-tractor making more effort to prevent equipment breakdowns once the contract was awarded. This situation is a key example of a collaborative partnering environment according to the NEC.

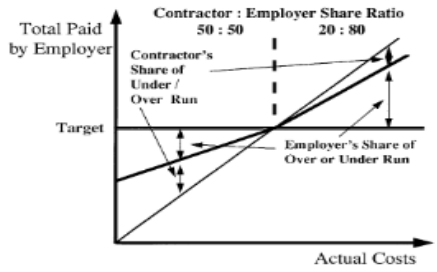


Figure 34. Share profile risky project with strong client

APPENDIX I. VARIATIONS OF BONUS-MALUS (SCHOL, 2008)

Bonus set beyond the requirement.
This variant of the bonus is set beyond the requirement and increases as the contractor improves performance is then the requirement. The client benefits from an earlier delivery date that has been agreed. If requirement, bonus is linked to the degree to which the building will be completed earlier than the final delivery date.

Bonus set on (or in accordance with) the requirement.
This variant of the bonus is only paid if the contractor meets the set requirement. Where the the contractor must also comply with the wishes and requirements of the other management aspects. States the principal the bonus on the requirement by linking it to the final delivery date, then this amount will only be paid if the delivery date has been reached. In addition, the wishes and requirements for the management aspects of money and quality. In this case, the bonus will lapse if a performance is delivered that is below the set requirement.

Bonus linked to indicator in case of wishes (no requirement).
A more desirable performance can also be obtained by steering a desire through a financial incentive. Through a measurable, verifiable and feasible agreement (indicator), the contractor is encouraged to, in addition to the requirements included in the contract are also incentivized to comply with the indicator / indicator in case of wishes.

The malus for undesirable behavior.
With this malus, the contractor is obliged to make the agreed malus, which is determined in advance, to be paid to the client if the "undesirable behavior" has occurred. An example of a malus imposed on undesirable behavior on the part of the contractor is the following agreement: "The the contractor is obliged to pay a malus of 100,000 euros if he closes the Dorpsstraat.

The malus with leeway for the contractor.
The malus applies if the client includes it in the contract that he does not accept any form of relapse and will therefore pay less for it. This shortcoming exists from the moment the relapse falls outside the agreement. An example of this malus is the following agreement: "If performance A is not met, but there is a lower performance in the form of B and C, then the client will pay EUR 10,000 and EUR 20,000 less for this respectively

APPENDIX J. CASE STUDY PROTOCOL

In the case studies, semi-structured interviews are used for exploration of the gain pain share mechanism to improve collaboration in projects. In special this interview is structured in a way to find information about the non-monetary gain pain sharing to find out how it possibly can be instrumented. Since both interviewer and interviewee are native Dutch speakers, the protocol is in Dutch.

Part 1. Introduction	Doel
• Voorstellen aan elkaar • Toestemming vragen voor het opnemen van het interview • Achtergrondinformatie delen over het onderzoek met het doel van het interview • Korte uitleg van de vragen • Rol van de interviewde bevestigen	Kennismaken met elkaar en context schetsen van het interview. Dit is de eerste stap waar al richting gegeven kan worden aan het onderwerp, zodat er in het verdere interview betere informatie naar voren komt.

Part 2. Samenwerking in het algemeen	Doel
1. Hoe is de samenwerking tussen de opdrachtgever en opdrachtnemer(s) verlopen gedurende het project? • Op welke manier is er aandacht besteed om een goede samenwerking te faciliteren? • Wat is je positief en negatief opgevallen in deze samenwerking?	Een algemeen beeld te schetsen van het project. Mogelijkheid tot context te beschrijven. Kan gebruikt worden in de vervolgvragen
2. Wat was de verwachting binnen de samenwerkingsrelatie van de opdrachtgever en opdrachtnemer?	Beeld krijgen van hoe de instelling was om het project in te gaan en wat men wilde
3. Had de samenwerking beter gekund? • zo ja, op welke manier en waarom is dit niet gebeurt? • Zo nee, wat ging er specifiek zo goed?	De geïnterviewde zelf een beeld te laten schetsen van de samenwerking en kijken of bepaalde methodes of factoren aangedragen worden voor de samenwerking
4. Welke processen / methodes met betrekking tot gain and pain sharing zijn er gebruikt om de samenwerking te bevorderen?	Overzicht van de gebruikte methodes, processen en/of afspraken die er gemaakt zijn in de case. Informatie kan gebruikt worden om gerichtere vragen te stellen verder in het interview.

Part 3. Specifieke gain pain share mechanism	Doel
Algemene uitleg Dit deel van het interview gaat in op de specifieke methodes voor samenwerking doormiddel van het gain pain share mechanisme geïdentificeerd uit de verschillende contracten. Methodes die terugkomen in de cases worden gevraagd hoe ze werken en of de samenwerking heeft bevorderd op de gewenste manier. Daarnaast wordt er gevraagd of deze methode wordt aangeraden. Over de methodes die niet terugkomen wordt gevraagd waarom deze niet zijn gebruikt en of deze wel zouden kunnen werken in bepaalde contexten.	
Vervolgvragen Als desbetreffende concept is toegepast worden er vervolg vragen gesteld: Werkte dit naar verwachting en is het een toevoeging van waarde aan het project? Belangrijk zijn daarin de factoren die een rol hebben in het succes en welke factoren een negatieve rol kunnen spelen in het succes.	

Wanneer niet: Had dit in uw ogen van waarde kunnen zijn? En kan een dergelijke methode toegepast worden in andere context/contract? Belangrijk hierin is de doorvraag van Waarom? Hoe? Waar blijkt dit uit? En voorbeelden Het doel is hiervan om inzicht te krijgen in de werkbaarheid van de methodes. Op welke factoren hebben ze invloed en stimuleert dit de samenwerking. Door dit te doen wordt het raamwerk uit de literatuurstudie getoetst en uitgebreid voor de expert review.	
Concept: Bonus-Malus	Opmerking: Belangrijk hierin is de doorvraag van Waarom? Hoe? Wanneer? Waar blijkt dit uit? En voorbeelden
Hoe is de bonus-malus tot stand gekomen?	Identificeren hoe de bonus-malus gevormd zijn en in welke gebieden dit toegepast is
Op welke gebieden in het contract zijn er bonussen opgenomen?	Identificeren van de gebieden waarop er gestuurd wordt in het project
Op welke gebieden in het contract zijn er malussen opgenomen?	Identificeren van de gebieden waarop er gestuurd wordt in het project
Is er sprake van performance gestuurde concepten (KPi's) om doelen te bereiken? - Heeft dit de samenwerking gestimuleerd? Zo ja, Hoe? Zo nee, waarom niet? - Heeft dit de geleidt tot behalen van project doelen? Zo ja, Hoe? Zo nee, waarom niet? - Hoe zijn de KPi's tot stand gekomen? - Waar liggen de gevaren bij het vaststellen van de KPi's?	identificeren hoe de KPi's toegepast zijn met bijbehorende beloning
Wat voor perverse prikkels kunnen er ontstaan door gebruik van bonussen en malussen?	Identificeren van knelpunten
Wat zijn de belangrijke factoren voor het vastleggen van een bonus-malus systeem?	Identificeren van interne & externe factoren die het succes van de bonus-malus bepalen
Concept: Target costs/risk reward scheme	Opmerking: Belangrijk hierin is de doorvraag van Waarom? Hoe? Wanneer? Waar blijkt dit uit? En voorbeelden
Hoe zijn de target costs tot stand gekomen?	Identificeren hoe de target costs gevormd zijn en in welke gebieden dit toegepast is
Binnen welke facetten van het project zijn er risico verdelingsafspraken gemaakt? - Heeft dit de samenwerking gestimuleerd? Zo ja, Hoe? Zo nee, waarom niet? - Heeft dit de geleidt tot behalen van project doelen? Zo ja, Hoe? Zo nee, waarom niet? - Hoe zijn pains verdeeld? - Hoe zijn de arrangementen tot stand gekomen? - Waar liggen de gevaren bij het vaststellen van de pains?	Identificeren hoe Pain sharing toegepast wordt en wat de positieve en negatieve factoren zijn
Binnen welke facetten van het project zijn er winst verdelingsafspraken gemaakt?	Identificeren hoe Gain sharing toegepast wordt en wat de positieve en negatieve factoren zijn

- Heeft dit de samenwerking gestimuleerd? Zo ja, Hoe? Zo nee, waarom niet? - Heeft dit de geleidt tot behalen van project doelen? Zo ja, Hoe? Zo nee, waarom niet? - Hoe zijn de gains verdeeld? - Hoe zijn de arrangementen tot stand gekomen? - Waar liggen de gevaren bij het vaststellen van de gains?	
Wat voor perverse prikkels kunnen er ontstaan door gebruik van target costs	Identificeren van knelpunten
Wat zijn de belangrijke factoren voor het vastleggen van een winst -en verliesdeling?	Identificeren van interne & externe factoren die het succes van target costs bepalen
Concept: Risico-pot	Opmerking: Belangrijk hierin is de doorvraag van Waarom? Hoe? Wanneer? Waar blijkt dit uit? En voorbeelden
Hoe is de Risico-Pot tot stand gekomen?	Identificeren hoe de Risico-pot gevormd zijn en in welke gebieden dit toegepast is
Welke risico's zijn er meegenomen in de Risico-pot? - Heeft dit de samenwerking gestimuleerd? Zo ja, Hoe? Zo nee, waarom niet? - Heeft dit de geleidt tot behalen van project doelen? Zo ja, Hoe? Zo nee, waarom niet? - Hoe zijn de risico's verdeeld? - Hoe worden beide partijen blijvend gemotiveerd? - Waar liggen de gevaren bij het vaststellen van de Risico-pot	Identificeren hoe een Risico-pot toegepast wordt en wat de positieve en negatieve factoren zijn
Wat voor perverse prikkels kunnen er ontstaan door gebruik van een Risico-pot	Identificeren van knelpunten
Wat zijn de belangrijke factoren voor het vastleggen van een Risico-pot?	Identificeren van interne & externe factoren die het succes van de Risico-pot bepalen
Concept: Sharing of new created benefits	Opmerking: Belangrijk hierin is de doorvraag van Waarom? Hoe? Wanneer? Waar blijkt dit uit? En voorbeelden
Hoe zijn de new created benefits tot stand gekomen?	Identificeren hoe de new created benefits gevormd zijn en in welke gebieden dit toegepast is
Hoe zijn de winst verdelingsafspraken gemaakt? - Heeft dit de samenwerking gestimuleerd? Zo ja, Hoe? Zo nee, waarom niet? - Heeft dit de geleidt tot behalen van project doelen? Zo ja, Hoe? Zo nee, waarom niet? - Hoe zijn de gains verdeeld? - Hoe zijn de arrangementen tot stand gekomen? - Waar liggen de gevaren bij het vaststellen van de gains?	Identificeren hoe sharing of new created benefits toegepast wordt en wat de positieve en negatieve factoren zijn
Wat voor perverse prikkels kunnen er ontstaan door gebruik van een sharing of new created benefits	Identificeren van knelpunten
Wat zijn de belangrijke factoren voor het vastleggen van Sharing of new created benefits	Identificeren van interne & externe factoren die het succes van de Sharing of new created benefits bepalen

Part 4. Ranking van de methodes	Doel
15. Van de besproken methode voor gain and pain sharing, Hoe belangrijk is deze methode ten opzichte van andere mechanismes voor de samenwerking?	Bepalen of er methodes zijn die goed kunnen werken om samenwerking te verbeteren
16. Is de besproken methode van gain and pain sharing, volgens u moeilijk breder te implementeren in de nederlandse bouwsector? Zo ja, waarom? Zo nee, waarom niet?	Bepalen of er methodes zijn die niet goed zullen werken om samenwerking te verbeteren

Part 5. Open vragen / discussie	Doel
17. Zijn er andere monetary en non-monetary (financiële en niet-financiële) gain and pain sharing methodes, concepten, processen en/of afspraken die gebruikt kunnen worden om samenwerking te faciliteren/verbeteren?	Inzicht krijgen of er methodes zijn gebruikt die het gain pain share concept kunnen versterken en een bredere aanbeveling gedaan kan worden aan de bouwsector als voor vervolgonderoek
18. In hoeverre hebben deze methodes, processen, concepten en/of afspraken invloed gehad op de samenwerking?	Inzicht krijgen over de invloed van deze methodes, concepten, processen en/of afspraken.

Part 6. Afsluiting	Doel
- Uitwerking ter validatie opsturen - Anonimiteit garanderen als gewenst - Mogelijk tot aanvullende vragen per mail bespreken - Mogelijke interesse in het uiteindelijke rapport bespreken	Afronden van het interview en de formaliteiten regelen omtrent de resultaten en het nadere contact.

APPENDIX K & L INTERVIEWS

Confidential

APPENDIX M. EXPERT VALIDATION PROTOCOL

Validatie protocol voor het onderzoek naar het inzetten van een gain and pain sharing mechanism voor een Nederlandse opdrachtgever.

Datum:
Naam:
Functie:
Ervaring:
Validatie nummer:

Introductie
Een korte introductie over mezelf om kennis te maken. Vooral het onderwerp introduceren en de Roadmap. Belangrijk is het idee van het onderzoek om samenwerking te intensiveren met een gain and pain sharing concept.

Onderzoeksdoel
Het doel van het onderzoek is om erachter te komen wat de positieve implementatie mogelijkheden zijn van het gain and pain sharing en dit via een Roadmap tastbaarder te maken voor de opdrachtgever.

Doel van het interview
Doel van het interview is om de conclusie uit het onderzoek te valideren. Dit betekent dus de generaliseerbaarheid van de concepten naar een Roadmap.

Structuur van het interview
Het validatie interview zal bestaan uit drie onderdelen. Het eerste onderdeel focust op algemene vragen over samenwerking en de concepten. Het tweede onderdeel zal zich richten op de conclusies van het onderzoek over de concepten. Het derde deel zal zich richten op de generaliseerbaarheid van de Roadmap. De roadmap zal ruim een week van te voren worden opgestuurd naar de expert, zodat deze tijd krijgt om het naar behoren door te lezen en zijn of haar mening/vragen te vormen.

Vertrouwelijkheid
Aangeven dat de expert ten allen tijde de conclusie krijgt te zien en vertrouwelijke informatie eruit kan halen en dit geheel voor eigen onderzoek gebruikt zal worden. Daarnaast de expert erop wijze dat het gesprek opgenomen wordt, mits er een bezwaar tegen is.

Interview
Deel 1. Algemeen

Onderwerpen/vragen
- Wat verstaat u onder samenwerking (Contract, persoonlijk etc.)?
- Wat verstaat u onder gain and pain sharing?
- Hoeveel jaar ervaring heeft u in binnen contractmanagement?
- Visie naar gain and pain sharing?

Deel 2. Validatie conclusies

In dit deel doorlopen we met de experts de steps per concept en valideren of dit inhoudelijk klopt. Denk hier aan de interne -en externe factoren, voorwaarden en uitzonderlingen van elke concept.

Deel 3. Validatie generaliseerbaarheid

In dit deel wordt de gehele Roadmap door de expert reviewen op generaliseerbaarheid. Dit betekent dus dat er gekeken wordt naar de toepassing van de Roadmap voor een opdrachtgever en of een consultant hier mee de opdrachtgever kan waarheidsgetrouw kan adviseren. Vragen zullen gaan over de benodigde informatie en helderheid in het proces.

APPENDIX N. CONCEPT ROADMAP

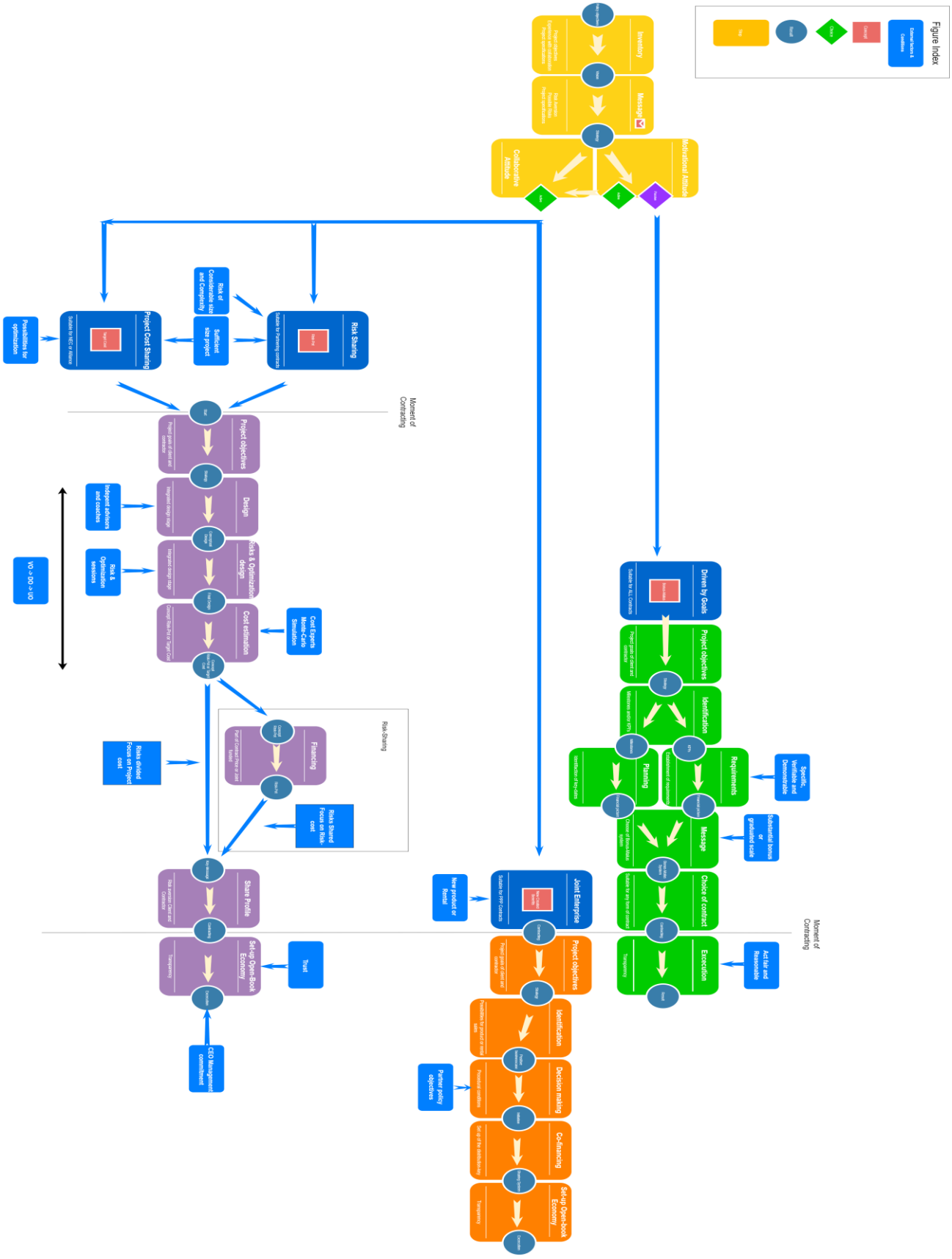


Figure 35. Concept roadmap gain-and-pain sharing

Figure index explanation

Blue Rectangle: indicates internal and external factors and conditions
Red square: Gain and pain sharing concepts
Green and Purple Diamond: Green and purple diamonds to give the different choice options clarity
Blue Circle: Results and starting point for the next step
Yellow Rectangle: Higher abstract level before choosing a gain and pain sharing concept
Green, orange, purple Rectangle: Concept steps
Black Line: Contracting moment to see when steps are taken

This roadmap is designed through findings from literature and case-studies and is meant to help the client to start and choose a gain and pain-sharing concept to incentivize collaboration and achieve project objectives. The roadmap is divided into two parts, where the first part is to get an understanding of the desired collaboration and the second part about the steps per concept. In this appendix the substantive steps are discussed.

Part 1

What is collaboration
The client will have to consider what collaboration means and what this would look like. This is the starting point for inventory which direction the client want with his project and the inventory of the package of circumstances. This involves policy objectives and project objectives, combined with collaboration experience. This results in a vision, which need to be translated to a message.

Strategy
As a client, you want to convey a strategy as a client. This strategy is based on the vision that you expand with possible project risks, project specifications, and own risk aversion. This means identifying what kind of risks are involved, how big these risks are, who can control the risks and what the own risk aversion is. Besides the risks other project specification such as duration, technicality, size, stakeholders, cost, innovation etc. This combined with the first step where objectives have been set creates a strategy for what the project needs. Then this strategy should be combined with the client attitude to choose a suitable gain and pain sharing mechanism.

Motivational and/or Collaborative attitude
The last step for choosing a gain and pain sharing mechanism is identifying the client attitude. The attitude is based on the strategy how to reach the objectives and the choice of contract. Take into account that a project have the following characteristics: complexity, customization, uncertainty, and long duration coupled with time pressure. These element scans differ and therefore different levels of collaboration are needed. The Different levels of collaboration are described as; a low level of collaboration primarily includes joint objectives and a charter, while in other aspects it is based on the same procurement and contractual arrangements as traditional arm 's-length relationships. In intermediate levels, the focus changes from short-term to long-term, which heavily affects trust, openness, risk-sharing, and continuous improvements. In high levels of cooperation, the team members identify themselves with the project team rather than with their employing organizations. This is facilitated by a common performance measurement system and a joint project office (Thompson and Sanders, 1998). The client needs to conduct an estimation of the characteristics to decide which level of partnering is needed and his own willingness to step in. This level of partnering comes back to attention in the attitude and conditions for a concept.

Motivational attitude passive
When to have a more distant role as a client and still want to motivate the contractor, a bonus-malus system based on milestones and KPi's is the option then. When a project has a high degree of scope certainty, risks are manageable and divided among the parties, costs are known and the client has no goal to optimize on project costs, there is the possibility to apply a gain and pain sharing mechanism in every contract form called bonus-malus. Despite a less high degree of scope security, the client can also choose to use a bonus-malus, but this will play a more secondary role.

Collaborative attitude active
When the client wants a an active collaborative role in the project, due to the fact of his vision and strategy or project specification the client can choose out of three options: Joint enterprise (Sharing of new created benefits), Risk sharing (Risk-Pot), and Project sharing (Target Cost). If the vision shows that the client wants to play a certain active role in the project, because an innovation on optimization is being realized and the project specification and strategy show that the risk can be better managed together, you arrive at a more active set of gain and pain sharing concepts that work from a Partnering principle. Therefore, other contracts also apply to be able to apply such concepts. Think of PPP or alliance, construction team and NEC. In order to make the right assessment, an explanation is given with the concepts why, when and how this concept can be applied.

Side Note: The reason why there is an active motivational attitude is because of the fact a bonus-malus mechanism can be used in conjunction with the other concepts.

Part 2
This is the part where concepts are split from each other and explained by key steps

Bonus-Malus
Motivational passive attitude to incentivize your partner with a gain or a pain by a bonus-malus principle for performance criteria and milestones. a bonus malus is widely applicable in various contracts. The bonus and / or maluses are aimed at achieving certain moments and bringing behaviour / performance to a desired level. This can be a bonus for achieving the desired level or for performing better than this desired level. The same also applies to maluses where the intention is to demotivate negative behaviour. Bonus-malus principle is more often applied when there is a certain scope of certainty so that it is clear what needs to be done and the bonus-malus can also be clearly and clearly coordinated because matters are clearly defined. Because it does not depend on other project specifications, it is possible to deploy it widely.

Project objectives
The first step for designing a bonus-malus is to look to the identified project objectives. These objectives are needed for designing the desired performance and milestones. The client must ask himself what incentive he wants to give to the contractor. Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent bonus-malus. This results in incentive strategy based on a bonus-malus.

Identification
The next step in the strategy is to further specify the performance and milestones where the client specifically wants to provide a motivational incentive. Requirements for the KPi's need to be specific verifiable and demonstrable. The next step is to financialise the bonus-malus.

Requirements and Planning
When applying a bonus malus, you can choose to apply to performance or milestones or both. For the highest achievable result, it is desirable to coordinate the bonus-malus via the following three communicating barrels of time, quality and costs. Once the strategy has been explored, defined performance and aligned milestones, it is important to keep this next to a financial picture. This means what are the benefits as a client that this performance or milestone is achieved. The desired bonus-malus amount can then be derived from this financial picture, in which account must be taken of the incentive this will give the contractor.

Message
Within the financial picture, there are of course various options for applying the bonus-malus. Here too it is important which incentive you as a client want to give the contractor. Think of a bonus that is gradually reduced or a bonus that immediately turns into a malus. This depends on the capacity and the leeway you give as a client. Identification of how hard a requirement date or wish is leading in this. In practice, this will always be custom work. Research does show that small bonuses often work for a small change in behaviour to streamline work, and the larger substantial bonuses can significantly change behaviour and / or performance.

Choice of contract

As a final step, which actually no longer belongs to the concept itself, but is important for the implementation, is that the bonus-malus can be applied in all contract forms, provided that it is known to the tendering parties in accordance with the procurement law.

Moment of initiation
When the process and the bonus are communicated transparently, the contractor will understand the situation more and make a better effort in the project. What often happens, however, is that a bonus-malus generates perverse incentives, because the contractor already includes the bonus in the contract price at the time of tendering. The initiation of a bonus-malus would therefore be more appropriate if this is later determined in collaboration with the contractor. However, this is a legal grey area. This means using an Alliance or Bouwteam it could be initiated after moment of contracting and then the earlier mentioned steps will follow. A down-side of this way of working is that a contractor is less likely to agree to a malus scheme. On a side note: act of fairness and reasonableness helps to succeed in your project objectives and mutual understanding.

Joint enterprise by sharing of new created benefits

A gain and pain sharing mechanism which incentivize collaboration by a joint enterprise of a new created benefit. Important starting point for this mechanism that it's based on the selling of a (new) product or rental of temporary space. It's currently suited to long-term PPP environments with PPP contracts. The idea of a joint enterprise is that when both parties have a win-win situation performance is optimized.

Project objectives
The first step is to design joint enterprise is looking into the identified objectives and possibilities to achieve a goal by means of a joint enterprise on the basis of, for example, the sale of a product jointly. The client must ask himself what incentive he wants to give to the contractor. Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent sharing of new created benefits. This results in incentive strategy based on a possible joint enterprise.

Identification
The next step is a deeper identification of the possibilities for product sale or rental to design a positive business case. This can be done by the client or contractor or together. The business case for the sale of the product will guide the decision-making process.

Decision making
The decision-making process is based on the procedural conditions of the contract. Most of the time it's an extra activity besides the normal activity that is asked by the client and therefore new arrangements need to be made. Contractor objectives can help the decision-making process with higher management level commitment. The business case will be the central point of attention to discuss. When is decides to proceed with each other financing decisions need to be made.

Co-financing
The idea of sharing of new created benefits and therefore sharing pains and gains is the distribution key by co-financing. Based on the co-financing the distribution key is determined and a sharing system is established. This means how much every parties invest and based on this amount a share profile will be established.
once the financing has been agreed and the percentages are fixed, the last step is to make it operationally workable.

Set-up Open-book Economy
To collaborate an open book-economy is needed. All costs and profits will be put in the shared profit and loss account, which is transparent. When it is in an open-book administration, it can also be managed by both parties. Side note a PPP environment with long-duration strengthened the ability and willingness to share and start a joint enterprise.

Risk Sharing by Risk-Pot and Project Cost Sharing by Target Cost

A full collaborative active attitude to incentive collaboration and achieving mutual objectives can be realised with a Risk-Pot or Target Cost mechanism. These concepts come off the ground after moment of contracting. A collaborative partnering environment is needed. This means an Alliance, Bouwteam or NEC contract. A Risk-Pot

benefits from sufficient size project with risks of considerable size and complexity, otherwise there is nothing to the share. The main reason for choosing a risk pot is because there is a certain scope of uncertainty that results in risks that are more manageable by the client and contractor jointly. Project cost sharing by target cost benefits also from a sufficient size project, with possibilities for optimization in for example technical design and materials. The main reason for choosing a Target cost is because there is a certain scope of certainty where you want to create a win-win situation by working together on optimizations within the project. The idea is that working together to optimize the project will result in higher quality for a better price where a contractor will earn a sufficient amount of money as well.

With a target cost concept, the scope certainty is important for the pricing of the project and set a suitable target price. A hard condition for this concept is the use a specific target cost contract such as NEC or target alliance. Because a partnering environment is important for these concepts, it first starts with contracting the contractor, after which the steps to shape the mechanism are set in motion. In some cases with a Target cost contract it may be possible that a calculation is requested from the contractor on the basis of a Pre-design, which will serve as a guideline for the target cost. In both cases, the steps to be taken are the same, but with a different approach, which will be explained. In some cases there is also the possibility of ending up in this process after the award, because the project nevertheless requires such a form of partnering and gain and pain sharing. It is then possible to form part of the project from, for example, a D&C in a construction team or alliance, in order to be able to actively collaborate in this area.

Project objectives
To design an effective risk or project cost-sharing mechanism, project objectives from client and contractor need to be identified. Think of optimization, quality, time, cost, etc. as objectives for choosing the right option. Objectives in the direction of quality optimization and cost of project are more suited to target cost. Objectives in the direction of innovation, risk management and cost are more suited to Risk-Pot. But it still depends on what the incentive the client wants to give to the contractor. In reality it remains customization Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent strategy for incentivization of collaboration.

Design & Risks and optimization design
Starting from the preliminary design phase together to the execution design phase. For target cost, the client can start with a final design to optimize with the contractor to the execution design. The idea in this stage that the client and contractor collaborate by risks and optimizations sessions to understand each other and the project. Independent advisors and coaches can steer both teams in the right direction to collaborate. Risks need to be of considerable size and complexity, otherwise, it costs too much money to implement a gain and pain sharing mechanism. Besides the risks room for optimization is desired, otherwise, there is nothing to share and collaborate. This step is the deeper continuation of the first step to the objectives, where in this step the actual possibilities are looked at by means of the design. Risks for sharing and optimization possibilities are identified at the end of this step/phase. This stage is very important for establishing the right Risk-Pot or Target cost and demands a lot of collaboration already. The process itself already incentive collaboration and the start to create mutual objectives.

Cost Estimation
When risks are divided and final designs are made the cost estimation process can start. The cost estimation part is one of the most important steps. If cost estimation for risk-pot or target cost is done wrongly the mechanism will fail. For good cost estimation cost experts at both sides are required and knowledge about simulation software such as Monte-Carlo simulation. with an insufficient target cost, no quality will be achieved and the contractor will be spending cuts. If the target cost is very large, the incentivize for optimization will fade. When a risk pot is not calculated correctly, the motivation to be close to controlling the risks can fade away. Inadequate risk pot can also lose motivation because it is just a lose-lose situation and profits evaporate.

Financing (Risk-Pot)
There are three options for financing a risk-pot. The purest form is financing where physical money is invested by both parties, as in a pure form of alliance. The second option is to split off part of the contract price for the risk-pot. As a last option, more of a light form of the risk-pot is a risk list. When a risk occurs, payment is made according to

the list. In this step the arrangement how to finance the risk-pot in this step. Financing of the target cost is done by the client off course.

Share Profile
When everything has been arranged around the cost estimation of target cost and financing of the risk pot, the core element of gain and pain sharing will of course remain the distribution key or the share profile. This is the arrangement of the share percentages for a cost under -and overruns. What kind of message do you as a client want to give to your contractor. Different share profiles can have different purposes for example a budget cost control sharing is different from one for quality or innovation purposes. Take into account the risk aversion as a client and the risk aversion of the contractor. More information about share profile possibilities can be found in Appendix H.

Set-up Open-book Economy
To collaborate an open book-economy is needed. All costs will be put in a shared account, which is transparent. When it is in an open-book administration, it can also be managed by both parties. Side note: a partnering environment, trust, willingness, and commitment of CEO management level can strengthen the sharing by risk-pot or target cost.

APPENDIX O. SUMMARY EXPERT VALIDATION REVIEW

Validatie Jaap de koning

De inkopers spelen een enorm grote rol in het gebied van gain and pain sharing omdat die de contracten schrijven en maken. Doordat inkopers eigenlijk niet de juiste kennis hebben en vooral voorwaarden schrijven op zekerheden die snel gezien worden als een pain. Denk aan boetebeding op oplevering, maar geen bonus. Inkopers bepalen vaak hoe het gewoon op de markt wordt gezet. Zorg dat de macht bij het projectmanagement team komt. Bespreek juist de wensen, de scope, de visie etc. Inkopers doen geen bouwproject. Het is geen product maar proces. Kijk goed naar de inkoopvoorwaarden en hoe dit door vertaald worden in het project. Management speelt een actieve rol in het meedenken welke incentives voor welke project doelstellingen om de juiste partij te selecteren, anders heeft het al helemaal geen zin. Bewust kiezen voor een mechanisme helder maken. Stuur op een bewuste keuze.

Regel bijvoorbeeld intern een dag waar alle afdelingen bij elkaar gaan zitten. Stel vragen naar risico-houding, standvastigheid, houding dichtbij of ver af. Afwegingsmodel socrates. Wat er nog meer in zit is omgeving, mark en projectmanagement aspecten, project specificaties. Kijk heel goed naar de randvoorwaarden van het contract, want anders kan het niet werken zonder bewustwording dat er voor deze mechanismes verandering nodig is.

4 aandachtsvelden socrates. Is het project rechttoe rechtaan (wat voor project) en wat voor doelstellingen zijn hier aanwezig. Innovatie en uav-gc gaan niet samen. Tweede is projectmanagement aspecten, de markt en omgeving.

In het nieuwe bouwteammodel zit geen vaste risico-pot in. Grote zekerheid incentive in het nieuwe bouwteam fase is het vaste winstpercentage en dit combineren. Wat goed kan werken voor klein beetje zekerheid is, op de vo begrotingen vragen voor de aanbiedingen en dan wordt het bijvoorbeeld het plafondbedrag na gunning en dan komt de risico-pot voor gezamenlijkheid. Risico-pot die het meest zuiver is volgens de pure vorm van alliantie. Hier moeten beide partijen beide geld instoppen en dat is toch eng, omdat iemand anders ook dan over jouw geld gaat. Bij een bouwteam is het vaak een papierending en is het meer een verrekening post. Start met kleine projecten om het te ontwikkelen. Openheid over risico's is een key factor. Optie van risico-optie is een risico-pot zonder pot meer een lijst waar je afspreekt waar je beide pijn voor zal dragen en dan kan jezelf kijken of je dit herverzekerd of een eigen potje voor achter de hand houdt.

De instelling van beide partijen is van zo groot belang en de ervaring ermee. Heb je niet de juiste instelling begin er dan niet aan. Wat is de houding van de opdrachtgever en dat is zo belangrijk. Je moet het eens zijn over de scope, risicodossier en de prijs voor het realiseren van een gain and pain share mechanisme.

Zou het kunnen werken om eerst in een D&C op de markt te brengen en dan om te bouwen naar een bouwteam of alliantie? Het is wel een ander signaal wat je dan aan de markt geeft. Het is niet perse een positieve instelling. Het creëert verschillende verhoudingen en complexiteit. Biedt mogelijkheid tot manipulatie. Je zou ook het bij de aannemer kunnen neerleggen hoe zij de risico-pot zien en beoordelen. Bij bonus-malus moet je heel erg goed nadenken over welke prikkel je wil meegeven en hoe dit uitwerkt in het project. Denk hier creatief bonus hoeft niet altijd in euro's te zijn. Trek het gain and pain sharing mechanisme eens een stuk breder. Raamcontract kunnen hier een rol in spelen in de nieuwe manier van gain and pain sharing met een bonus-malus idee. In de basis kloppen deze bonus-malus stappen.

Sharing of new created benefits goed voor productie omgeving zoals water en energie, maar ook bijvoorbeeld innovatiepartnerschappen zoals in Amsterdam met kademuren. Hier ontwikkelen ze samen om te vermarkten. Vanuit de objectives en mogelijkheden zal men een businesscase vormen inderdaad. Deze zal dan dienen als startpunt voor het besluitvormingsproces.

Meer onzekerheid bij target cost levert een hogere opslag. Je kan als opdrachtgever alle onderzoeken financieren zodat opdrachtnemer het risico overneemt. Target cost wordt wel vaak gezien als vaste prijs voor de opdrachtnemer. Ze gaan lijstje maken met wat er in zit en wat niet en een lijstje wat er niet bij hoort. Die lijstjes bepalen de waarde van de target price. Het positieve aan open book en target cost is dat het onderwerp open op tafel ligt en te vragen hoe zit het nou eigenlijk met de kosten. Goede projectleider speelt hierbij een rol.

Risico-pot en target cost stappen kloppen naar behoren volgens het maatwerk. In elke stap zullen de objectives meegenomen moeten worden om de juiste afwegingen te maken, vooral met betrekking tot de share profile. Wanneer iemand meer risico's op zich neemt wilt die natuurlijk wel meer van de beloning kunnen krijgen of vooruitzicht op hebben. De risico aversiteit speelt hierin een rol wilt men de pains tot een maximum laten gaan voor de opdrachtnemer of voor zichzelf.

Opdrachtgevers moeten bewuster kiezen met oog op stimuleren en eigen rol. Toekomst ligt toch in het programmatisch aanbesteden met de grote vervangingsvraag van kunstwerken en onderhoudsklussen. Hier zijn veel meer leuke maatregelen in te bouwen ten aanzien van langdurig samenwerking. Dit biedt kansen voor het gain and pain share mechanisme.

Validatie Marco Westhuis

Projecten starten bij de inkopers waar al snel naar de details van een bepaald contract gekeken worden zonder eerst goed te inventariseren wat er nodig is. Zoals in de roadmap beschreven is zou het idealiter met een sessie moeten starten waarin bedrijfsdoelen en project doelen op elkaar afgestemd moeten worden. Om de visie compleet te maken is het van belang om de project specificaties in het achterhoofd te houden en af te vragen waar je al opdrachtgever prettig bij voelt in een samenwerking. Als opdrachtgever moet er ook gekeken worden of ze zelf wel klaar zijn voor een bepaalde manier van samenwerking. Vanuit die visie kan ik bevestigen dat de strategie afhangt van zoals gezegd de eigen instelling van de opdrachtgever ten aanzien van risico aversiteit. Een afstandelijke opdrachtgever die het liever traditioneel vanaf de zijlijn stuurt zal een dergelijk partnering gain and pain share mechanisme niet gaan toepassen. Vraagt het project om een gezamenlijke risico beheersing zal het toch stappen moeten maken binnen de organisatie hier klaar voor te maken.

Malussen geven verkeerde signalen die vaak onredelijk zijn, maar opportunistische aannemer wordt vaak ook niet gestraft. Malussen heeft toch een idee van vechtcontract en dat komt de samenwerking niet ten goede. Doe je zonder boetes is dit vaak later niet meer mogelijk ineens toch toe te passen.

Je zou het later in een alliantie vorm te kunnen gieten om de perverse prikkel weg te nemen, omdat bonus-malus na de aanbesteding wordt vastgelegd. Hierdoor is het echt een bonus en een boete en niet doorberekend in de aanneemsom. Dan is het iets wat er boven op komt en de aanbesteding is voor iedereen hetzelfde geweest. Het effect van je beschreven stappen met een positievere uitgangspunt doormiddel van bonussen werkt niet altijd, omdat de extra inspanningen hiervoor meegenomen worden in de aanbestedingssom, wat resulteert in een verkapte boete.

Wat je vaak ziet dat het project eerst in een D&C contract gestopt en dan omgevormd. De aannemer heeft een aanneemsom met een risicoprofiel en de opdrachtgever ook die afgeprijsd zijn en dan kan je ze herverdelen voor een mooie prijs. Met het herverdelen heb je al wat in te brengen, bijvoorbeeld zijn risico's. Doe je dit bij een alliantie heeft de opdrachtnemer niks in te brengen, want de risico's liggen nog bij de opdrachtgever en zit het nog niet in de aanneemsom. Het belang is anders. Na gunning ombouwen kan dit oplossen om het evenwichtiger te maken, waar een aannemer meer in te brengen heeft.

Wil je bonussen via andere contractvormen zoals een bouwteam toepassen, krijg je hetzelfde bij het afstemmen van de prijs en risicoprofiel dat na de tweede gunning de bonus toch een boete weer wordt. Het zelfde effect. Om de bonussen juist aftestemmen zou de opdrachtgever moeten starten met de strategie op basis van zijn objectives. Op basis hiervan geef je de opdrachtnemer een prikkel mee die afgestemd op een financieel plaatje en concrete, meetbare prestatie-eisen en milestones. De genoemde problemen kunnen opgelost worden, maar hebben in eerste instantie geen invloed op de proces stappen, alleen op de toepassing wanneer. Wanneer start men deze stappen voor of na gunning.

Wanneer een groter deel geen discussie is doe je gewoon D&C en dan de rest in een alliantie. De vraag die je moet stellen is het D&C af te prijzen door bijvoorbeeld te hoge risico's. Je kan dit toepassen door twee delen opdrachten uit te schrijven. Is het risico heel groot en is de methode niet bekend dit op te lossen kan je zelfs kiezen voor een bouwteam waar na onderzoekskosten de methode afgeprijsd zal worden en eventuele risico-pot nog voor worden opgesteld. Je gaat aanbesteden bijvoorbeeld deel raw-bestek en een deel bouwteam etc. voor deel wat af te prijzen is krijg je marktconforme prijs en voor de selectie van de partij, wie is de beste bouwteampartner.

Risico-pot in een D&C contract is niet gezamenlijk en zal door vertaald worden in de aanneemsom en komt dan toch weer bij de opdrachtgever terug.

Wanneer een project niet af te prijzen is kan je hem niet standaard aanbesteden. Dan moet je kijken of je dit kan opsplitsen en het zo mogelijk maken of in zijn geheel in bouwteam of alliantie te gieten direct.

Stel je plan is eerst D&C en dan alliantie, dan moet je wel een heldere onderbouwing hebben. Met een goede inschrijvingsstaat met objecten en kosten, zodat je kan isoleren waar de alliantie over gaat ten opzichte van de rest van het werk.

Verdiepen in de objectives van de opdrachtnemer is heel belangrijk. Wat zijn de prikkels en echt de drive van de aannemer. De belangrijkste conclusie is dat het maatwerk is. Het potje wat je neemt moet reel zijn en passen en je doet juist omdat je de risico's niet weet. De stap die de opdrachtgever dus in het begin maakt zal daarna ook samen gemaakt moeten worden om een reele afstemming te maken van een gezamenlijke beheersing bij een risico-pot of target cost. Het is van belang dat hiervoor zoals genoemd in de roadmap een bepaald partnering contract is gekozen om dit proces te ondersteunen. De verschillende design fases met bijbehoren blik op scope ten aanzien van risico's kosten en planning zijn een terugkerend thema. Wanneer dit ver genoeg is uitgediept kunnen er kostenramingen gemaakt worden waar het van belang is dat er de juiste cost expertise is. Dit kan een onafhankelijk cost expert zijn of gezamenlijke cost expertise aan beide kanten. De verdeelsleutel die men aangaat geeft aan hoe de verhoudingen zijn. Gunt de opdrachtgever de opdrachtnemer de mogelijkheid om winst te maken of sturen ze op kwaliteit. Verschillende share-profiles zullen afgestemd moeten worden op de prikkel die de opdrachtgever wilt meegeven om de doelen te bereiken. Dit zal altijd maatwerk zijn. De open-book economy speelt hierin een grote rol om het samen te beheersen. In de huidige tijd raakt dit principe die vooral terugkomt in een bouwteam steeds meer de standaard. Een open-book begroting geeft openheid en vertrouwen naar elkaar dat er geen geheimen zijn en gezamenlijk aan het project gewerkt wordt. Bij hogere kosten kan er begrip worden getoond, omdat er duidelijkheid is waardoor dit kan komen. Hierdoor creëert men wederzijds begrip.

Scope is enorm belangrijk met bijvoorbeeld een taakstellend budget om keuze te maken voor een dergelijke mechanisme. De vraag is altijd ik heb een wens en kan ik dit als pakketje aan de markt geven of een bestek of juist de aannemer laten uitzoeken of samen. Ligt dit ergens tussen in dan zijn dit te tussenvormen waar je uit zou kunnen komen.

Sharing of new created benefits is aanbestedingsrechtelijk een moeilijk verhaal. Het moet eigenlijk al onder de voorwaarden dat onder de opties in de eerste publicatie van de aanbesteding al genoemd zijn. Het is de randjes opzoeken. Dit werkt beter bij bouwteams en pps/alliantie, want je kan niet uitgaan van innovaties bij een D&C contract. Het zal dan wel een samenwerking moeten zijn voor langere tijd, want anders zal men zich niet aan elkaar verbinden. Het lijkt mij logisch dat er eerst door één van de partijen een businesscase wordt ontwikkeld als uitgangspunt voor de besluitvorming, waarna een share-profile op basis van de investering en moeite afgesproken wordt. Om iets te kunnen delen is het open-book principe hier inderdaad nodig.

Reële kosten met goede prikkels maken het juist tot een beter project. Kijk goed naar de prikkels die je geeft. Beste partij met vertrouwen doet wonderen. Kies voor best value for project bij alliantie of bouwteam. Voor D&C kan je elementen uit best value in je emvi meenemen om een juiste partij hierbij te zoeken.

Validatie Gerard Buunk

Het is momenteel nog geen common sense om dergelijke mechanisme toe te passen. De sleutel is om samen een bijdrage te leveren om een risico te tackelen en dan is het waardevol om naar een dergelijke mechanisme te kijken. UAV en UAV-gc geeft weinig ruimte voor een gezamenlijk deel. Je kan door een gain and pain share mechanisme juist de gezamenlijkheid afdwingen. Er kan hierdoor een natuurlijke prikkel ontstaan om elkaar te helpen. Het process in een bouwteam zorgt voor een samenwerking proces waar dergelijke mechanisme goed in ontworpen kunnen worden. Het nadeel is dat bouwteam nu vooral volgens een uav-gc worden opgesteld en dat men in de uitvoering op de oude voet verder gaat en samenwerking op deze gebieden afneemt. Een alliantie is dan toereikender.

Het is beter als er in een vroege fase al dergelijke mechanisme te bespreken. Aan de hand van de genoemde factoren in je stappenplan vroeg het gesprek te beginnen en de juiste keuze te maken voor samenwerking. In de huidige

situatie gebeurt dat in een alliantie of bouwteam om vervolgens tijdens de uitvoering naar een ouderwetse rolverdeling te gaan, waar ieder zijn eigen deel doet. Hier valt de gehele gezamenlijkheid weer weg. Bedenk wat je wilt bereiken in je project en met elkaar. De belangen moeten eerst op tafel komen en dat eerst te bespreken voordat je in details gaat treden. Zoals beschreven in je eerste stappen tot de keuze van het proces en de eerste stap weer die je maakt na de keuze van een concept. Hoe wil je in de basis dat dit project gaat werken. Uitgangspunten dus samen vaststellen die zijn bepalend voor de koers en de detailinvulling.

Als je veel omgevingsfactoren stakeholders hebt is het heel verstandig om een alliantie constructie te gebruiken, omdat je niet weet wat er tijdens het bouwen gaat gebeuren vanuit deze omgevingsfactoren. Hoeveel onderzoeken je ook doet krijg je in sommige projecten gewoon niet alles naar boven en zal een gain and pain share mechanisme kunnen schikken.

Normaal heb je een PSU waar de beweegreden eigenlijk op tafel zouden moeten komen, alleen vaak gebeurt dit niet doordat vanuit de aanbesteding al is gestuurd op een bepaalde factor. De mindset van hoe de opdracht in de markt is gezet is hierin de factor of je ook openheid terug krijgt. Het blijft een kwestie van houding en gedrag. De aanpak kan alleen slagen als de aannemer een redelijke boterham kan verdienen of vooruitzicht op heeft. De aannemer en opdrachtgever wil zekerheid. Ze moeten kijken hoe ver je met elkaar doorgaan. Heeft de opdrachtgever genoeg zekerheid wat er gaat komen en de opdrachtnemer wat te gaan bouwen, dan kunnen dingen afgeprijsd worden. Voor de risico's waar beide wat aan gedaan kan worden kan dan in een risico-pot gestopt worden.

Als je eerst een D&C project in de markt zet voor 80% krijg je dit afgeprijsd terug en kan je voor die andere 20% een bouwteam opzetten, waar je opzoek kan gaan naar optimalisatie en beloning. Dit is zeer geschikt voor target cost. Deze 20% is dan een soort ontwikkel pot.

Sharing of new created benefits is ideaal voor extra inkomsten voor positieve businesscases waar ruimte is voor ontwikkeling van een product. Gezien de kennis en mogelijkheden van het concept lijkt mij het interessant om vaker toe te passen voor ontwikkeling van producten in de inframarkt.

Bij grotere projecten gaan er grotere belangen spelen en is het lastig te verkopen om ruimte voor onzekerheden in te prijzen in het budget en ze gaan begrenzen in de mogelijkheden voor gain and pain sharing. Wanneer je een risico-pot gaat toepassen komt het onderwerp wel vaker op de tafel wat al een positief effect kan hebben op de samenwerking. Vanuit de objectives zal de koers bepaald worden en de design stappen doorlopen. De design stappen kunnen van VO tot UO doorlopen waarna cost-estimation gedaan wordt. Het is maatwerk per project wanneer men vindt dat scope zekerheid genoeg is voor het afprijzen van het project en het realiseren van een risico-pot of target cost. De cost estimation is de vervolg stap, hier is open-book economy al van belang voor het realiseren van het mechanisme. Zonder openheid in hoe men tot prijzen zullen partijen elkaar niet vertrouwen en niks delen. Openheid in de financiële berekening die vervolgens gezamenlijk overeengestemd kan worden is de basis voor verdere verdelingsafspraken (share-profile).

Open book principe is de basis. Bij de emvi kan je al vragen hoe ze openheid gaan geven over de uitvoeringsprijs. Gezamenlijk kijken naar onderaannemers en leveranciers en daar van eisen dat ze ook openheid en transparantie bieden. Dit kan beteken wel opslagpercentage er op een onderaannemer zit. Openheid is toch echt onderbouwen van hoe prijzen tot stand gekomen zijn. Het is daarnaast cruciaal om dezelfde taal te spreken met elkaar. Dat je appels met appels kan vergelijking bij de raming van de aannemer en de begroting van de opdrachtgever.

In praktijk kan je natuurlijk geen rekening houden met onvoorziene risico's en zal altijd terug komen bij de opdrachtgever. Wanneer teveel risico's naar de opdrachtnemer geschoven worden zal bij het target cost principe de target cost heel hoog worden. Of je gapt de bedragen per risico's weer tot een bepaalde hoogte per partij. Target cost is een flexibiliteitpotje die moet leiden tot betere prestatie met een hogere kwaliteit. Forecasting van de kosten tijdens het project is zo belangrijk om te weten waar je staat.

Cruciaal bij een bonus-malus waar een beoordeling wordt gegeven voor de prestatie is een evenwichtige beoordeling. Je zou de perverse prikkel kunnen wegnemen door hun kosten te vergoeden, zodat de bonus gezien kan worden als een winst. Doe je dit over meerdere meetmomenten kan je een mooie marge maken over een bepaalde tijd. Dit zou je kunnen vertalen naar andere projecten. Het opstellen van de bonus-malus gaat in eerste instantie aan de hand van de objectives en een financieel plaatje van meetbare prestaties en milestones die

gefinancialiseerd kunnen worden. De stap daarna is echter maatwerk, welke boodschap geef je af en hoe? Is het met alleen een bonus of alleen een malus. Loopt deze bonus-malus trapsgewijs af of wordt het direct een boete. Hier zijn legio opties in mogelijkheden en is moeilijk één beste optie voor te schrijven, omdat het afhangt van de prikkel en omstandigheden van het project. Het blijft elke keer weer maatwerk.

APPENDIX P. ROADMAP

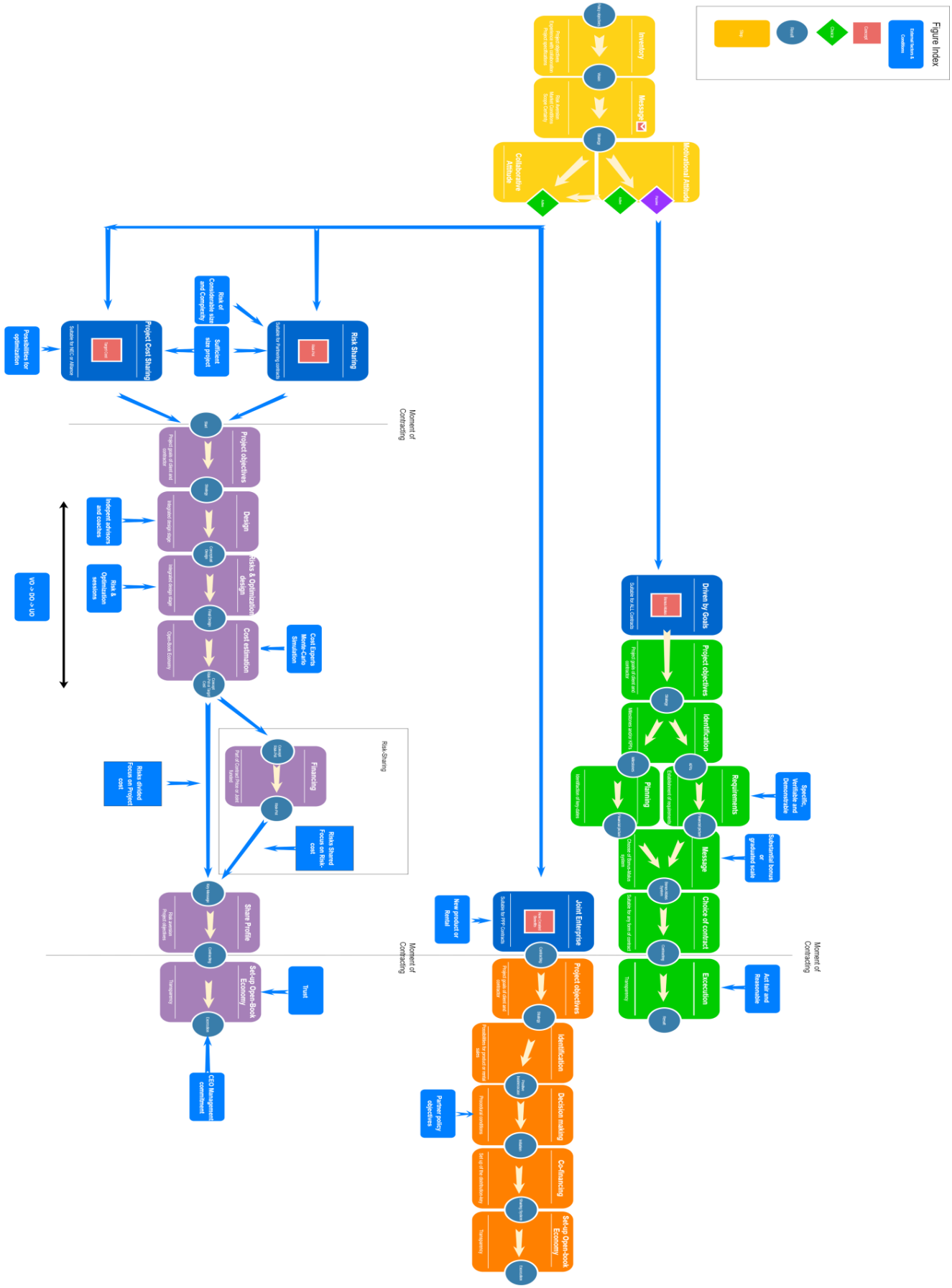


Figure 36. Roadmap Gain and Pain Mechanism

Figure index explanation

Blue Rectangle: indicates internal and external factors and conditions
Red square: Gain and pain sharing concepts
Green and Purple Diamond: Green and purple diamonds to give the different choice options clarity
Blue Circle: Results and starting point for the next step
Yellow Rectangle: Higher abstract level before choosing a gain and pain sharing concept
Green, orange, purple Rectangle: Concept steps
Black Line: Contracting moment to see when steps are taken

This roadmap is designed through findings from literature and case-studies and is meant to help the client to start and choose a gain and pain-sharing concept to incentivize collaboration and achieve project objectives. The roadmap is divided into two parts, where the first part is to get an understanding of the desired collaboration and the second part about the steps per concept. In this appendix the substantive steps are discussed.

Part 1

What is collaboration
The client will have to consider what collaboration means and what this would look like. This is the starting point for inventory which direction the client want with his project and the inventory of the package of circumstances. This involves policy objectives and project objectives, combined with collaboration experience. This results in a vision, which need to be translated to a message. This means a vision about the level of collaborative environment

Strategy
As a client, you want to convey a strategy as a client. This strategy is based on the vision that you expand with, Scope certainty based on project specifications, market conditions and own risk aversion. This means identifying what kind of risks are involved, size of project, environment conditions, stakeholders, available contractors and budget. With clear scope where risks can be divided and project can be priced, a traditional contract fits. With low scope certainty a partnering environment fits where uncertainty will be shared through a gain and pain sharing mechanism. This combined with the first step where objectives have been set creates a strategy for what the project needs. Then this strategy should be combined with the client attitude to choose a suitable gain and pain sharing mechanism.

Motivational and/or Collaborative attitude
The last step for choosing a gain and pain sharing mechanism is identifying the client attitude. The attitude is based on the strategy how to reach the objectives and the choice of contract. Take into account that a project have the following characteristics: complexity, customization, uncertainty, and long duration coupled with time pressure. These element scans differ and therefore different levels of collaboration are needed. The Different levels of collaboration are described as; a low level of collaboration primarily includes joint objectives and a charter, while in other aspects it is based on the same procurement and contractual arrangements as traditional arm 's-length relationships. In intermediate levels, the focus changes from short-term to long-term, which heavily affects trust, openness, risk-sharing, and continuous improvements. In high levels of cooperation, the team members identify themselves with the project team rather than with their employing organizations. This is facilitated by a common performance measurement system and a joint project office (Thompson and Sanders, 1998). The client needs to conduct an estimation of the characteristics to decide which level of partnering is needed and his own willingness to step in. This level of partnering comes back to attention in the attitude and conditions for a concept.

Motivational attitude passive
When to have a more distant role as a client and still want to motivate the contractor, a bonus-malus system based on milestones and KPi's is the option then. When a project has a high degree of scope certainty, risks are manageable and divided among the parties, costs are known and the client has no goal to optimize on project costs, there is the possibility to apply a gain and pain sharing mechanism in every contract form called bonus-malus. Despite a less high degree of scope security, the client can also choose to use a bonus-malus, but this will play a more secondary role.

Collaborative attitude active
When the client wants a an active collaborative role in the project, due to the fact of his vision and strategy or project specification the client can choose out of three options: Joint enterprise (Sharing of new created benefits), Risk sharing (Risk-Pot), and Project sharing (Target Cost). If the vision shows that the client wants to play a certain active role in the project, because an innovation on optimization is being realized and the project specification and strategy show that the risk can be better managed together, you arrive at a more active set of gain and pain sharing concepts that work from a Partnering principle. Therefore, other contracts also apply to be able to apply such concepts. Think of PPP or alliance, construction team and NEC. In order to make the right assessment, an explanation is given with the concepts why, when and how this concept can be applied.

Side Note: The reason why there is an active motivational attitude is because of the fact a bonus-malus mechanism can be used in conjunction with the other concepts.

Part 2
This is the part where concepts are split from each other and explained by key steps

Bonus-Malus
Motivational passive attitude to incentivize your partner with a gain or a pain by a bonus-malus principle for performance criteria and milestones. a bonus malus is widely applicable in various contracts. The bonus and / or maluses are aimed at achieving certain moments and bringing behaviour / performance to a desired level. This can be a bonus for achieving the desired level or for performing better than this desired level. The same also applies to maluses where the intention is to demotivate negative behaviour. Bonus-malus principle is more often applied when there is a certain scope of certainty so that it is clear what needs to be done and the bonus-malus can also be clearly and clearly coordinated because matters are clearly defined. Because it does not depend on other project specifications, it is possible to deploy it widely.

Project objectives
The first step for designing a bonus-malus is to look to the identified project objectives. These objectives are needed for designing the desired performance and milestones. The client must ask himself what incentive he wants to give to the contractor. Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent bonus-malus. This results in incentive strategy based on a bonus-malus.

Identification
The next step in the strategy is to further specify the performance and milestones where the client specifically wants to provide a motivational incentive. Requirements for the KPi's need to be specific verifiable and demonstrable. The next step is to financialise the bonus-malus.

Requirements and Planning
When applying a bonus malus, you can choose to apply to performance or milestones or both. For the highest achievable result, it is desirable to coordinate the bonus-malus via the following three communicating barrels of time, quality and costs. Once the strategy has been explored, defined performance and aligned milestones, it is important to keep this next to a financial picture. This means what are the benefits as a client that this performance or milestone is achieved. The desired bonus-malus amount can then be derived from this financial picture, in which account must be taken of the incentive this will give the contractor.

Message
Within the financial picture, there are of course various options for applying the bonus-malus. Here too it is important which incentive you as a client want to give the contractor. Think of a bonus that is gradually reduced or a bonus that immediately turns into a malus. This depends on the capacity and the leeway you give as a client. Identification of how hard a requirement date or wish is leading in this. In practice, this will always be custom work. Research does show that small bonuses often work for a small change in behaviour to streamline work, and the larger substantial bonuses can significantly change behaviour and / or performance.

Choice of contract
As a final step, which actually no longer belongs to the concept itself, but is important for the implementation, is that the bonus-malus can be applied in all contract forms, provided that it is known to the tendering parties in accordance with the procurement law.

Moment of initiation
When the process and the bonus are communicated transparently, the contractor will understand the situation more and make a better effort in the project. What often happens, however, is that a bonus-malus generates perverse incentives, because the contractor already includes the bonus in the contract price at the time of tendering. The initiation of a bonus-malus would therefore be more appropriate if this is later determined in collaboration with the contractor. However, this is a legal grey area. This means using an Alliance or Bouwteam it could be initiated after moment of contracting and then the earlier mentioned steps will follow. A down-side of this way of working is that a contractor is less likely to agree to a malus scheme. On a side note: act of fairness and reasonableness helps to succeed in your project objectives and mutual understanding.

Joint enterprise by sharing of new created benefits
A gain and pain sharing mechanism which incentivize collaboration by a joint enterprise of a new created benefit. Important starting point for this mechanism that it's based on the selling of a (new) product or rental of temporary space. It's currently suited to long-term PPP environments with PPP contracts. The idea of a joint enterprise is that when both parties have a win-win situation performance is optimized.

Project objectives
The first step is to design joint enterprise is looking into the identified objectives and possibilities to achieve a goal by means of a joint enterprise on the basis of, for example, the sale of a product jointly. The client must ask himself what incentive he wants to give to the contractor. Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent sharing of new created benefits. This results in incentive strategy based on a possible joint enterprise.

Identification
The next step is a deeper identification of the possibilities for product sale or rental to design a positive business case. This can be done by the client or contractor or together. The business case for the sale of the product will guide the decision-making process.

Decision making
The decision-making process is based on the procedural conditions of the contract. Most of the time it's an extra activity besides the normal activity that is asked by the client and therefore new arrangements need to be made. Contractor objectives can help the decision-making process with higher management level commitment. The business case will be the central point of attention to discuss. When is decides to proceed with each other financing decisions need to be made.

Co-financing
The idea of sharing of new created benefits and therefore sharing pains and gains is the distribution key by co-financing. Based on the co-financing the distribution key is determined and a sharing system is established. This means how much every parties invest and based on this amount a share profile will be established.
once the financing has been agreed and the percentages are fixed, the last step is to make it operationally workable.

Set-up Open-book Economy
To collaborate an open book-economy is needed. All costs and profits will be put in the shared profit and loss account, which is transparent. When it is in an open-book administration, it can also be managed by both parties. Side note a PPP environment with long-duration strengthened the ability and willingness to share and start a joint enterprise.

Risk Sharing by Risk-Pot and Project Cost Sharing by Target Cost
A full collaborative active attitude to incentive collaboration and achieving mutual objectives can be realised with a Risk-Pot or Target Cost mechanism. These concepts come off the ground after moment of contracting. A

collaborative partnering environment is needed. This means an Alliance, Bouwteam or NEC contract. A Risk-Pot benefits from sufficient size project with risks of considerable size and complexity, otherwise there is nothing to the share. The main reason for choosing a risk pot is because there is a certain scope of uncertainty that results in risks that are more manageable by the client and contractor jointly. Project cost sharing by target cost benefits also from a sufficient size project, with possibilities for optimization in for example technical design and materials. The main reason for choosing a Target cost is because there is a certain scope of certainty where you want to create a win-win situation by working together on optimizations within the project. The idea is that working together to optimize the project will result in higher quality for a better price where a contractor will earn a sufficient amount of money as well.

With a target cost concept, the scope certainty is important for the pricing of the project and set a suitable target price. A hard condition for this concept is the use a specific target cost contract such as NEC or target alliance. Because a partnering environment is important for these concepts, it first starts with contracting the contractor, after which the steps to shape the mechanism are set in motion. In some cases with a Target cost contract it may be possible that a calculation is requested from the contractor on the basis of a Pre-design, which will serve as a guideline for the target cost. In both cases, the steps to be taken are the same, but with a different approach, which will be explained. In some cases there is also the possibility of ending up in this process after the award, because the project nevertheless requires such a form of partnering and gain and pain sharing. It is then possible to form part of the project from, for example, a D&C in a construction team or alliance, in order to be able to actively collaborate in this area.

Project objectives
To design an effective risk or project cost-sharing mechanism, project objectives from client and contractor need to be identified. Think of optimization, quality, time, cost, etc. as objectives for choosing the right option. Objectives in the direction of quality optimization and cost of project are more suited to target cost. Objectives in the direction of innovation, risk management and cost are more suited to Risk-Pot. But it still depends on what the incentive the client wants to give to the contractor. In reality it remains customization Besides the own project objectives it is important to identify the contractor objective to create mutual objectives and a subsequent strategy for incentivization of collaboration.

Design & Risks and optimization design
Starting from the preliminary design phase together to the execution design phase. For target cost, the client can start with a final design to optimize with the contractor to the execution design. The idea in this stage that the client and contractor collaborate by risks and optimizations sessions to understand each other and the project. Independent advisors and coaches can steer both teams in the right direction to collaborate. Risks need to be of considerable size and complexity, otherwise, it costs too much money to implement a gain and pain sharing mechanism. Besides the risks room for optimization is desired, otherwise, there is nothing to share and collaborate. This step is the deeper continuation of the first step to the objectives, where in this step the actual possibilities are looked at by means of the design. Risks for sharing and optimization possibilities are identified at the end of this step/phase. This stage is very important for establishing the right Risk-Pot or Target cost and demands a lot of collaboration already. The process itself already incentive collaboration and the start to create mutual objectives.

Cost Estimation
When risks are divided and final designs are made the cost estimation process can start. The cost estimation part is one of the most important steps. If cost estimation for risk-pot or target cost is done wrongly the mechanism will fail. For good cost estimation cost experts at both sides are required and knowledge about simulation software such as Monte-Carlo simulation. with an insufficient target cost, no quality will be achieved and the contractor will be spending cuts. If the target cost is very large, the incentivize for optimization will fade. When a risk pot is not calculated correctly, the motivation to be close to controlling the risks can fade away. Inadequate risk pot can also lose motivation because it is just a lose-lose situation and profits evaporate. This full process need to be done according the Open-Book Economy. Open-Book economy creates insights in each other cost process and helps to come to an agreement on the estimation.

Financing (Risk-Pot)
There are three options for financing a risk-pot. The purest form is financing where physical money is invested by both parties, as in a pure form of alliance. The second option is to split off part of the contract price for the risk-pot. As a last option, more of a light form of the risk-pot is a risk list. When a risk occurs, payment is made according to the list. In this step the arrangement how to finance the risk-pot in this step. Financing of the target cost is done by the client off course.

Share Profile
When everything has been arranged around the cost estimation of target cost and financing of the risk pot, the core element of gain and pain sharing will of course remain the distribution key or the share profile. This is the arrangement of the share percentages for a cost under -and overruns. What kind of message do you as a client want to give to your contractor. Different share profiles can have different purposes for example a budget cost control sharing is different from one for quality or innovation purposes. This must be coordinated on the basis of the objectives. Take into account the risk aversion as a client and the risk aversion of the contractor. More information about share profile possibilities can be found in Appendix H.

Set-up Open-book Economy
To collaborate an open book-economy is needed. All costs will be put in a shared account, which is transparent. When it is in an open-book administration, it can also be managed by both parties. Side note: a partnering environment, trust, willingness, and commitment of CEO management level can strengthen the sharing by risk-pot or target cost.