The road to become a preferred customer in the construction sector

Part II:

An internal maturity assessment of relevant business processes

Strukton Groep

UNIVERSITY OF TWENTE.

Colophon

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Abstract

The construction industry is a highly complex industry wherein performance is lagging behind from other traditional industries. Various authors investigated this lagging performance and advocate that cooperation within the supply chain should focus on moving away from adversarial practices and move towards more integrated cooperation between the various entities within a supply chain. Moreover, the structure and relations within the industry are also changing. Firms are increasingly outsourcing their work and reducing their supply base at the same time. The result is a shift in the power dynamic within the industry. Traditionally, buyers are the most powerful party in the relation, however due to the changes in market and power dynamics, suppliers and subcontractors gain power and become the focal firm within the relation. In addition to these changing circumstances, the introduction of Best Value procurement also increased the need for managing contractors to focus on what suppliers want instead of executing coercive power to get the preferred result (often the cheapest). The quantifiable performance information of excellent suppliers and sub-contractors is becoming a competitive resource for managing contractors within construction tenders and thus, Strukton wants to become a preferred customer for their excellent suppliers to gain access to this information and remain competitive within the construction market.

This report contains the second stage of the research. The first stage of this research (external perspective) used a quantitative approach to define the antecedents of supplier satisfaction and preferred customer status in the construction sector. The first stage concluded that supplier satisfaction within the construction industry is mainly influenced by the (1) relational behaviour and (2) operative excellence of the managing contractor. The antecedents of a preferred customer status are defined as; (1) growth opportunities, (2) support & involvement of suppliers and (3) innovation potential. Additionally, the first stage research defined a step-by step framework to become a preferred customer in the construction sector and develop long-term relations with excellent suppliers and sub-contractors. The three steps within this framework (see *Figure 2*) are defined as; (1) initial performance (e.g. supplier satisfaction), (2) engagement (e.g. preferred customer status) and (3) sustainability (e.g. partnership).

The second stage of the research (this report) used the results from the external analysis (stage 1) to define and asses relevant processes and formulate improvements for these

processes to become a preferred customer and establish long-term relations. This thesis used a qualitative approach to develop a new maturity model which includes all relevant processes connected to the antecedents found in the first research stage. The development of the model followed the design science approach defined by Hevner, March, Park, & Ram (2004). The design science approach consists of three blocks and is shown in *Figure 1*.

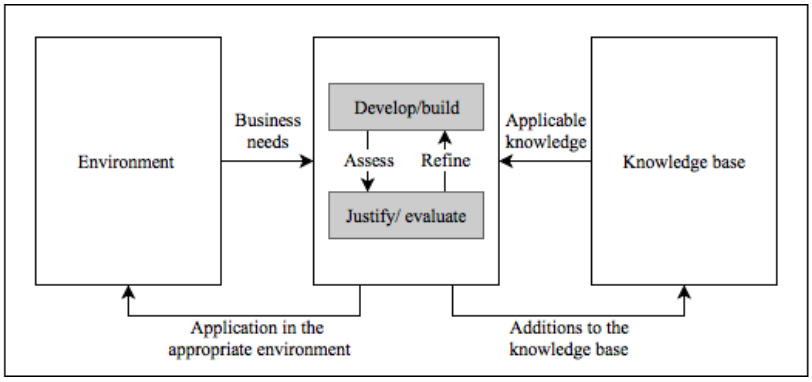

Figure 1: Design science approach by Hevner et al. (2004)

Following the design science approach, a new maturity model is developed. This new maturity model consists of 33 processes which are related to the five antecedents of supplier satisfaction and preferred customer status. The application of this model within the case company (Strukton) yielded an overview of the maturity levels of the business processes related to the development of (long-term) buyer-supplier relationships. Highly mature processes were mostly related to the company wide innovation strategy, preferred supplier lists and the handling of problems and risks. Low scoring aspects were mostly related to the partnering aspects within the model such as mutual objective setting and joint improvement programs. None of the 33 processes which were analysed was at the highest maturity level.

Figure 2 shows a consolidation of the results from both the internal analysis (this thesis) and the supplier satisfaction survey (research stage 1). The mean maturity level of the first phase was assessed at 55%. The mean maturity for the second phase was assessed at 40,3%. This shows that the processes related to relational behaviour and operative excellence are more mature than the processes related to growth opportunities, support & involvement and innovation potential. These results are in line with the results from the supplier satisfaction survey (research stage 1) which shows a higher mean score for the phase 1 antecedents opposed to the phase 2 antecedents.

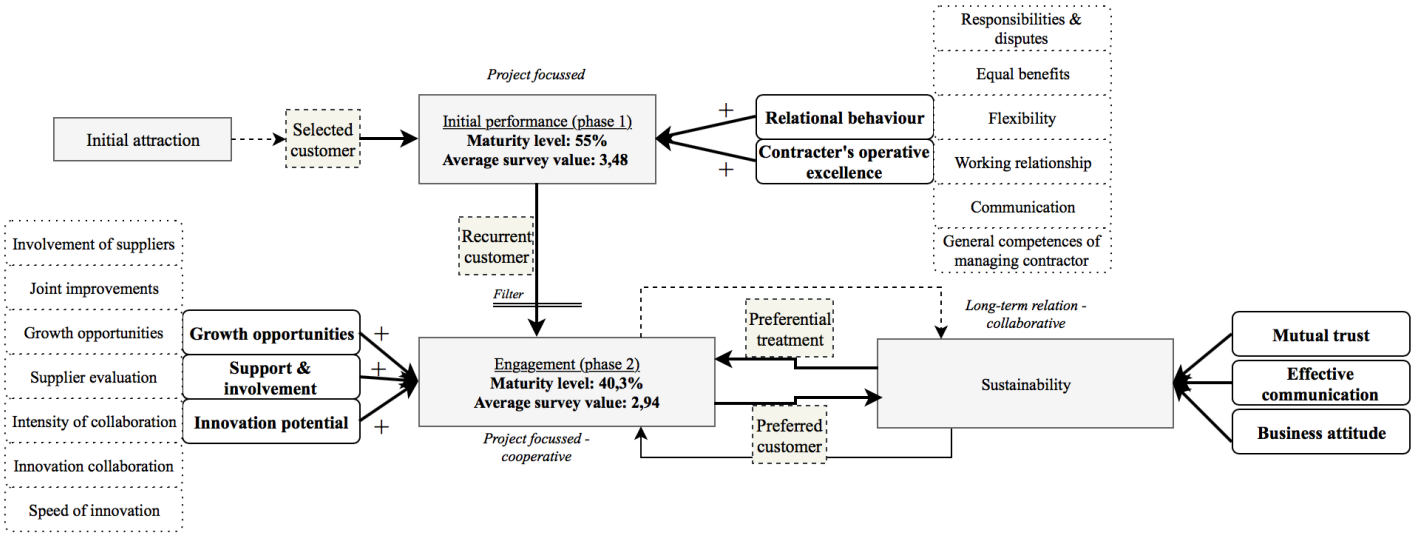

Figure 2: Results from external and internal analysis.

Based on the internal assessment of the business processes, several improvements and barriers are identified. The improvements can be categorized into two main themes; (1) improvement of existing processes and (2) the development of a formal supplier management process. The first category improvements include aspects like communication guidelines to ensure equal treatment of suppliers and the adaptation of the supplier evaluation and selection categories. The second category improvements include all relevant aspects for the formulation and development of a supplier management process. This process must at least include a process for (1) selecting suitable long-term partners based on the overall mission, vision and strategy of Strukton, (2) mutual goal setting, (3) information and knowledge exchange procedures, (4) a strategic framework contract and (5) evaluation based on pre-defined objectives & goals. The main barrier identified for successful implementation is the, still prevailing, traditional approach of managing contractors towards sub-contractors and suppliers. This traditional approach mainly uses the power of a managing contractor to steer sub-contractors and suppliers into the preferred direction. This preferred direction is often the direction which costs the managing contractor the least money. Hence, there is very limited focus on the relationship itself. However, since the power dynamics in the industry are changing, this traditional approach may backfire and is thus considered to be the main barrier for successful implementation. Education and a change of mindset at the managing contractor are therefore deemed necessary to be able to have successful long-term relations in the construction sector.

This thesis contributed to an expanding stream of literature into long-term partnerships within the construction sector. By exploiting two major literature streams (e.g. preferred customer status & partnerships), this thesis explained both the internal and external perspectives on the road to become a preferred customer in the construction sector. The main contribution of this thesis for both practitioners and researchers is the step-by-step framework presented in *Figure 2* in combination with the newly developed maturity model. This framework shows that building long-term relationships in the construction sector consists of several steps rather than a single decision to enter in a collaborative partnership. Moreover, this framework also shows that each of the steps requires a different focus. Lastly, this thesis proposes two company specific roadmaps to increase the maturity of the processes related to supplier satisfaction and preferred customer status within Strukton Civil.

Table of contents[1]

[1] Chapter 1 & 3 are similar as the chapters regarding the problem statement & theoretical background in the business administration thesis (research stage 1).

List of figures

List of tables

List of Abbreviations

Abbreviation	Meaning
BVP	Best value procurement
RM	Reversed marketing
RFP	Request for proposal
RFQ	Request for quotation
QPI	Quantifiable performance information
RAVA	Risks & value added
RQ	Research question
SQ	Sub-research question
SET	Social exchange theory
GDP	Gross domestic product
CSF	Critical success factor
AGC	Associated general contractors
MEAT	Most economically advantageous tender
LLC	Limited liability company
SD	Standard deviation
SRMR	Standardised root mean residual

1. Introduction

This thesis is the second part of a two-stage research into preferred customers in the construction sector. The first stage approached the concept of preferred customers from an external perspective through a supplier satisfaction survey amongst suppliers and sub-contractors. The second stage of the research will take an internal approach by exploring the processes which relate to the results significant antecedents found in the survey. The first chapter will elaborate on the overall problem statement and the research problems of both separate research stages. A summary of the results from the first stage of this research is included in Appendix A.

1.1. Overall problem statement

A shift in procurement approaches of clients have led to more emphasis on the performance of the contractors (and their sub-contractors). Traditional procurement methods, which mostly award contracts based on the lowest price, result in information asymmetry between managing contractors and sub-contractors (Snippert, Witteveen, Boes, & Voordijk, 2015). New procurement methods follow a trend towards a more principle-steward type of relation wherein goals are aligned and trust is the basis for a relation. One of these methods is Best Value procurement. The Best value procurement method is developed by Dean Kashiwagi and is also called performance purchasing (Kashiwagi, Halmrast, & Tisthammer, 1996). This new procurement method is focused on selecting the best possible contractor for a construction project by integrating past-performances of contractors in the award process. The Best value procurement method is increasingly growing in the Dutch public procurement sector. In 2012 there were only 4 best value tenders and in 2015, there were already 103 best value tenders (Tenderned, 2012, 2015). This rise in the application numbers shows that this innovative procurement method is becoming increasingly important for construction contractors. And therefore, several scholars explored the Best value procurement method with Dutch contractors (Gaaff, 2014; Ivanova, 2016; Jongerius, 2014; Samson, 2015).

Within this method the client only compiles a list of project goals which form a direction for the contractors to make bids on. By leaving the specification part open-ended, the client trusts the contractors (expert) that he is competent enough to meet the project goals. This opens up more room for solutions and additionally stimulating contractors to innovate their

products and processes (Van der Rijt & Santema, 2013). By eliminating the specification requirements, the costs for participating in a tender are reduced for both the client and the contractor. This, however, asks a very different view on construction projects from both client and contractors' point of view. According to Snippert et al. (2015), the Best value procedure develops trust in a relationship by using metrics style performance information and goal & risk alignment between client and contractor. For the Best value method to work, the clients must trust the expert (contractor) and ensure a streamlined process.

The importance of trust development by the use of performance information, goal & risk alignment changes the way contractors are, traditionally, approaching a tender procedure. The aspect of goal and risk alignment is mostly covered by the clients' documents on the project. The performance information on the other hand, is solely in de hands of the contractor. The contractors must measure, manage and use this information in a proper way. In general, the Best value process consists of three phases; preparation phase, selection phase and execution phase (Van der Rijt & Santema, 2013). The selection phase is the phase wherein the client elaborates on the scope and objectives for a project and the contractor shows their expertise on the objectives by showing performance information to the client. Based on the assessment of the client, one contractor is allowed to proceed. That contractor must proof his claims by showing evidence of his performances. If a contractor is not in the position to substantiate his claims, the contractor is replaced by the second-best contractor of the selection phase. Many contractors and also scholars, use the term quantifiable performance information (QPI) for this kind of information in Best value tenders (Jongerius, 2014).

Furthermore, since the Best Value procurement method put more emphasis on the competences and past performance of the managing-contractor and its suppliers, information management becomes key in winning tenders. Best value tenders include a performance argumentation and risk & value added (RAVA) document wherein the contractor shows that he is the expert for the project through QPI's. This type of information is thus becoming an important aspect for contractors in ensuring continuity of their business due to the rise of Best Value procurement. For management contractors, which lack large in-house working forces, a large portion of this information is usually generated by their second-tier suppliers. However, the knowledge about the value of this kind of information is not widely spread yet, and sub-contractors/suppliers are not used to share their performance/risk information

since they traditionally compete on price only. Additionally, many of those second-tier suppliers are not solely committed to one organization and thus, they are not always willing to provide the managing-contractor with their performance information to be used in (best value) tenders.

Lastly, also other types of tender procedures and contracts may benefit from the accessibility of performance information since this kind of information provides the client with an irrefutable piece of evidence regarding the contractor's past performance, allowing the client to select the best contractors to execute the project. The overall problem statement for both research stages is shown below.

Overall research problem

In current construction projects, the sub-contractors and suppliers of Strukton/Reef are not willing to share their performance information for utilisation in a tender procedure. Without this performance information it becomes harder for Strukton to compete in various tender procedures (mostly BVP and integrated contracts).

1.2. Research problem 1: Business administration

Another (global) factor is influencing the structure of the construction market. Several trends in international industries have caused a switch towards the so-called reverse marketing (Schiele, Calvi, & Gibbert, 2012). Classical marketing theories build upon the situation wherein there is a competition for buyers and reverse marketing builds upon a situation where there is a competition for suppliers. This shift towards reverse marketing is caused by two global trends. Firstly, the increase in out-sourcing of non-core activities leaves more responsibilities at the suppliers and secondly, many industries are reducing their supply base to achieve economies of scale or a reduction of transaction costs (Schiele, Ellis, Eßig, Henke, & Kull, 2015; Vos, Schiele, & Hüttinger, 2016). Result of these global trends is the fact that buyers become more dependent on their suppliers since their capabilities are key for developing the buyers capabilities and performance (Koufteros, Vickery, & Dröge, 2012). This shift in approaching the market led to the situation wherein competing firms look for the same resources in the same supply base, resulting in a competition for the best suppliers (Dyer & Hatch, 2006). Firms that are able to obtain better resources than their competitors have a competitive advantage over their fellow buyers. However, the degree to which a firm is able to attain better resources than their competitors is influenced by the suppliers: the

suppliers decide the allocation of their resources. Recent marketing literature shows a rise of various concepts which treat the competition for supplier resources (Pulles, Veldman, & Schiele, 2016). Amongst these concepts is the concept of preferred customers. The preferred customer concept is the opposite of the concept of preferred suppliers and is therefore a reaction to the changing market circumstances. In markets where resources are scare, buyers must obtain a preferred customer status to be able to obtain resources from the preferred suppliers (Pulles et al., 2016). Thus, one way of obtaining the performance information (QPI's) from key suppliers and sub-contractors is to become a preferred customer. According to Schiele et al. (2012), obtaining the preferred customer status depends on two key constructs; customer attractiveness and supplier satisfaction. However, recent research shows a stronger relation between supplier satisfaction and preferential resource allocation compared to customer attractiveness and preferential resource allocation (Pulles, Schiele, Veldman, & Hüttinger, 2016; Vos et al., 2016). Moreover, prior research into supplier satisfaction and preferred customer status mostly focussed on the industrial production industry (Hüttinger, Schiele, & Schröer, 2014; Pulles, Schiele, et al., 2016; Vos et al., 2016). For this research, the construction industry will be used as environment. The construction industry is a substantially different industry compared to the industrial production industry. Instead of serial production of a set of predefined products, the construction industry deals with project-based and one-of-a-kind products within a technically complex environment (Dubois & Gadde, 2002). Because of this substantially different environment, the antecedents of supplier satisfaction and preferred customer status may differ from the results of prior researches. The research objective for the first stage of this research was therefore to clarify the antecedents of these constructs in the construction industry (for results see Appendix A). The problem statement for the first stage is formulated as:

Research problem stage 1: Business administration

Prior research shows that increasing supplier satisfaction is the way to receive a preferred customer status and subsequent preferential resource allocation from suppliers. However, none of the prior researchers covered the preferred customer concept in a project-based industry such as the construction industry. The relations with- and between the antecedents of supplier satisfaction and preferred customer status in a project-based industry are thus unknown.

1.3. Research problem 2: Civil engineering

This report elaborates further on the results from the first research stage to take a closer look at the internal processes which are related to the antecedents of supplier satisfaction and preferred customer status in the construction industry. The problem statement is derived from the market characteristics described in paragraph 1.1 & 1.2 and the results from the first research stage. The output from the first research stage, which forms the base for the second research stage, is shown in *Figure 3* (also see Appendix A). The problem statement which relates to this specific report is formulated as:

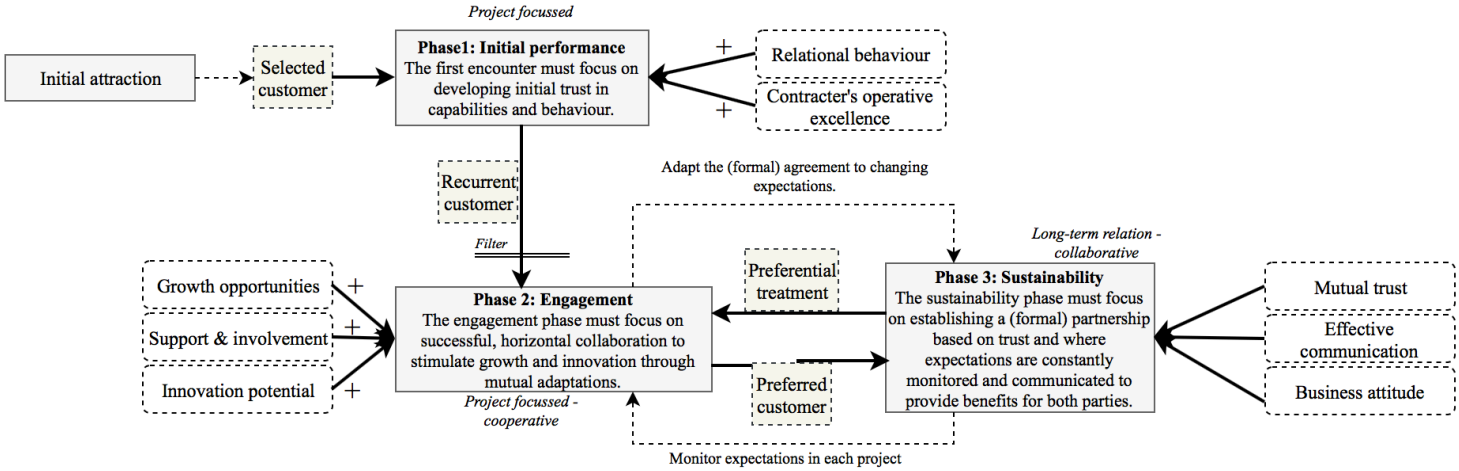

Figure 3: Framework for developing relations with suppliers and sub-contractors (external perspective)

Research problem stage II: Civil engineering

Developments in the structure of the market changed the way suppliers allocate resources. This reversed marketing in combination with Best value procurement and integrated contracts introduced a need for managing-contractors to become a preferred customer for their key suppliers. The results form research stage I show that relational behaviour, support & involvement of suppliers, innovation potential, growth opportunities and operational excellence are key concepts for increasing supplier satisfaction and obtain a preferred customer status. However, it is not clear which internal business processes relate to one of these antecedents. Therefore, current processes at Strukton do not embed these antecedents enough to be awarded the preferred customer status.

2. Research setup, methodology & operationalisation

This second chapter will elaborate on the research setup and methodology which is used to address the research problem. The chapter starts with stating the research objective in relation to the research problem. Thereafter, the research questions will be formulated and the practical and theoretical relevance are addressed. The final paragraphs entail the methodology part of the research and formulates all necessary research steps to answer the research questions.

2.1. Research setup

2.1.1. Research objective

The first stage of the research investigated the antecedents of supplier satisfaction and preferred customer status in the construction sector. Based on the survey, a new framework is constructed for developing and maintaining relationships with sub-contractors and suppliers in the construction sector (see *Figure 3* & Appendix A). The antecedents, which are defined for each phase, are constructed from a group of processes and behavioural aspects. However, the exact composition of these antecedents in relation to operational processes is unclear. By exploring the underlying composition of the antecedents in terms of processes and behaviour, a more detailed roadmap can be formulated for Strukton to become a preferred customer. The research objective is therefore:

Providing insights into the processes which relate to the antecedents of supplier satisfaction and preferred customer status in the construction industry and build a roadmap to become a preferred customer.

Research objective part II

2.1.2. Research questions

Following up on the problem statement and research objective of this research, several research questions have been formulated. Starting with the main research question:

How can Strukton/Reef infra adapt their operational processes to become a preferred customer for their key sub-contractors and suppliers?

Research question part II: civil engineering

The starting point for this thesis are the five antecedents identified in the first research stage; (1) relational behaviour, (2) contractor's operative excellence, (3) growth opportunities, (4) support & involvement of suppliers and (5) innovation potential. To cover the full extent of the main research question, several sub-questions are formulated:

SQ 1. Which processes relate to one of the antecedents defined in the first research stage?
SQ 2. Which behavioural aspects relate to one of the antecedents defined in the first research stage?
SQ 3. In what manner is it possible to formulate and measure the classifications and improvements in the processes and behavioural aspects from SQ 2 & 3?
SQ 4. Considering the previous questions, which steps should be taken to increase the supplier satisfaction and become a preferred customer?

2.1.3. Theoretical and practical relevance

Research into partnering and buyer-supplier relationships in construction have mostly focussed on the relation between client-contractor instead of on the relationship between contractor and sub-contractor (Bemelmans, Voordijk, & Vos, 2012). However, the temporary nature or project-based nature of these relations make it hard to manage these contractor/ sub-contractor relationships on levels that last beyond projects. The road that leads to long-term, mutual beneficial relations in the construction sector is therefore yet to be explored. It is thus important that additional research is conducted into the relationship between contractors and their sub-contractors and suppliers.

Moreover, the Best Value environment of this research in relation with buyer-supplier relations is also an under investigated subject. None of the mainstream journals and databases have any publications on the relation between contractor and sub-contractor in a best value environment with respect to the quantifiable performance information. Furthermore, the need for quantifiable information that is held by sub-contractors and suppliers is increasing because more firms are concentrating on their core-business and are therefore outsourcing their non-core business activities. This results in less in-house activities and therefore also less quantifiable performance information of their own processes. Hence, contributing to this stream of literature is an important theoretical implication of the research.

The practical relevance of the research is considered high since the company Strukton is currently experiencing difficulties in winning Best Value tenders. At the moment, competitors have better access to QPI's and use for example, core-teams that do all Best Value Tenders (Heijmans for example) or have serious long-term relations with strategic suppliers. Within Strukton, the awareness of the importance of Best Value in the upcoming years is present, but the exact interpretation of relevant processes and relations is yet unclear. This research will contribute to these problems by assessing the current organizational processes and providing recommendations for the improvement of processes on key aspects in a way that sub-contractors and suppliers provide Strukton with preferential treatment.

2.1.4. Company outline: Strukton Group & Reef infra

Strukton was originally a public construction company of the Dutch government founded in 1918. In 1952 the company relocated their headquarters from Utrecht to Maarssen. Later on, in 1972, the company merged with a Danish construction company and together they formed the Strukton group in 1974. From then onwards, the Strukton group acquired several nation-wide and regional construction companies. Amongst these acquisitions was Reef infra in 2006. In 2010, the Strukton group was bought by Oranjewoud LLC and brought to the stock exchange. The Strukton group nowadays operates in three main markets (rail systems & infrastructure, civil constructions, technical building installations) with 5 work companies (Strukton Rail, Strukton Civil, Strukton Worksphere, Strukton integrated projects and Strukton International). Within the Netherlands, the Strukton group constructed several of the big integrated projects in the last decade, such as the MAVA A15 and Avenue A2. Also internationally, Strukton constructed integrated projects such as the autonomous Riyad Metro system and the supply of the ERTMS system in Denmark. In 2017, the revenue of the Strukton group was €1.917 billion euro with operating profits of nearly €76 million euro. For the next years, Strukton has an order backlog of over €3 billion euro (Strukton, 2017).

The subject of the second part of the research is the sub-company of Strukton Civil; Reef infra. Reef infra is located in Oldenzaal (NL) and reported a turnover of €55m in 2016. Within Strukton Civil, a reorganisation is ongoing. This reorganisation is aimed and achieving synergies within all different sub-companies of Strukton civil and to improve the corporate branding by operating under the same brand (Strukton Civil). The reorganisation will be finished on 1 January 2019. Starting on that date, Reef infra will operate under

Strukton Civil Region North-West. To prevent confusion, this thesis will use the name Strukton as company name, instead of Reef infra.

2.2. Methodology

2.2.1. Type of research

This part of the research will be conducted from a qualitative perspective. Qualitative research is used to investigate phenomenon's in a real-world setting (Leedy & Ormrod, 2005). The goal of this research is dual. The research will start with an exploration of the current business processes at Strukton, specifically aimed at the processes that are relevant for obtaining the preferred customer status. This will be done by developing a maturity model for the identification and assessment of the relevant business processes. The second part of the study will be an evaluation of the current processes in relation to the antecedents of supplier satisfaction and preferred customer status. This will form a recommended roadmap for Strukton to become a preferred customer for their key suppliers.

2.2.2. Data collection and case selection

Data collection in case studies can consists of multiple combinations of data. According to Leedy & Ormrod (2005) case study data includes; interviews, documents and past records. Next to this, several other aspects are important to consider when addressing the validity of the research in relation to the data collection strategy. Starting with the reflexivity of the researcher. If a researcher is not able to reflect on his own ideas and principles, a bias can be introduced when interpreting the data. Secondly, triangulation within the data collection can enhance the quality of the data collected (Leedy & Ormrod, 2005). Triangulation embraces the collection of multiple sources of data in qualitative research. Thirdly, there must be a clear distinction between interpretations and actual, fact-based data. The research must therefore make a clear division between own interpretations (possible fiction) and actual observations (factual data). Fourth, the researcher should not stop collecting data when that data shows certain patterns, which fit the believes of the researcher. Data collection is not about finding data that confirms certain presumptions, the researcher must also look at data that disconfirms those presumptions. Lastly, the researcher must spend time on site to see what is actually happening. In this research that will mostly consist of joining meetings of projects or purchasing teams. Leedy & Ormrod (2005) state that these factors are essential for understanding the complexity of the situation in a real-world setting.

2.3. Operationalisation

The operationalisation of this research is divided into five phases. These five phases will be elaborated in this paragraph. The basis for the operationalisation is the design science approach defined by Hevner, March, Park, & Ram (2004).

Based on the results gathered from the survey, an assessment model will be developed. This assessment model will focus on the significant antecedents of supplier satisfaction, preferred customer status and preferential treatment resulting from the stage 1 research. Building an assessment model around these three constructs allows the researcher to define and assess the processes and behavioural aspects which relate to these constructs. For designing the assessment model, the design science approach of Hevner et al. (2004) is used. The design science approach is used to address wicked problems, which are problems characterised by (Hevner et al., 2004, p. 81):

- Unstable requirements and constraints based upon ill-defined environmental contexts.
- Complex interactions among subcomponents of the problem and its solution.
- Inherent flexibility to change design processes as well as design artefacts (i.e., malleable processes and artefacts).
- A critical dependence upon human cognitive abilities (e.g., creativity) to produce effective solutions.
- A critical dependence upon human social abilities (e.g., teamwork) to produce effective solutions.

These characteristics are similar to the sources of uncertainty and complexity described by Dubois & Gadde (2002) and thus the problems, which are related to this research can be considered as wicked and therefore the design approach of Hevner et al. (2004) is deemed appropriate. Furthermore, the ultimate goal of the design science approach is to provide utility (Hevner et al. 2004) and thus, the approach can help defining an assessment model for internal evaluation of relevant processes within Strukton. An overview of the design approach is shown in *Figure 4*.

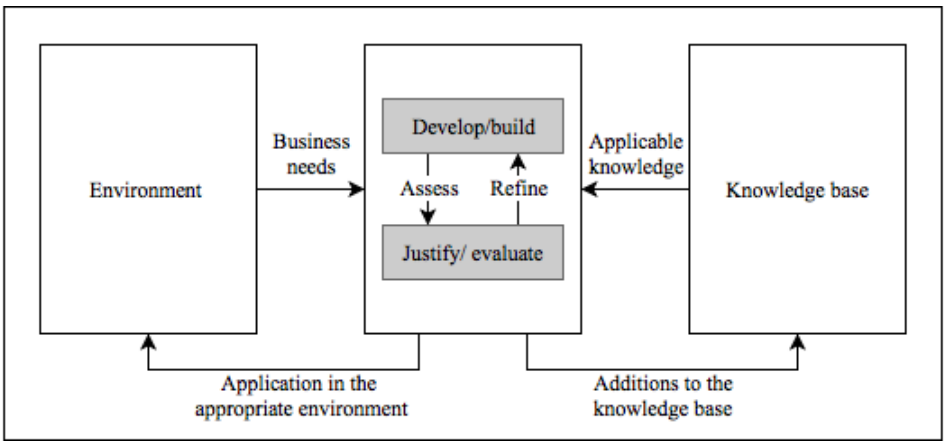

Figure 4: After Hevner et al. (2004); Hevner (2007).

The design approach contains three main subjects. The environment defines the business needs and the subsequent research problem. By assessing the business needs from a company, relevance of the research is assured (Hevner et al., 2004). In this case, the research problem is the absence of qualitative performance information from sub-contractors and suppliers. To convince suppliers and sub-contractors to share this information, Strukton must become a preferred customer for key suppliers by increasing their satisfaction. The results from research stage 1 show several key antecedents for supplier satisfaction in the construction sector such as growth opportunities and the involvement/support of suppliers (see Appendix A).

The second aspect of the model is related to the available knowledge base for assessing the key antecedents of supplier satisfaction and preferential treatment. This knowledge base consists of prior research and their constructs, frameworks, instruments and models which relate to the significant antecedents. This knowledge is used to develop the assessment model. Furthermore, by using prior contributions to the knowledge base and apply those contributions in an appropriate way, rigor of the research is assured (Hevner et al., 2004).

The third and final aspect of the design approach contains the development of assessment model itself. The development of the model will be based upon several existing models with distinctive levels of performance as is often seen in maturity models (Bemelmans et al., 2012; Enkel, Bell, & Hogenkamp, 2011; Meng, Sun, & Jones, 2011; Schiele, 2007). The amount of different assessment levels depends on the existing knowledge base. However, to increase the applicability of the final model, all maturity levels will be re-formulated. The final model will use 5 levels of maturity which is in line with the most commonly used

structure of maturity models such as the Capability Maturity Model (CMM) (Harmon, 1995, 2004). The five levels are thus defined as: (1) Initial, (2) Defined, (3) Repeatable, (4) Managed and (5) Optimized.

After developing the assessment model, there are several ways to justify and evaluate the model (Hevner et al., 2004). For this study, a case study is executed. The case study has two purposes: (1) validation of the model and (2) application of the model. This dual objective case study can however introduce a bias into the model since the validation and application are conducted within the same company. Therefore, the researcher limited the possibility of this bias by using the interviews and literature for the validation of the model and factual, documented evidence for the application of the model.

The design of this validation case study will have the following form. First a questionnaire is distributed among five employees of Reef infra which are involved in the acquisition or execution of projects. Each of these employees is asked to fill in the questionnaire which includes all questions from the developed model over five levels of maturity. The functions of the interviewees are shown in *Table 1*.

Table 1: Functions of respondents

Respondent	Function
1	Head of development region north
1	District manager region north/east
2	Project manager
3	Senior calculator
4	Business developer

After filling in these questionnaires, they are asked to send them back to the researcher for comparison. Thereafter, the researcher will formulate interview questions for each of the participants. These questions will be based upon discrepancy between the given answers of the different participants. During the semi-structured interviews, these in-depth questions will be asked to four participants. Additionally, the participants are asked if there are any subjects which are not yet covered by the model. Based on the given answers and further discussion, the model is assessed and refined. The refined model will be the main product of this thesis.

The final step of this research is to apply the maturity model to the internal processes of Strukton (application case study). By collecting evidence and using observations, the

maturity model will be filled in. The results from the maturity model will form the input for the recommendations to increase supplier satisfaction and eventually become a preferred customer for relevant suppliers and sub-contractors.

All phases of this research are shown in *Figure 5*. On the left, the input for each phase is shown. The right side shows the objectives of each phase. The next chapter will elaborate on all theoretical aspects related to the general subject of this thesis. Chapter 4 handles the theory needed for the development of the maturity model.

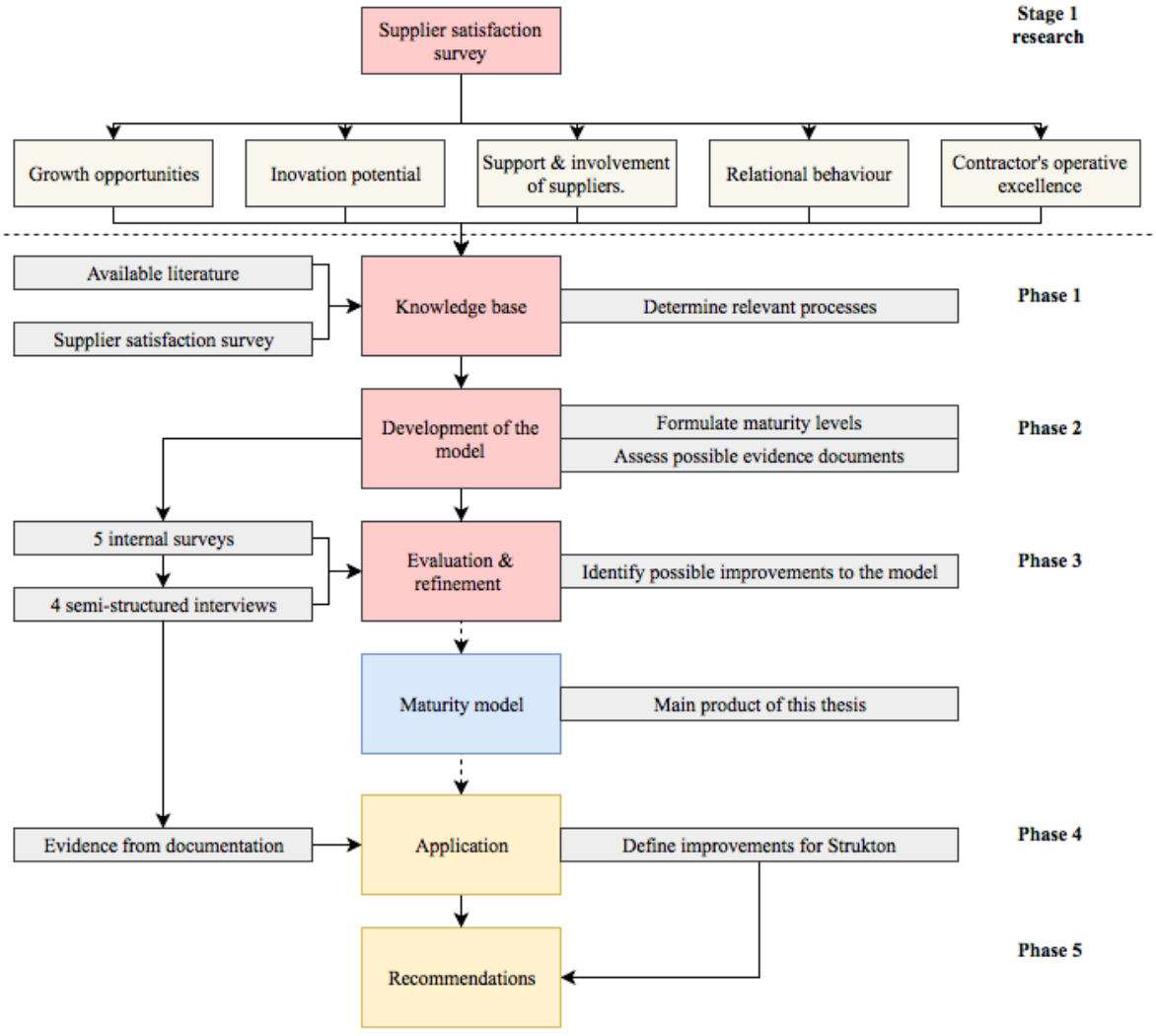

Figure 5: Methodology of thesis

3. Theoretical background

The third chapter includes the theoretical background which will form the basis for this thesis. The first part will consist of two theoretical concepts which are developed as a response to the changing circumstances within the construction market (see chapter 1 and Appendix D). The first one entails the concept of preferred customers and the influence of supplier satisfaction on becoming a preferred customer, the second one treats the concept of partnering within the construction supply chain. The final part of the theoretical background will combine all theoretical considerations presented in this chapter to form a theoretical framework for the remainder of this thesis.

3.1. Buyer- supplier relations: the preferred customer status

3.1.1. Social exchange theory

The social exchange theory builds upon the fact that exchanges in business environments are not only based on material goods but also include intangible resources. The core of the SET theory is the relational interdependence that develops over time through interactions (Hallen, Johanson, & Seyed-Mohamed, 1991; Lambe, Wittmann, & Spekman, 2001). Hence, SET builds upon norms of reciprocity. Entering and maintaining a relationship is expected to be rewarding because of the reciprocity involved (Blau, 1989). The reciprocity originates from trust between exchange partners. Since social exchange partners build upon social obligations rather than contracts, trust is an important factor in SET (Blau, 1968). However, the question whether contract precedes trust or that both concepts are complementary is one for debate (Woolthuis, Hillebrand, & Nooteboom, 2005). Reciprocity is also one of the main problems with the social exchange theory, since there is no certainty that benefits provided by one party will reciprocated by the other party (Das & Teng, 2002). The rewards that are obtained through social exchanges can be seen as relational benefits. Similar to interpersonal relations, inter-firm relations are developed by repeated interaction between partners. In inter-firm relations, one firm can influence the other by using relational mechanisms (Pulles et al., 2016). Two of those relational mechanisms are customer attractiveness and supplier satisfaction.

Customer attractiveness is based upon the expectation that a relational connection with another party may prove to be beneficial (Blau, 1989; Schiele et al., 2012). Supplier satisfaction on the other hand, is based upon the comparison between expected value and

actual value (Thibaut & Kelley, 1959). From a SET perspective, parties only remain in a relation when a certain level of satisfaction is present (Lambe et al., 2001). SET will be used for this research since the explanatory value of SET in firm behaviour based on relational mechanisms is high (Pulles, Schiele, et al., 2016). Finally, SET is used in previous research to include both internal and external perspectives on exchange relationships in business to business relations (Anderson & Narus, 1990). The following paragraphs will elaborate on preferred customer status, customer attractiveness and supplier satisfaction form a SET perspective.

3.1.2. Becoming a preferred customer and the benefits of being one

Preferred customer status originates from the concept of reverse marketing wherein customers are competing for the best suppliers (Dyer & Hatch, 2006; Pulles, Veldman, et al., 2016). The main reasoning behind this theory can be divided into three different sections (Schiele et al., 2012):

- Expectations (E)
- Comparison level (Cl)
- Comparison level of alternatives (Cl_{alt})

The first concept relates to the expectations (E) of the relationship and is related to the concept of customer attractiveness. The second concept relates to the comparison level (Cl) and reflects the supplier satisfaction. Together, the expectation and comparison level determine the way the supplier is continuing the relationship. According to Schiele et al. (2012) there are two ways for continuing the business relationship; (1) as regular customer or (2) as preferred customer. This decision depends on the level of available alternatives (Cl_{alt}) for the supplier (Thibaut & Kelley, 1959). The resulting framework is shown in *Figure 6.*

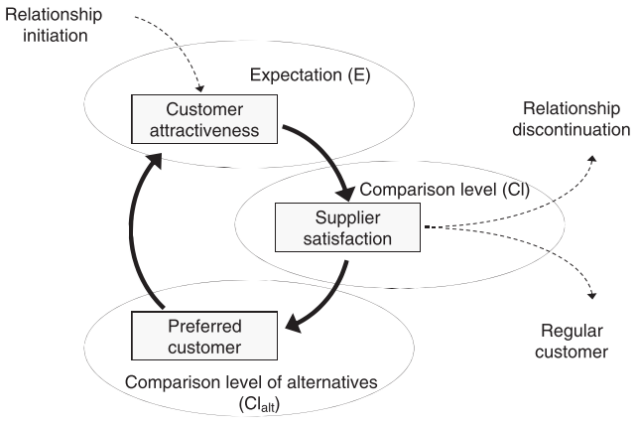

Figure 6: Preferred customer concept (*Schiele et al., 2012, p. 1180)*

Next to the framework presented above, several authors investigated the exact relations between the three levels in the model. Pulles et al. (2016) found that the impact of customer attractiveness on preferential treatment is affected by supplier satisfaction. The direct relation between customer attractiveness and preferential treatment was not significant when supplier satisfaction was added in the model. And even the relation between supplier satisfaction and preferred customer status is argued to be indirect and mediated by commitment (Baxter, 2012). One of the first to summarize the drivers of the three main concepts were Hüttinger et al. (2012). Later on, Hüttinger et al. (2014) were one of the first to empirically test these drivers. They found that growth opportunities and reliability were the antecedents that positively influence the obtainment of a preferred customer status. The study of Bemelmans et al. (2015) found that annual spend, relation specific investments and relationship maturity influences preferred customer status in the construction sector. Sunil Kumar & Routroy (2016) found that top management support and proper communication channels are also influencing the chance to become a preferred customer. Sunil Kumar & Routroy (2016) also found that the customer must focus on creating risk & profit-sharing mechanisms and supplier incentives to meet supplier interests.

Additionally, there are several benefits that can follow from being a preferred customer. Nollet, Rebolledo, & Popel (2012) describe five categories wherein benefits can be obtained by being a preferred customer. Firstly, they describe benefits for product quality and innovation. By being a preferred customer, buyers receive consistent quality levels or are able to opt for customized products. The second category is related to support. Benefits include, among others, sharing of innovations and sharing of information about products and markets. The third category are reliability benefits, for example, the situation where the demand exceeds supply. In such a situation, the buyer receives preferential allocation of the scare resources. The last two categories are related to price and cost benefits such as a lower price for products or lower acquisition/operational costs for the preferred customer (Nollet et al., 2012). Next to these benefits described, Nollet et al. (2012) also propose a framework for becoming a preferred customer. The four steps that are described are shown below:

1. Initial attraction (customer attraction)
2. Performance (supplier satisfaction)
3. Increasing supplier commitment and engagement
4. Sustaining the preferred customer status

The framework that is presented by Nollet et al. (2012) is based upon the notion that attractiveness precedes supplier satisfaction (step 1 & 2). The third step in becoming a preferred customer is to increase commitment from the supplier. Nollet et al. (2012) propose several tactics that can be used to increase supplier commitment. These tactics are based upon two main categories; (1) ensure operational excellence and (2) create relational value (Nollet et al., 2012). Important in operational excellence is the reassessment of processes to find solution to problems, which relate to low customer attractiveness or supplier satisfaction. Furthermore, relational value can be increased by employing senior personnel or by sharing important information early on. The framework also shows similarities with the results from Baxter (2012) who found that commitment is needed to become a preferred customer. The final stage of the framework includes the maintenance of the relationship. This can be achieved by sharing performance results with the supplier or early communication about potential problems and risks (Nollet et al., 2012).

3.1.3. Customer attractiveness as source of initial allocation of resources and reciprocity

Customer attractiveness is according to Blau (1962), inherent to social exchange. Attractiveness is the force that increases the scope of social interaction and is the source of motivation for initial allocation of resources and subsequent reciprocity (Ellis, Henke, & Kull, 2012). Moreover, the level of attraction of a firm depends on the ability to provide relevant rewards to the other party (Blau, 1989). In the customer attractiveness literature, there are three different streams. Mortensen (2012) divided the literature in (1) attraction in buyer-supplier relationship management, (2) customer attractiveness to suppliers and (3) attraction in key account or portfolio management. The second stream of literature is relevant for this research and will therefore be used for elaborating customer attractiveness. According to Ellis et al. (2012) attractiveness is the result of relational mechanisms described by the SET theory such as trust, dependence, interaction and expected value. By interacting with other firms, firms show insights into the expected value that can be gained by entering a relationship. Expected value is the result subtracting direct and opportunity costs from rewards, and thereby provides insights into cost-reduction abilities of a partner (Ellis et al., 2012; Hald, Cordón, & Vollmann, 2009). However, expected value can be perceived different by buyers and suppliers according to Hald et al. (2009). In *Table 2,* the main components of expected value, trust and dependence are shown which were developed by Hald et al. (2009).

Table 2: Relational mechanisms and their perceptions.

	Buyer perceptions	Supplier perceptions
Expected value	Cost reduction	Price
	Time compression	Volume
	Innovation	Growth
	Access to new buyers/ suppliers	
	Competency development	
Trust	Perceived benevolence trust:	
	Loyalty	
	Support	
	Perceived integrity trust:	
	Shared values	
	Fairness	
	Reliability	
Dependence	Expected association value	
	Association alternatives	
	Level of transaction specific assets	

Following from Blau (1962), attraction influences the level of reciprocity in a relation. Reciprocity originated from social pressure, trust and moral standards to ensure a fair exchange. However, a failure to return the favour may lead to a decrease in trust and commitment of a relation. Reciprocity is thus key in maintaining relationships and is backed by substantial social and individual pressure (Blau, 1968; Ellis et al., 2012). The literature study of Hüttinger et al. (2012), show various categories which are arguably affecting customer attractiveness in buyer-supplier relations. The categories are divided into (1) market factors such as size and market share, (2) risk factors such as standardisation and demand stability, (3) technological factors such as skills and knowledge transfers, (4) economic factors such as margins and price and (5) social factors such as participation and behaviour.

3.1.4. Satisfying suppliers by matching expectations and outcomes

Supplier satisfaction is the third concept derived from SET. Thibaut & Kelley (1959) describe that the level of supplier satisfaction depends upon the evaluation of expected value and actual value developed in a relationship. Effectively, this comes down to the quantity of rewards and costs associated with the relation. Previous research into satisfaction is mostly characterized by the buyer's perception on satisfaction rather that the suppliers perspective (Essig & Amann, 2009). Schiele et al. (2012, p. 1181) define supplier satisfaction as ‘*'supplier satisfaction is a condition that is achieved if the quality of outcomes from a buyer-supplier relationship meets or exceeds the supplier's expectations*''. Benton & Maloni

(2005, p. 2) describe supplier satisfaction as ''*a feeling of equality despite power imbalances*''. Supplier satisfaction is thus achieved when the expectations are met and there is no power imbalance that leads to inequality. Hence, a minimum level of satisfaction is required to be motivated to maintain the relationship. Important in maintaining this minimum level of satisfaction is joint evaluation of outcomes to see where improvements can be made in the relation (Nollet et al., 2012; Schiele et al., 2012). The increased outsourcing of business activities calls for increased cooperation between buyer and supplier to meet the end-users requirements (Wong, 2000). Supplier satisfaction is key in successful cooperation and business performance. Wong (2000) states that satisfied suppliers are more willing to cooperate with the buyer to meet the demands from their clients. Additionally, Hüttinger et al. (2012) state that a relational and cooperative approach to suppliers will enhance supplier satisfaction. Thus, satisfied suppliers are more willing to engage in cooperation, and cooperation will enhance supplier satisfaction. These conclusions support the framework of Nollet et al. (2012) wherein a minimum level of satisfaction is needed to start cooperating and further increase of satisfaction is achieved by successfully cooperating (consistently meet suppliers needs).

In literature, several authors made distinctions in categories of supplier satisfaction antecedents. From these different approaches, Hüttinger et al. (2012) composed a list of the drivers for supplier satisfaction divided into four categories; (1) technical excellence such as supplier development and early supplier involvement, (2) supply value such as volumes and long-term horizons, (3) mode of interaction including communication and structure and (4) operational excellence, which includes forecasting and payment habits. Based upon these drivers, research into supplier satisfaction must focus on the discrepancy between expected and actual value of these antecedents to determine supplier satisfaction.

3.1.5. The basic dimensions to measure supplier satisfaction

The measurement tool used in this the first stage of this study (research stage 1) is based upon earlier research into supplier satisfaction and preferred customer status. This measurement tool was originally developed by Hüttinger et al. (2014). This study used a world café method with several discussion groups to discuss various antecedents of supplier satisfaction and preferred customer status. By using inductive coding, Hüttinger et al. (2014) defined eight possible antecedents of supplier satisfaction and preferred customer status. Moreover, Hüttinger at al. (2014) defined the constructs supplier satisfaction and preferred

customer status. Furthermore, Vos et al. (2016) defined two additional constructs; profitability and preferential treatment. For their study, Vos et al. (2016) differentiated between supplier intention (preferred customer status) and supplier behaviour (preferential treatment). The constructs of the measurement tool used in this study are shown in *Table 3*. The entire measurement tool and the results from the survey are shown in Appendix C.

Table 3: Constructs of the measurement model.

Antecedents	**Aspects**
Growth opportunities	Growth, volume, brand name, image.
Innovation potential	Expertise, innovation possibilities/ orientation.
Operative excellence	Planning, decision making and processes.
Reliability	Opportunism, adherence to agreements, contract compliance
Support of suppliers	Training, development and advice.
Supplier involvement	Early and close involvement in NPD processes.
Contact accessibility	Cross-functional contact person
Relational behaviour	Solidarity, mutuality and flexibility.
Profitability	Profits, margins.

3.2. Buyer-supplier relationships: Supply chain partnerships

The basic idea behind the way the construction industry is dealing with the complexity and interdependencies present in the industry (see Appendix D) is described by Dubois & Gadde (2002). They elaborate in their paper on two types of couplings in the construction sector; (1) loose couplings and (2) tight couplings. These couplings originate from the notion that there is always some sort of dependence between different units in a construction project. The number of shared variables between units determines the classification of the coupling (e.g. loose or tight). If there are not many shared variables and the dependence between two units is minimal, the couplings are classified as loose. If there is a high dependence between two units, the couplings are tight. Based upon the characteristics of the construction industry and its environment, Dubois & Gadde (2002) describe four situations of couplings. These four situations are: (1) coordination within projects, (2) coordination within supply chain, (3) coordination within firms and (4) coordination beyond individual projects. Within these situations, various configurations are possible between loose and tight couplings. However, couplings are interrelated and thus, changing one coupling will change another as well. (Dubois & Gadde, 2002)

In general, the couplings on individual projects are tight and couplings in the permanent network are loose. This configuration allows firms to provide the necessary slack in projects through loose couplings in the permanent network. Other reasons for this configuration of

couplings is the decentralisation of authority in individual projects and the presence of need and transaction uncertainty as a result of competitive tendering. These couplings were similar to other industries in the past, however, these industries recognized the advantages of establishing and maintaining close relationships with partners across projects in the permanent network and thus adapted the couplings in their permanent network. (Dubois & Gadde, 2002)

Further research into the interactions between managing contractors and sub-contractors in the construction industry is also conducted by Gadde & Dubois (2010). They investigated typical relationships in the construction industry based upon the six dimensions of a high involvement relationship: (1) longevity, (2) adaptations, (3) dependence, (4) interaction, (5) atmosphere and (6) mutual orientation. Gadde & Dubois (2010) state that the interaction patterns of high involvement relationships provide the necessary conditions for long-term relations because it provides mutual orientation, adaptations and learning. They found that the construction industry is characterized by irregularity, adverse relations and low loyalty. This leads to only few adaptations in the permanent network and a high amount of project based, on-site adaptations (e.g. loose couplings & tight couplings). Additionally, the irregularity of the industry (need & transaction uncertainty) also withholds firms to increase their organizational dependencies and increase their innovation and knowledge sharing capabilities. Since the industry is characterized by these adverse relations, collaboration is not embedded into the interaction patterns. Thus, even though the interaction patterns in construction show signs of high involvement relations, the benefits of high involvement relations are not reaped in the construction sector. (Gadde & Dubois, 2010)

Since the construction industry plays a major role in the economic growth of a country, many researchers have focussed on the lagging performance of the industry. Various of these researchers have focussed their research on the couplings in the permanent network, especially on partnerships (Black, Akintoye, & Fitzgerald, 2000; Crespin-Mazet, Havenvid, & Linné, 2015; Gadde & Dubois, 2010; Havenvid, Holmen, Linné, & Pedersen, 2017; Vrijhoef & Koskela, 2000). The rationale behind this research direction is the fact that the construction industry is behind in adapting the couplings in their permanent network despite the fact that partnering is a widely investigated and recommended approach to solve these problems (Egan, 1998; Gadde & Dubois, 2010; Havenvid et al., 2017; Latham, 1994, 2001). There are various benefits that are the result of successful partnering in the construction

industry such as an improved contractual situation, improved information flow, improved efficiency and financial position, reduced costs & risks and improved quality (Black et al., 2000; Gadde & Dubois, 2010; Matthews, 1996). Additionally, it is advocated that partnering is an indispensable part of a contractors total quality system since the development & enhancement of customer-supplier relations can substantially improve the quality gained from the supply chain (Dyer, 1996; Kanji & Wong, 1998; Wong & Fung, 1999).

However, there are also different constraints defined for partnering in the construction sector. Frödell (2009) distinguished four categories of constraints for establishing and maintaining managing contractor – sub-contractor relations in the construction industry; organizational structure, long vs short term, purchasing volumes and specification of products (Frödell, 2009, 2011). Regarding organizational structure, the local and one-of a kind character of each construction project calls for local decisions (Dubois & Gadde, 2002). These are often well-thought-out for their effects on the project, however, these decisions can prove to be bad for the organization as a whole. Moreover, this local character of construction can also have an influence on supplier selection. Suppliers which are much closer to the construction site have a significant advantage in terms of logistics and price, opposed to suppliers who are relatively far away. Lastly, project managers can have different types of working and establishing relations with suppliers and therefore, the constant variation between projects in terms of working relation can also form a constraint for suppliers to engage in a partnership.

For managing contractors, a long-term perspective can prove to be beneficial in terms of a reduction of transaction cost and improving productivity. However, the focus on single projects in terms of incentives and KPI's drive the managing contractor to have a short-term focus in their supplier relations. The next constraint to partnering is related to the relative purchasing volume. Many sub-contractors and suppliers supply les then ten percent of their total volume to one managing contractor which reduces the incentive to cooperate in long-term relations. Lastly, every project has its own product. Therefore, clients often use detailed specifications of products and materials. This limits the room for purchasers to establish long-term relations with suppliers and sub-contractors since the change in specifications may lead to an inevitable choice for other suppliers (Frödell, 2009, 2011). These constraints are supported by Bemelmans et al. (2015) who state that the temporary organisations among

firms acts as constraint to long-term relations because project teams and product design change for each project.

Next to the constraints of partnering in the construction industry, various authors described key success factors for establishment and maintenance of partnerships. Cheng, Li, & Love (1999) defined ten critical success factors for partnering. This framework also includes possibilities for measuring these CSF's. Furthermore, Black et al., (2000) empirically investigated 19 success factors for partnering in construction and found similar CSF's compared to the study of Cheng, Li, & Love (1999). However, some additional CSF's were found and defined as; actions consistent with objectives, a dedicated team, flexibility with regard to changes and commitment to continuous improvement. The paper of Humphreys, Matthews, & Kumaraswamy (2003) provides a comparison of partnering elements in the construction industry. This study focussed especially on the relation between maincontractor and subcontractor. Humphreys et al. (2003) found that communication, trust, goals & objectives, continuous evaluation and problem solving are key elements of partnering. One of the most recent studies into construction partnering was conducted by Kim & Nguyen (2018). They found thirteen key factors which affect relationships in the construction industry. Other authors which have investigated the success factors of partnering are, among others, Chan et al. (2004) and Bayliss, Cheung, Suen, & Wong (2004, p. 262). A review of these CFS's shows substantial overlap with the drivers of supplier satisfaction. This supports the notion that successful cooperation has a positive effect on supplier satisfaction (Wong, 2000). An overview of these success factors is shown in Appendix B.

Furthermore, there are two distinctions present in the partnering literature that deserve attention in relation to this thesis. First of all, many researchers did research into partnering between the client (mostly public commissioners) and the managing contractor instead of examining the relation between managing contractor and sub-contractors (Beach, Webster, & Campbell, 2005; Naoum, 2003; Ng, Rose, Mak, & Chen, 2002). Secondly, the type of partnership investigated is also changing each research. In general, there are two-types of partnering between managing contractor and sub-contractors. These two types are project-partnering (short-term) and strategic partnering (long-term). However, there are also extensions of these two general types such as semi-project partnering (Bygballe, Jahre, & Swärd, 2010; Humphreys et al., 2003).

Lastly, there is not a one size fits all approach to partnering in the construction sector. Eriksson (2010) defined several tactics that can be used by managing contractors to enter in a competitive, coopetition or collaborative relation with sub-contractors. However, these tactics do not define exact steps for developing a specific type of partnership. Moreover, the association of general contractors in America defined 5 steps which are needed to enter in a partnering type of relation (The Associated General Contractors of America [AGC], 1991). The first step is educating your own organisation in partnering. Secondly, the decision to partner must be made. Thereafter, the intentions which underlie the decision to use partnering must be clear. Fourth, the senior management from both companies must show commitment to partnering. The last step is to organize a partnering workshop with all key players to streamline the process. The steps defined by AGC are focussed on the internal efforts to enter in a partnership. Similar is the approach of Cheng & Li (2004) who used procedural mapping to define an approach to partnering. They make distinctions between formation, application and reactivation processes (Cheng & Li, 2004). A common aspect in all these studies is the fact that they only partially incorporate the sub-contractor's view on partnering through critical success factors. Besides those success factors, most studies solely focus on internal efforts and processes which are needed for successful partnering. They also do not distinct between short-term and long-term partnerships. A study that does distinct between the different types of partnering is the study of Humphreys et al. (2003). He states that the partnerships evolve over time through learning. However, this study also does not propose any specific steps for developing a partnership.

3.3. Conclusion

The construction market is changing due to various reasons such as increased outsourcing of business activities and the increased use of integrated contracts. This calls for a different approach to the market for managing contractors. On the one hand, excellent suppliers have gained a dominant position in the market and can afford to choose their customers. The preferred customer concept developed by Schiele et al. (2012) handles this type of dominance of suppliers by evaluating their satisfaction in a buyer-supplier relation. The excellent suppliers which are eligible for this kind of approach are the focal entity in this type of research. On the other hand, the integration of design, exploitation and finance components in integrated contracts calls for a more cooperative market approach. The literature which handles cooperation in the construction sector define partnerships as solution to this increased integration. Various benefits, constraints and success factors have

been identified in previous research. However, many contractors are still struggling with the implementation of successful partnerships with their supply chain partners. The focal entity in this type of research is mostly the buyer (e.g. the managing contractor).

Concluding, the performance of the construction industry is still lagging behind some other core industries despite the numerous efforts of researchers and practitioners to define suitable approaches to the changing market dynamics. This thesis will therefore explore a combination of two concepts which treat buyer-supplier relationships to increase the knowledge base and provide new insights in business to business relations in the construction sector. *Figure 7* shows a summary of the theoretical background.

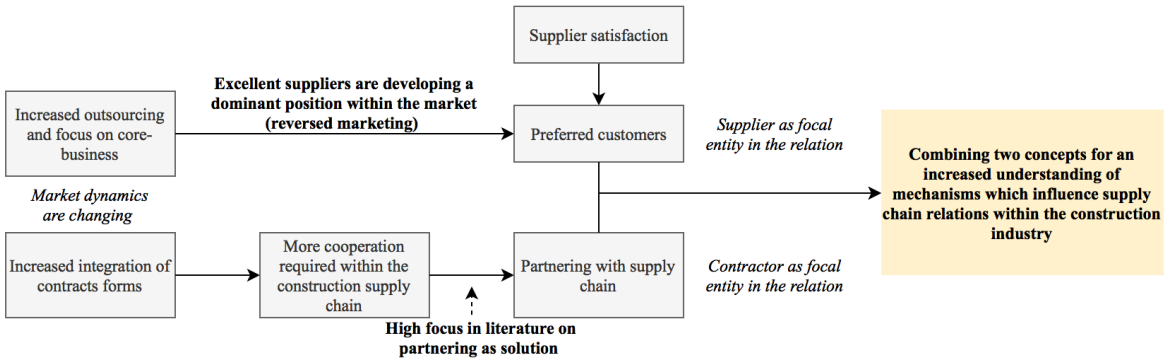

Figure 7: Theoretical framework

4. Constructing the model

4.1. Introduction

The maturity model will be constructed according to the design science approach of Hevner et al. (2004). *Figure 8* shows all steps which are taken to develop the model. Each step will be elaborated in one of the upcoming paragraphs in this chapter.

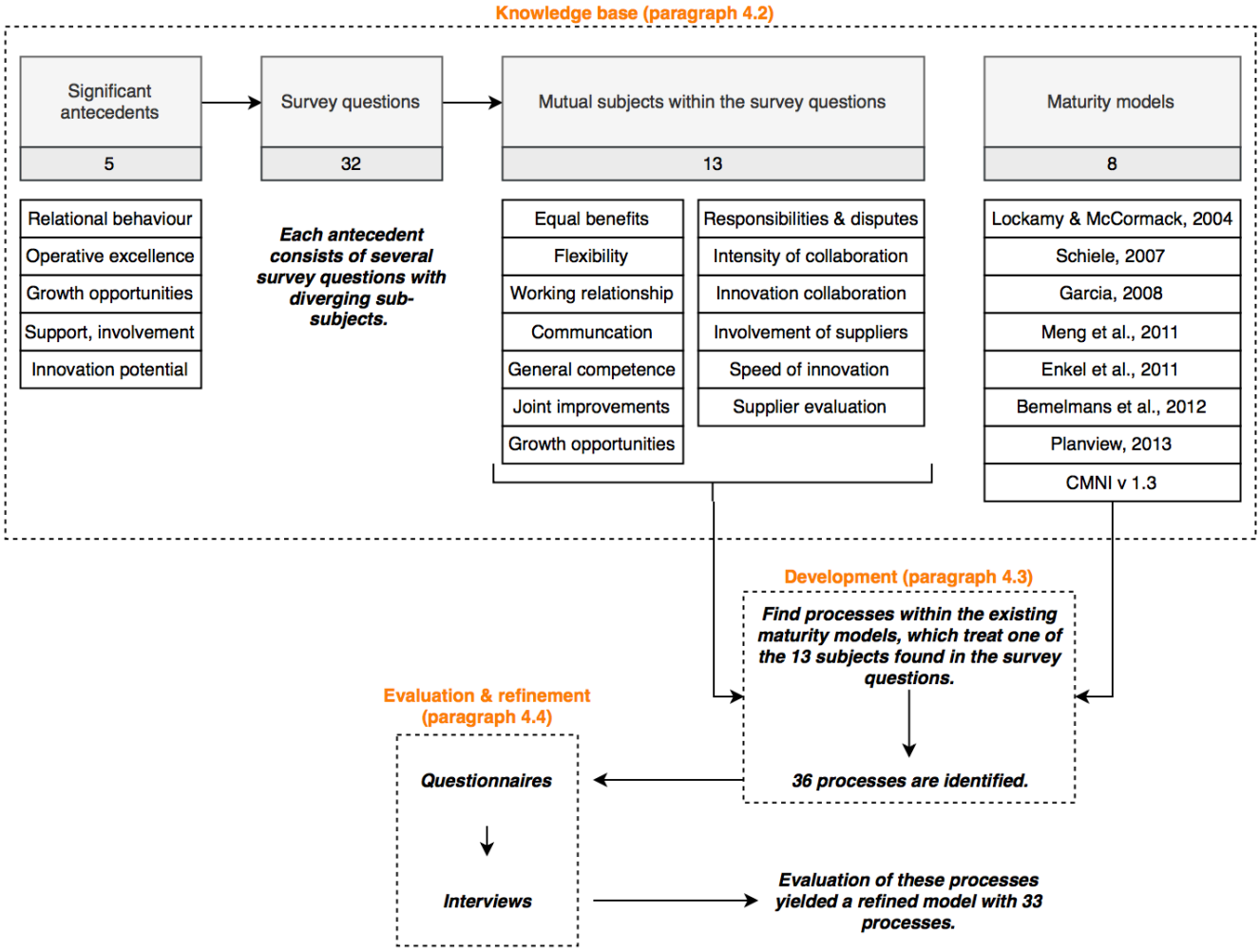

Figure 8: The development of the assessment model

4.2. Knowledge base

The knowledge base used to develop the model will be elaborated in this paragraph. According to Hevner et al. (2004), the knowledge base consists of foundations (theories and constructs) and methodologies (formulations and data validation).

The foundations for this model consist of the results from the stage 1 research and 8 existing maturity models. Based on the model described in *Figure 3*, there are three phases of interest for the development of the model. Phase 1 represents the initial performance and is influenced by relational behaviour and operative excellence of the managing contractor.

Phase 2 consist of the engagement between sub-contractor and managing contractor and is influenced by the growth and innovation opportunities and support/ involvement of the sub-contractors. The final phase consists of the maintenance of the relation and is influenced by mutual trust, effective communication and business attitude. *Table 4* shows an overview of the different phases, the numbers between brackets represent the mean value obtained from the supplier satisfaction survey (research stage 1) on a scale from 1 to 5.

Table 4: Results from thesis stage 1

Phase 1 (initial performance)	**Phase 2 (engagement)**	**Phase 3 (sustainability)**
Relational behaviour (3,51)	Growth opportunities (2,97)	Mutual trust
Operative excellence (3,47)	Innovation potential (2,70)	Effective communication
	Support & involvement of sub-contractors (3,05)	Business attitude

Each of the constructs in *Table 4* consist of various sub-questions which define the main construct. Each of these separate survey questions treats a separate subject. The five constructs of phase 1 & 2, consist of a total of 32 sub-questions. To be able to assess the relevant processes for each of these sub-questions, they are categorized in groups with mutual subjects. This approach led to 13 different subjects which are present within the 32 survey questions, this list is shown in *Table 5*. Appendix E shows all survey questions with the corresponding subject.

Table 5: Mutual subjects

Subject	**Phase**	**Number of survey questions**	**Description**
Responsibilities & disputes	1	2	Handling of problems and responsibilities during projects.
Equal benefits	1	2	Fair allocation of profits and losses.
Flexibility	1	2	Flexibility of managing contractor in handling ideas and suggestions from suppliers.
Working relationship	1	4	Treatment of a partner as equal and a cooperative attitude.
Communication	1	3	Communication towards and between sub-contractors and suppliers.
General competences of a managing contractor	1	3	The managing contractor has sufficient knowledge about building processes and products.
Involvement of suppliers	2	2	(Timely) involvement of sub-contractors and suppliers in tender and operational processes.
Joint improvements	2	1	The commitment to jointly improve products and processes.
Growth opportunities	2	4	Offered guarantees for future work and possibilities to attract/supply new customers/markets.

Supplier evaluation	2	2	Evaluation and feedback process for suppliers and sub-contractors.
Intensity of collaboration	2	2	Amount of information shared and intensity of relationship.
Innovation collaboration	2	2	Joint innovation activities between managing contractor and sub-contractor including the knowledge sharing between the partners.
Speed of innovation	2	3	The speed of development and exploitation of new innovations including knowledge absorption of personnel.

The second part of the knowledge base consist of existing maturity models which relate to one of the 13 subjects identified above. The search for these models is executed through Scopus and Web of science. The search strings used are different combinations consisting of *''supply chain relations''*, *''innovation''*, *''construction industry''*, *''buyer-supplier relations''*, *''maturity''*, *''purchasing''*, *''supply chain management''*. The search yielded eight different maturity models which are considered relevant for this research. These are shown in *Table 6*. Thereafter, the eight models are assessed on the aspects they include from the list of subjects. This assessment is shown in *Table 7*.

Table 6: Relevant maturity models (Knowledge base)

Source	**Focal subject**
Lockamy & McCormack, 2004	Supply chain management
Garcia, 2008	Supply chain performance
Schiele, 2007	Purchasing maturity
Meng et al., 2011	Supply chain relations in construction
Enkel et al., 2011	Innovation potential
Bemelmans et al., 2012	Buyer-supplier relationship management
Planview, 2013	Innovation potential
CMNI v1.3	Capability maturity model for services

Table 7: Comparison of selected maturity models

Maturity models	**Lockamy & McCormack, 2004**	**Schiele, 2007**	**Garcia, 2008**	**Meng et al., 2011**	**Enkel et al., 2011**	**Bemelmans et al., 2012**	**Planview, 2013**	**CMNI v1.3**
No of stages	***5***	***4***	***5***	***4***	***5***	***10***	***5***	***5***
No of items	***15***	***55***	***21***	***24***	***21***	***44***	***16***	***22***
No of constructs	***5***	***7***	***5***	***8***	***10***	***5***	***3***	***4***
Responsibilities & disputes				✓				
Joint improvements	✓		✓	✓		✓		✓
Equal benefits				✓				
Flexibility				✓		✓		
Working relationship			✓	✓		✓	✓	✓
Communication				✓		✓	✓	✓
Involvement of suppliers	✓	✓				✓		
General competences of a managing contractor	✓		✓			✓		
Growth opportunities		✓			✓			
Supplier evaluation		✓	✓			✓		✓
Intensity of collaboration					✓	✓		
Innovation collaboration		✓			✓		✓	
Speed of innovation		✓			✓		✓	

4.3. Development

This paragraph will contain the development of the maturity model. Based on the literature search presented in the previous paragraph, each of the processes (related to one of the 13 subjects) will be defined and formulated. In general, a higher maturity level represents better performance of the organization as a whole (Batenburg & Versendaal, 2008; Paulraj, Chen, & Flynn, 2006; Schiele, 2007). The assessment of maturity in this thesis is related to the maturity of business processes. Within the field of business process maturity, it is common to use 5 levels of maturity (Garcia, 2008; Harmon, 1995, 2004). The five maturity levels used in the development of the new model are shown in *Table 8*.

Table 8: Maturity assessment levels

Level	Definition	Notes
1	Initial	Processes are chaotic and ad hoc. Problems are solved when they occur.
2	Repeatable	Processes and decisions are based on previous experience and knowledge.
3	Defined	The processes are defined as standard business processes.
4	Managed	Business processes are managed through the use of KPI's.
5	Optimizing	There are deliberate optimization processes included.

Next is the formulation of the maturity levels for each of the subjects from *Table 5*. For each of the separate subjects, relevant processes from one of the eight maturity models are selected. Thereafter, each of the existing processes which relates to the subject are analysed. An example of the development of the model is shown in *Figure 9* on the next page. Within this example there where two existing models which included a relevant process that is related to joint improvements. Both models have different assessment levels and are thus rewritten to the five levels of maturity used in this thesis. Lastly, every process in the model also has a question included which is used in the evaluation & refinement step.

The full development of the model for each of the separate subjects, along with possible evidence documents, is shown in Appendix F. The developed model consists of 36 different processes.

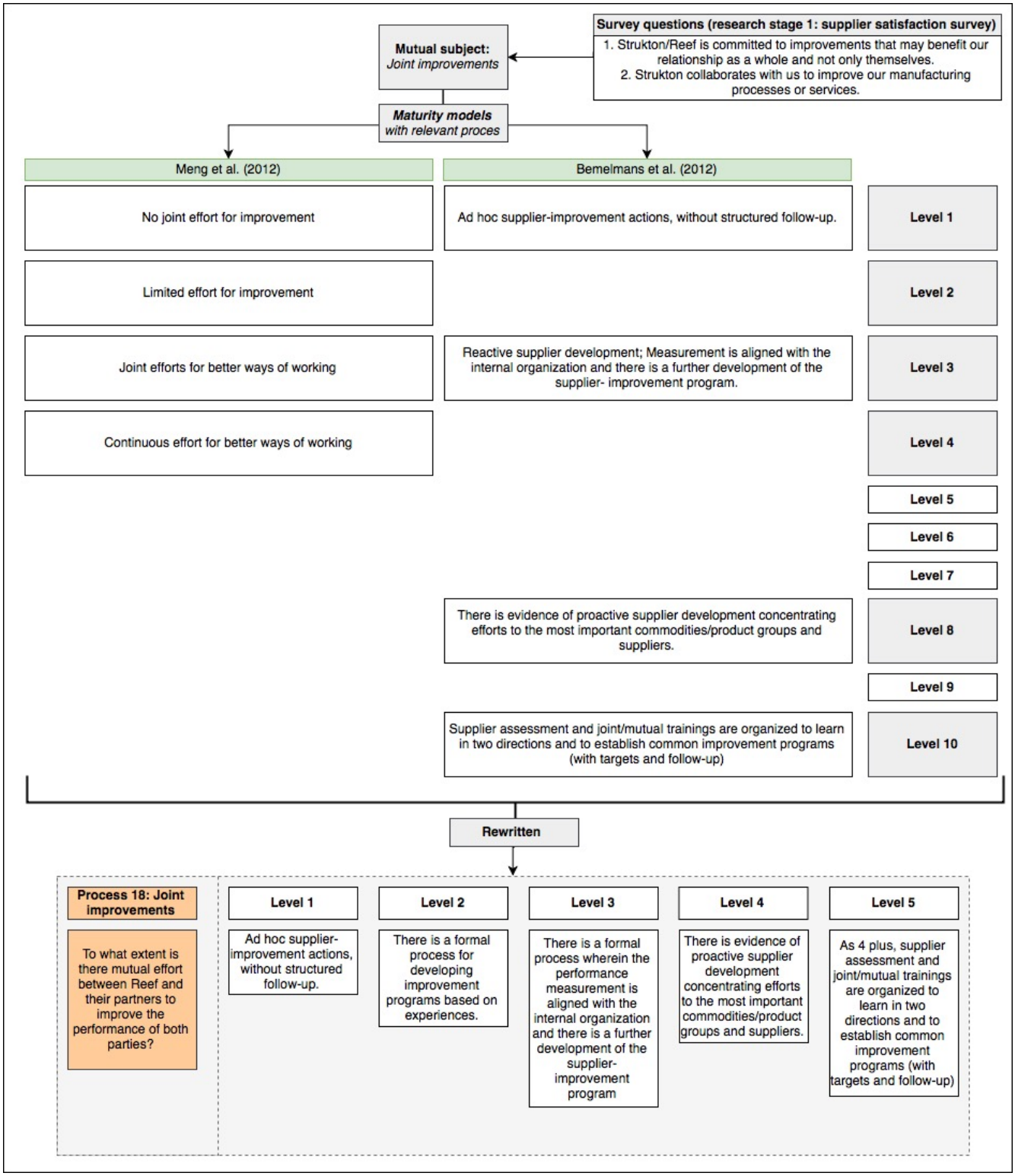

Figure 9: Example of model development (process 14)

4.4. Evaluation & refinement

The process for evaluating the model starts with a questionnaire which is distributed amongst five persons. The questions from this questionnaire correspond to the questions of the maturity model (see Appendix F). They are asked to evaluate Strukton based on the 5 maturity levels. By calculating the differences between each of the respondents, in-depth interview questions were formulated. The focus of these in-depth questions were the ambiguities within the questions or maturity levels and large differences between the given answers. These semi-structured interviews were held with four of the respondents and lasted approximately one hour. Appendix G shows the results from the questionnaire and a summary of the most important aspects of the given answers in English. The full transcriptions of each interview in Dutch are shown in Appendix I.

The refinement of the new model is based upon the results from the questionnaires combined with the given answers during the interviews. *Table 9* shows the most important changes to the model compared to the original model from Appendix F. A full list of changes is added in Appendix G. Appendix J shows the entire, refined, model. In total, 3 questions were deleted from the model due to the fact that they were too specific for one partner and therefore not suitable to evaluate a general business process. The deleted questions are no. 6, no. 8 and no. 10.

Table 9: Refinement of the model

#	Subject	Changes
1	**Responsibilities & disputes**	Both the complexity and effect on overall project result were already present in the model. The aspect of the agreements in the collaboration contract was not present and is added to the managed & optimizing level.
2	**Responsibilities & disputes**	The question text is changed to ‘’on-site’’ processes. Furthermore, the level 1-2-3 text is adapted. For each, the levels at which problems are resolved are added to the text. The text for level 4 is altered to account for problems which affect the total project result.
3	**Equal benefits**	The text for level 2 is adapted to incorporate a distribution based on work packages. The text for level 3 & 4 is adapted to account for the agreements in collaborative contracts.
4	**Equal benefits**	The text for level two has been adapted to include the rewards for taking risk based on work packages. In level 3, the advice component is added. For level 4, risks are handled together and rewards are divided. Level 5 relates to the pre-determined agreements in the collaborative contract which define the allocation of rewards.
16	**Involvement of suppliers**	The formulation of the managed level is adapted: The past performance and preferred supplier lists are used to determine possible supplier contributions.
19	**Growth opportunities**	The text for level 4 & 5 has been altered to account for a division between evaluations on hard skills and soft skills.
25	**Intensity of collaboration**	The text for level 3 has been adapted to clarify ‘’ownership’’. The text for level 4 is also clarified by adding goal, objectives and contract considerations for each

		partner as part of a managed process. In the text for level 5, ‘’processes’ is added to account for project specific needs within processes and not only within agreements.
27	**Intensity of collaboration**	For level 4 the text has been clarified by adding ‘’adapting each contract to the specific partner’’. Level 5 has been rewritten to account for the construction industry wherein partnering within the entire value chain is unlikely to happen because of need & transaction uncertainty. The optimized level is now formulated to add a constant improvement of the used contracts by training employees and sharing knowledge.
33	**Speed of innovation**	The text for level 3 has been altered, now it also states that employees are stimulated to take initiative. Level 4 has been completely re-formulated.

5. Application of the model

This chapter handles the application of the new maturity model. For each of the 13 subjects, the most important considerations for defining the maturity levels are elaborated. The full elaboration of each process is shown in Appendix H. A list of evidence documents is also shown in Appendix H.

Responsibilities & disputes

The first two processes of the maturity model treat responsibilities and disputes within projects. In general, sub-contractors are responsible for their own work packages and the problems associated with those, only problems which have the possibility to affect the project result are treated as a mutual responsibility. However, in most cases, problems are only treated as mutual responsibility when this is explicitly stated in the contract. The maturity level of process 1 is therefore defined at *level 2: Only complex problems which affect the entire project are treated as mutual responsibilities.*

The second process is concerned with disputes between project partners. Most of the problems which surface during projects are solved on site. However, there are two exceptions; (1) problems which have the possibility to affect the project result and (2) problems which surface repeatably. These problems are not solved on site and treated by the project manager or when the risks are high, by the management team of the organisation. The maturity level of process 2 is therefore defined at *level 4: Most problems are timely resolved at the lowest level. Except for problems which have an influence on the total project result, these are escalated.*

Equal benefits

The second subject within the maturity model is the division of profits and losses. In general, the division of both profit and loss is based on the work packages. Sub-contractors are responsible for their own work package and are therefore also accountable for both profit and losses within these work packages. In addition, only sub-contractors and suppliers who are able to influence the profits or losses are included in the division of profits and losses. The maturity level of process 3 is therefore defined at *level 2: Distribution of benefits based on separation of work packages.*

For the allocation of risks, a similar approach is executed. In vertical collaborations, the risks are allocated to the party who is responsible for the work package where the risks originate from. For horizontal collaborations, mutual risk provisions are made and the risks are controlled together. If there is money left from the provisions, it is divided between the parties based on the collaboration contract. The maturity level of process 4 is therefore defined at *level 4: The risks are controlled together. Rewards originate from the proper control of these risks (in the form of leftover money from the risk provisions).*

Flexibility

Flexibility of the managing contractor towards their sub-contractors and suppliers is present at the case company when the changes provide significant benefits to the total project result in terms of time, money or quality and have no negative influence on any of the other aspects of a project. The maturity level of process 5 is set at *level 3: Flexibility towards a partner is part of the standard business processes.*

Working relationship

The working relationship between the case company and their sub-contractors and suppliers is divided into two separate processes. The first process is concerned with the trust and goodwill present towards sub-contractors and suppliers. Within the case company, there is a clear division between recurrent and new suppliers. For recurrent suppliers, a certain amount of goodwill and trust in competences is present. For new suppliers, only trust based on the contract is present. These new suppliers are also monitored more often compared to recurrent suppliers. The maturity level for process 6 is therefore set al *level 3: Trust based on competences of a recurrent supplier. Trust in new suppliers is solely based on the contract.*

The second process is concerned with the collaboration guidelines. Within the case company, only general integrity (company-wide) guidelines are present. These guidelines do not make specific provisions about the equal treatment of suppliers. Additionally, most of the aspects within a collaboration are based upon experience of the employees involved. The maturity level for process 7 is therefore set al *level 2: Focus on satisfying itself, collaboration is based on experience.*

Communication

Within the case company there are no specific guidelines on communication with sub-contractors and suppliers. The only provision which is concerned with communication originate from the standard collaboration contract (both horizontal and vertical collaboration) and is superficial. Specific rules about the amount of information shared or formats for meetings are not part of a business process or guidelines. Decisions which involve this type of communication are based on experience and ad hoc decisions. Therefore, the maturity level of process 8 is defined as *level 2: There is a superficial formal communication framework based on earlier experiences.*

General competences

The general competences of a managing contractor are divided in four separate processes. The first process includes the training of employees. Within the case company there are several training programs available for employees. However, these do not cover subjects related to relationship management and collaboration. Hence, most of the knowledge related to those subjects is based upon experience of employees. The maturity level of process 9 is therefore defined at *level 2: Employees gain skills through experience on the job in interdisciplinary teams.*

The second process treats the supplier selection process. The case company uses a standardised supplier management process which includes the selection of suppliers. Additionally, there is a specific purchasing process which treats all separate steps for selecting and contracting suitable suppliers. Both processes use preferred supplier lists as starting point for selecting suitable suppliers. These preferred supplier lists are updated based on the evaluation of the respective suppliers. The maturity level of process 10 is therefore defined at *level 4: There is a formal process with multiple criteria based on specific project characteristics and accounting for current needs. Preferred supplier lists are also available.*

Regarding the targets which are set for purchasers, the case company uses project specific purchasing plan with amounts and target prices. The central purchaser uses these numbers to select suitable supplies. However, these targets are almost always only expressed in terms of money, aspects like quality or timing are not a part of the purchasing targets. The maturity level of process 11 is therefore defined at *level 2: There are some targets set for purchasers.*

The last process is about market research executed by the purchasing department. Within the standard purchasing process, market research is part of the selection step and thus, the maturity level of process 12 is defined at *level 4: The formal process of market research is a structural part of a purchaser's tasks*

Involvement of suppliers

Involving suppliers into the operational processes of a managing contractors can yield various benefits related to costs and quality. However, the case company has no specific process for the involvement of suppliers. The decision to include suppliers is based on an ad hoc evaluation of needs and the experience of employees. The maturity level of process 13 is therefore defined at *level 2: Decision to involve suppliers is based on experience and a superficial process.*

Process 14 treats project exceeding goals with recurrent sub-contractors and suppliers. Within the case company, none of the business processes or results from the interviews showed any project exceeding goals with recurrent sub-contractors and suppliers. The maturity level for this process is thus defined at *level 1: No common, project exceeding goals with strategic partners.*

Joint improvements

Similar as the process which treats project exceeding goals, there is no evidence of structured joint improvement programs with suppliers. There is one example of a yearly evaluation with a recurrent sub-contractor, however, this evaluation is not structured and fairly superficial. The same applies to the improvement actions which are executed, these are not structured and without follow-ups to monitor the improvements. The maturity level for process 15 is therefore defined at *level 1: Ad hoc supplier-improvement actions, without structured follow-up.*

Growth opportunities

Offering growth opportunities to excellent suppliers and sub-contractors is mostly absent within the case company. The only way for sub-contractors and supplier to have a higher chance of obtaining future work is by becoming a preferred supplier. The case company uses a classification system which consist of 5 levels (ABCDE). Preferred suppliers are classified as category A suppliers. However, being a class A supplier is not a guarantee for future work

since multiple class A or B suppliers and sub-contractors are invited to make bids for each separate project. The maturity level for process 16 is therefore set a *level 3: Only future work through tendering based on price.*

Supplier evaluation

The subject of supplier evaluations consists of 4 processes. The first process handles the performance measurement system which is in place to evaluate suppliers based on their performance. The case company composes supplier evaluations after each project. This is part of a formal business process (purchasing process). The suppliers are evaluated on 11 subjects. The results of these supplier evaluations are used to update the preferred supplier lists. Since the evaluation of suppliers is part of the purchasing process, there is no separate business process which combines the evaluations with, for example. improvement actions. Therefore, the maturity level for process 17 is defined at *level 2: A general supplier performance measurement system is in place.*

Within the case company, the purchasers use a supplier rating system as described above. Based on project evaluations, these ratings are adapted to changing circumstances. The 11 subjects which are used to evaluate suppliers do not include aspects like supply risk or revenue and therefore, the maturity level of process 18 is defined at *level 2: There is a standard supplier rating system in place. At least quality and delivery performance is measured.* Additionally, the results from each supplier evaluation are solely used for internal purposes and are thus, not communicated towards sub-contractors and suppliers. The maturity level for process 19 is thus defined at *level 1: No communication of performance evaluations towards suppliers.*

The last process is about the treatment of complaints about suppliers. Most of the complaints are handled by the project manager. The project manager is also responsible for communicating these complaints towards the purchaser for the adaptation of the preferred supplier list. However, this is not part of a formal business process and therefore the maturity level of process 20 is defined at *level 2: There is an informal system in place for complaints about suppliers.*

Intensity of collaboration

The intensity of collaboration subject consists of five processes which treat various aspects of collaboration with partners. The first process is about the amount of information which is exchanged between partners. The amount of information shared with partners depends on the type of collaboration and the type of contract. However, there is no formal process or guideline that treats information exchange between partners. The results from the interviews show that every partner is treated differently and there are no common rules for information exchange between partners. Therefore, the maturity level of process 21 is defined at *level 2: Knowledge sharing only if one party ought its necessary based on experience.*

Within the case company, recurrent sub-contractors and suppliers have fixed contact persons. Additionally, during every project, there is clear internal ownership of each sub-contractor and supplier. During the formulation of the purchasing plans, sub-contractors and suppliers are divided between the employees of the project team. Lastly, there are also standardised contracts available for the project team to use. The maturity level of process 22 is therefore set at *level 3: Standardized tools for partnerships are present, clear internal ownership of specific partners. Contracts used are standardised.*

Every project uses its own purchasing plans and supplier selection based on preferred supplier lists. The criteria used for the selection of suppliers are mostly based on quality and price. Criteria which are concerned with the relation itself are not part of the selection process. Additionally, there is no additional selection procedure for the selection of long-term partners. The maturity level of process 23 is therefore defined at *level 1: No specific policy to select long-term partners.*

The fourth process relates to the collaboration with partners is concerned with the type of contracts and partnerships used. Within the case company, there various standardised contracts (horizontal & vertical collaboration) for suppliers and sub-contractors which include criteria for the products and processes. However, these contracts do not include any aspects which relate to the relation itself and are not focussed on long-term collaboration. The maturity level of process 24 is therefore defined at *level 1: Arbitrary partnering.*

Lastly, the supplier and sub-contractor pool of the case company consists of a large amount of local /regional and national suppliers and can be seen as a network system (preferred

supplier list). This network system is constantly updated and extended to provide sufficient capacity and capabilities to fulfill the demands from Strukton's clients. The maturity level for process 25 is thus defined as *level 4: Network is expanded with more diverse, new parties.*

Innovation collaboration

The collaboration on innovation consists of two processes in the maturity model. The first process is concerned with the exchange of knowledge gained through innovation activities. The results from the interviews and document study show no regulated way for the sharing of knowledge between employees of the case company. Some innovations are added into a database on the intranet of the company. However, this is not actively communicated towards employees. The maturity level of process 26 is thus defined at *level 1: Only ad hoc knowledge sharing.*

Regarding the absorption of knowledge which is gathered through innovation, the solutions and innovations which are implemented are subject to informal communication (intranet) and are not actively shared with all personnel. However, during project meetings, employees are able to use knowledge which is gathered in previous projects despite the fact that this is not actively stimulated. The maturity level of process 27 is defined at *level 2: Informal sharing of new knowledge and ideas between employees.*

Speed of innovation

The last subject of the maturity model is the speed of innovation. The first process is about the innovation strategy. Within the case company there is no specific innovation strategy that is communicated towards external parties. Internally, the case company has an innovation strategy which can be summarized within the IDL-SDC process. Additionally, four core innovation teams are preparing a new formal process wherein all steps will be described to commercialize innovations. The maturity level for process 28 is therefore set at *level 3: Innovation is incorporated into the organization's strategy.*

Next are the innovation rewards that are offered by the case company. Based on the four interviews, none of the respondents had ever seen rewards for innovation activities. The only reward that is possible to earn is through an idea can where a winner is determined every year for the best idea. Therefore, the maturity level of process 29 is determined at *level 1: No assessment based on innovation activities.*

Within the innovation process and the four focus teams, there are sponsors appointed for each of the four teams. These sponsors originate form one of the regions of case company and are higher management positions. These sponsors are appointed to stimulate innovation within each of the regions, enhance the cohesion between the regions (''Samen sterk'' & ''op weg naar één Strukton Civiel'') and control results. In the brochure, employees are also stimulated to come up with ideas and solutions. However, there is no set platform for employees to show their initiatives. Based on this argumentation, the maturity level for process 30 is set at *level 3: Champions are appointed to demonstrate entrepreneurship. Individual employees are stimulated to take initiative.* Moreover, each of the four focal teams (big data/mobility/smart working/circularity) has their own innovation targets. Smart working must enhance the tender ''hit'' rate to at least 1 on 3. Big data, circularity and mobility must generate at least 60 million of revenue in 2022 with at least 10% profit. These targets are also communicated to employees through the periodical innovation letter. The maturity level of process 31 is therefore set at *level 4: Targets are set for and communicated to employees.*

Some success stories are shared with the employees through the intranet. Example is the concrete blend without cement. The successes of the overall innovation strategy and the four focal teams are also communicated through intranet or email. The maturity level of process 32 is thus defined as *level 4: Success stories are shared in a regulated way*

The last process is concerned with the communication of initiatives. The lower level initiatives (solutions/innovations) with mostly practical applications in projects are not communicated in a regulated way. These are only added to the database on intranet but not actively communicated towards employees. For the initiatives which are taken by one of the four focal teams, these are communicated through the innovation letter and through intranet. The maturity level of process 33 is therefore defined as *level 4: Initiatives communicated via widely accessible intranet.*

Table 10 shows an overview of all maturity levels for each process.

Table 10: Overview of maturity levels for each process

Subject	No.	Maturity level	Description
Responsibilities & disputes	1	2: Repeatable	Only complex problems which affect the entire project are treated as mutual responsibilities.
	2	4: Managed	Most problems are timely resolved at the lowest level. Except for problems which have an influence on the total project result, these are escalated.
Equal benefits	3	2: Repeatable	Distribution of benefits based on separation of work packages
	4	4: Managed	The risks are controlled together. Rewards originate from the proper control of these risks (in the form of leftover money from the risk provisions).
Flexibility	5	3: Defined	Flexibility towards a partner is part of the standard business processes.
Working relation	6	3: Defined	Trust based on competences of a recurrent supplier. Trust in new suppliers is solely based on the contract.
	7	2: Repeatable	Focus on satisfying itself, collaboration is based on experience.
Communication	8	2: Repeatable	There is a superficial formal communication framework based on earlier experiences.
General competences	9	2: Repeatable	Employees gain skills through experience on the job in interdisciplinary teams.
	10	4: Managed	There is a formal process with multiple criteria based on specific project characteristics and accounting for current needs. Preferred supplier lists are also available.
	11	2: Repeatable	There are some targets set for purchasers.
	12	4: Managed	The formal process of market research is a structural part of a purchaser's tasks
Involvement of suppliers	13	2: Repeatable	Decision to involve suppliers is based on experience and a superficial process.
	14	1: Initial	No common, project exceeding goals with strategic partners.
Joint improvements	15	1: Initial	Ad hoc supplier-improvement actions, without structured follow-up.
Growth opportunities	16	3: Defined	Only future work through tendering based on price.
Supplier evaluation	17	2: Repeatable	A general supplier performance measurement system is in place.
	18	2: Repeatable	There is a standard supplier rating system in place. At least quality and delivery performance is measured
	19	1: Initial	No communication of performance evaluations towards suppliers.
	20	2: Repeatable	There is an informal system in place for complaints about suppliers.
Intensity of collaboration	21	2: Repeatable	Knowledge sharing only if one party ought its necessary based on experience.
	22	3: Defined	Standardized tools for partnerships are present, clear internal ownership of specific partners. Contracts used are standardised.
	23	1: Initial	No specific policy to select long-term partners.
	24	1: Initial	Arbitrary partnering
	25	4: Managed	Network is expanded with more diverse, new parties.
Innovation collaboration	26	1: Initial	Only ad hoc knowledge sharing.
	27	2: Repeatable	Informal sharing of new knowledge and ideas between employees.
Speed of innovation	28	3: Defined	Innovation is incorporated into the organization's strategy.
	29	1: Initial	No assessment based on innovation activities.
	30	3: Defined	Champions are appointed to demonstrate entrepreneurship. Individual employees are stimulated to take initiative.
	31	4: Managed	Targets are set for and communicated to employees.
	32	4: Managed	Success stories are shared in a regulated way
	33	4: Managed	Initiatives communicated via widely accessible intranet.

6. Results & Discussion

6.1. Results from the application and utility of the maturity model

The average maturity percentage defined in the analysis is 47%. Eight of the 33 processes are defined at maturity level 4. Six of the 33 processes are defined at level 3. Twelve processes are determined at level 2 and 7 are determined at level 1. None of the processes reached the highest maturity level in this model. *Table 11* shows an overview of all maturity levels (1-5) for each subject and the corresponding maturity percentage (0-100%).

Table 11: Results from maturity assessment for each code

Code	Internal assessment		Phase
	Maturity level	Percentage	
Responsibilities & disputes	3	60%	1
Equal benefits	3	60%	1
Flexibility	3	60%	1
Working relation	2,5	50%	1
Communication	2	40%	1
General competence	3	60%	1
Involvement of suppliers	1,5	30%	2
Joint improvements	1	20%	2
Growth opportunities	3	60%	2
Supplier evaluation	1,75	35%	2
Intensity of collaboration	2,2	44%	2
Innovation collaboration	1,5	30%	2
Speed of innovation	3,17	63%	2

The processes which are defined as initial (level 1) are mostly connected to the partnering aspects of the model. From mutual goals and joint improvements to the selection of long-term partners. Other low scoring aspects are related to the assessment and sharing of innovative solutions throughout the firm on lower levels. High scoring aspects are related to the company wide innovation strategy, the handling of risks/ problems and the preferred supplier lists & network system.

To provide information on the utility of the newly developed model, a connection is made between the results from the external analysis (research stage 1) and the results from the application of the maturity model in this thesis. *Figure 10* shows the framework which summarizes the main results from research stage 1 and research stage 2. The figure shows that the survey means of the phase 1 antecedents (relational behaviour and contractor's operative excellence) is equal to 3,48 on a scale of 1 to 5. The average maturity which is found in this thesis for all subjects related to the first phase is equal to 55%. The mean survey

score for the phase 2 antecedents (growth opportunity, support & involvement of suppliers and innovation potential) is equal to 2,94 and the average maturity of all subjects related to phase 2 is equal to 40,3%.

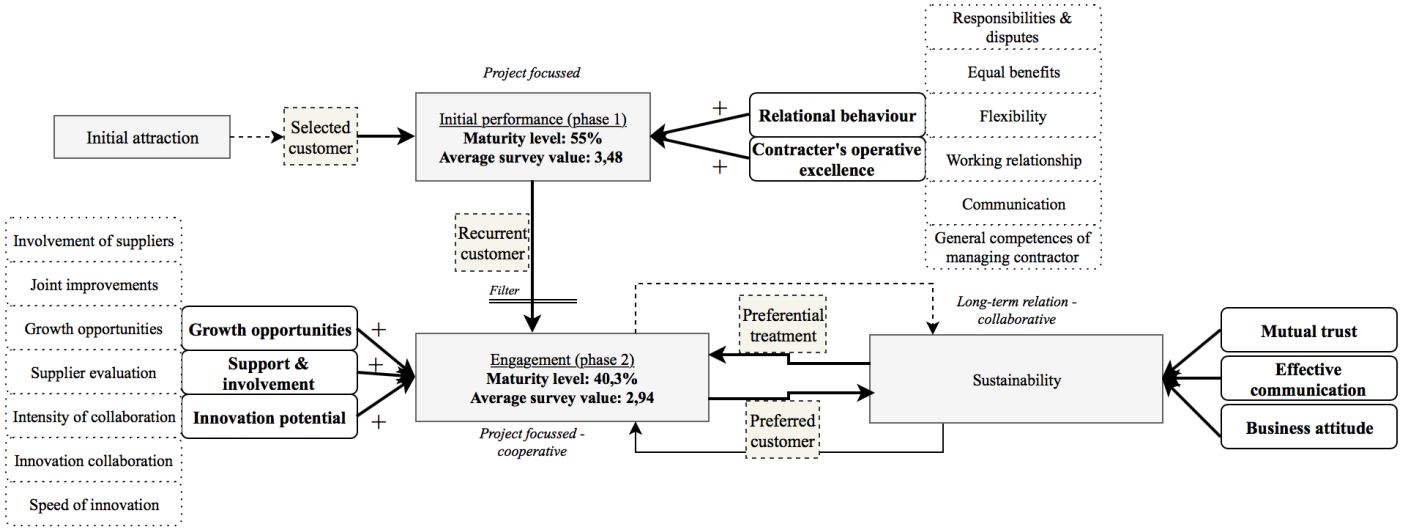

Figure 10: Extended framework for becoming a preferred customer in the construction sector

These results show that the results from the internal maturity assessment are (to some extent) in line with the results from the supplier satisfaction survey regarding those subjects. In other words, a higher score derived from the supplier satisfaction survey also implies a higher maturity for the connected processes. The remainder of this chapter will elaborate on the possible improvements which can be made to increase the maturity level of the business processes within the case company.

6.2. Possible improvements and barriers

None of the 33 processes analysed reached the highest maturity level in the model. Therefore, this paragraph will elaborate on the most important process improvements which can increase the maturity level of the respective business processes when implemented correctly. *Table 12* shows an overview of the proposed improvements.

Table 12: Possible improvements

Code	Process	Improvements
Communication	8	Describe general relational guidelines for the treatment of suppliers to ensure equal treatment across all personnel.
Involvement of suppliers	13	Define criteria which are relevant for the involvement of suppliers and use them for the formal decision moment to include suppliers and sub-contractors.
	14	Execute improvements for process 22,23,24 and include senior management in managing strategic partnerships.
Joint improvements	15	Include joint improvement programs as into the overall strategic frameworks as part of the long-term partnership.

Growth opportunities	16	Adapt the preferred supplier program and incorporate more criteria based on competitive capabilities and supplier profile.
Supplier evaluation	17,18	Formally describing the supplier selection and evaluation process including a risk assessment of potential sub-contractors and suppliers (for example based on past performance).
	19	Communicate the results of supplier evaluations to the respective suppliers.
	20	Incorporate a supplier complaints system into the new supplier selection and evaluation process.
Intensity of collaboration	21	Define general guidelines for the exchange of information with sub-contractors and suppliers and use this to construct project-specific guidelines.
	22,23	Define objectives for long-term relations based on the overall business objectives of Strukton. Use these objectives for the selection of strategic partners and for defining relation specific goals.
	24	Use the guidelines and objectives defined for process 21,22,23 for specifying new collaboration contracts for relations with strategic partners.
Innovation collaboration	26,27	Plan meetings to accommodate the exchange of knowledge between all relevant personnel.

6.2.1. Communication (phase 1)

Equal treatment of sub-contractors and suppliers is important since the feeling of equity among participants is a deciding factor in the success of construction projects. Especially interpersonal justice is found to be relevant for the success of construction projects (Lim & Loosemore, 2017). Additionally, Cheng & Li (2002) found that the mutual problem solving is key in successful partnering application in the construction industry. Therefore, subjects like the treatment of problems & responsibilities, flexibility and equal benefits should be part of the new communication guidelines.

6.2.2. Involvement of suppliers (phase 2)

Early involvement of suppliers is key in finding the optimal solution in quality and costs. This is also recognized in the literature related to early supplier involvement (ESI) in new product development (Chiang & Wu, 2016; Handfield, Ragatz, Petersen, & Monczka, 1999). Therefore, a formal decision moment should be implemented which decides on the moment to involve suppliers. Criteria which could be used to define this formal decision moment are (1) complexity of work package and (2) possible contributions of the supplier in finding the optimal solution. Additionally, a lack of senior management commitment is seen as barrier for implementing a partnering approach (Akintoye, McIntosh, & Fitzgerald, 2000). Therefore, both companies should involve senior management to be able to develop a partnership. This is also supported by the conclusion from Bemelmans et al. (2015) who

state that senior management involvement is a perquisite for the preferred customer status in the construction sector. A possible barrier for the implementation of these improvements is a lack of commitment from the sub-contractor or supplier to either help finding the optimal solution or provide senior management support.

6.2.3. Joint improvements (phase 2)

To define structural improvements and hold track of those, a formal process should be defined. The goals for these improvement programs should be based on (1) overall business objectives, (2) objectives of the partnership and (3) current performance. The development of suppliers can contribute to an increased performance of those suppliers (Krause, 1999; Trent, Monczka, & Callahan, 1993). Other advantages of supplier development are, among others, argued to be increased social responsibility (Zhang, Pawar, & Bhardwaj, 2017) and process optimisation and development (McGinnis & Vallopra, 1999). Moreover, to improve the overall performance of the firm, the firm has to increase the performance of the whole network it is operating in (Elfving & Ballard, 2011).

6.2.4. Growth opportunities (phase 2)

A more extensive supplier selection system wherein the classification of the suppliers on the preferred supplier list is also based on quality and where a good classification can yield suppliers a fictive discount on their quotation could provide additional incentives for suppliers to perform well. Additionally, by granting fictive discounts based on a classification, suppliers gain more influence on their ability to be awarded the contract which may increase their perception on the growth opportunities offered by Strukton. This extended supplier selection process could be classified as a preferred supplier program described by Elfving & Ballard (2011). They state that the selection of suppliers must focus increasingly on the possibilities for learning and growth in the long-term instead of sole competition on price. However, the uncertainty and anti-corruption laws present in the construction sector may form a barrier for implementing a proper classification system.

6.2.5. Supplier evaluation (phase 2)

Within the formal supplier evaluation process there should be a division between material suppliers and sub-contractors who perform a part of the work on-site. Moreover, communication of the evaluation results and a possibility to file complaints about suppliers

should also be incorporated into the formal process. Describing the exact steps and responsible persons for the evaluation of suppliers will improve the maturity level on this aspect.

6.2.6. Intensity of collaboration (phase 2)

The first process contains the exchange of information. Within this process, there are no formal procedures to define the amount of information exchanged. The definition of standard guidelines for information exchange with partners will improve the maturity level. Within these guidelines it is important for Strukton to define the type of information that is shared with partners, the frequency and the level of detail of the information shared (especially for cost information). The sharing of knowledge (information) can contribute to increased performance on new product (project) development (Sjoerdsma & van Weele, 2015). However, a possible barrier for this improvement may be the reluctance to change existing practices. Many construction companies are still using traditional approaches when managing suppliers and are thus not keen to share lots of information with them. Thus, important for this improvement is the involvement of senior management and the creation of support among lower level employees by explaining the possible advantages.

Additionally, an improvement could be made for relations with strategic suppliers. Based on the overall business objectives of Strukton, several objectives for strategic relations with recurrent supplier could be derived and used to assess performance within a relation. Additionally, these objectives can help to evaluate each other's actions within a relation. Black et al., (2000) found that it is important for the success of a partnership to evaluate the actions against the objectives. Furthermore, as the results from the stage 1 research show, the development of long-term relations should focus on developing an overarching agreement which is adapted to each specific project. This strategic framework can include business objectives like the measurement of performance information. Moreover, the model developed by Seth et al. (2018) could form the basis for defining criteria to select long-term partners (based on a balance between supplier profile and supplier's competitive capabilities). Additionally, these criteria can also be used to develop objectives and goals for a partnership. Lastly, the standard contracts which are used should also incorporate criteria and agreements on how the relationship between Strukton and a partner should be executed. Aspects like information sharing, meetings and the handling of problems should be

incorporated into these contracts to reach a higher maturity level. A possible barrier for these improvements is the lack of experience in managing long-term relations.

6.2.7. Innovation collaboration (phase 2)

Innovation remains a difficult subject within the construction industry. Within Strukton, the overall innovation teams share their innovations across the firm. Smaller (mostly incremental) innovations which are developed during the design phase of a project are often only communicated within the project team. To improve the maturity of process 26, it is important that the organization itself encourages innovation (Loosemore, 2015). An improvement could therefore be (ir)regular meetings with a selected group of personnel wherein they can exchange their innovative solutions. These meetings can also stimulate employees to actively share new solutions and innovations with each other.

7. Conclusion

The increased outsourcing of work and the reduction of supply bases have led to a shift in power dynamics within various industrial markets. The traditional focal entity in buyer supplier relations was the buyer. However, the changing market dynamics enhanced the power of (excellent) suppliers and thus, the supplier becomes the focal entity in some relationships. Moreover, public commissionaires are moving towards more innovative types of tender procedures and using more integrated contracts, bringing along different demands from managing contractors. One of the upcoming tender procedures is the Best Value method which obligates managing contractors to substantiate their claims in the tender documents with quantifiable performance information or QPI's. Managing contractors thus need excellent suppliers to provide quantifiable performance information within a Best Value procedure. This information is also usable in other integrated contracts. Therefore, remaining a competitive position within the construction market is increasingly depending on the attractiveness of the managing contractor compared to their competitors and their ability to develop and maintain long-term relations with excellent suppliers. Hence, academic researchers focussed on (1) becoming a preferred customer for excellent suppliers and (2) developing partnerships to outplay competitors. The latter is often applied in the construction sector with alternating successes and mostly focussed on the contractor-client relationship rather than the contractor-sub contractor relationship. Moreover, the preferred customer concept is not widely spread yet and the possible advantages of this approach are not yet known in the construction sector. This thesis has explored these two buyer-supplier relationship concepts to increase the understanding of the implementation possibilities and focal subjects for a successful implementation.

The stage 1 research showed two antecedents of supplier satisfaction in the construction sector; (1) relational behaviour, (2) contractor's operative excellence and three antecedents for the preferred customer status; (1) growth opportunities, (2) support & involvement of suppliers and (3) innovation potential. Moreover, the process to become a preferred customer can be divided into three phases; (1) the performance phase, (2) the engagement phase and (3) the sustainability phase. The main research question of this thesis was formulated as:

How can Strukton/Reef infra adapt their operational processes to become a preferred customer for their key sub-contractors and suppliers?

The five antecedents found in the stage 1 research are divided in 13 subjects. These 13 subjects are used to search for relevant internal business processes. The execution of a literature search uncovered 8 existing maturity models which cover one or more of the 13 subjects. Based on these maturity models, a new maturity model was developed according to the design science approach of Hevner et al. (2004). The refined model includes 33 internal business processes.

The application of this model showed that the maturity of the business processes connected with the initial performance phase is equal to 55%. The maturity of the business processes connected with the engagement phase is equal to 40,3%. This shows that Strukton scores higher on the antecedents of supplier satisfaction (initial performance) compared to the antecedents of the preferred customer status (engagement). This is in line with the expectations of the researcher since the case company is conducting the first steps in identifying relevant processes and improvements to achieve more engaged suppliers and sub-contractors. Moreover, the results from the maturity model are, to some extent, in line with the external assessment of the five antecedents. The mean of the survey questions related to the initial performance phase is equal to 3,48. The mean of the survey questions related to the engagement phase is equal to 2,94. This also shows that external suppliers and sub-contractors have a similar view on the performance of the internal business processes related to the initial performance and engagement phases.

Concluding, the suppliers and sub-contractors of Strukton are satisfied with the relational behaviour and operative excellence of Strukton. This is also underlined by the fact that the average maturity of the connected processes is almost at level 3. However, there are still improvements possible to the existing business processes which will improve the maturity of these subjects. Communication and equal treatment of suppliers are considered to be the most important improvements for the initial performance phase.

Moreover, both internal and external assessment of the antecedent's growth opportunities, involvement & support of suppliers and innovation potential show that the focus of Strukton

should be at improving the processes connected to these antecedents to become a preferred customer and develop long-term relationships. The most important improvements for this phase are considered to be the development and formulation of formal processes. These processes should cover the subjects of supplier relationship management, supplier evaluation and an extended preferred supplier program. Moreover, Strukton should define a vision and strategy which relates to the relations with suppliers. This is necessary to be able to define suitable long-term suppliers and sub-contractors who can significantly accelerate the achievement of the business objectives for Strukton.

Additionally, this thesis also defined several possible barriers to the implementation of the improvements. The most important barrier for the implementation of the improvements defined in this thesis is considered to be the, still prevailing, traditional approach of managing relationships in the construction sector. Employees who are used to exercise coercive power to force suppliers to, for example, drop their prices or perform better should be advised on the changing market dynamics and importance of changing their approach towards key suppliers and sub-contractors. The acknowledgement of this and the subsequent change in relationship management may also attract new, like-minded, suppliers and sub-contractors since the expected value of the relation may be higher in such a case.

Finally, this thesis contributed to an increased understanding of internal processes which relate to the antecedents of supplier's satisfaction and preferred customer status in the construction sector by the development of a maturity model. This model proved its utility by the definition of key improvements within the existing business processes of Strukton which are in line with the external assessment of the supplier satisfaction. Additionally, the model could form the basis (benchmark) for structural improvements of business processes within Strukton and other managing contractors in managing relationships with sub-contractors and suppliers in the construction sector.

8. Recommendations

The recommendations of this thesis can be summarized in two independent roadmaps which allows the focal firm to improve their business processes and become more attractive for excellent suppliers. The first roadmap is concerned with improvements of existing processes (left side in *Figure 11*). Improving existing processes will enhance the overall supplier satisfaction. The second roadmap describes the process to formalize the supplier management process for long-term relations with excellent suppliers and sub-contractors (right side in *Figure 11*). Developing such a supplier management process will open up new possibilities to gather and measure relevant performance information which can be used in Best Value tenders and other (integrated contracts) tender procedures.

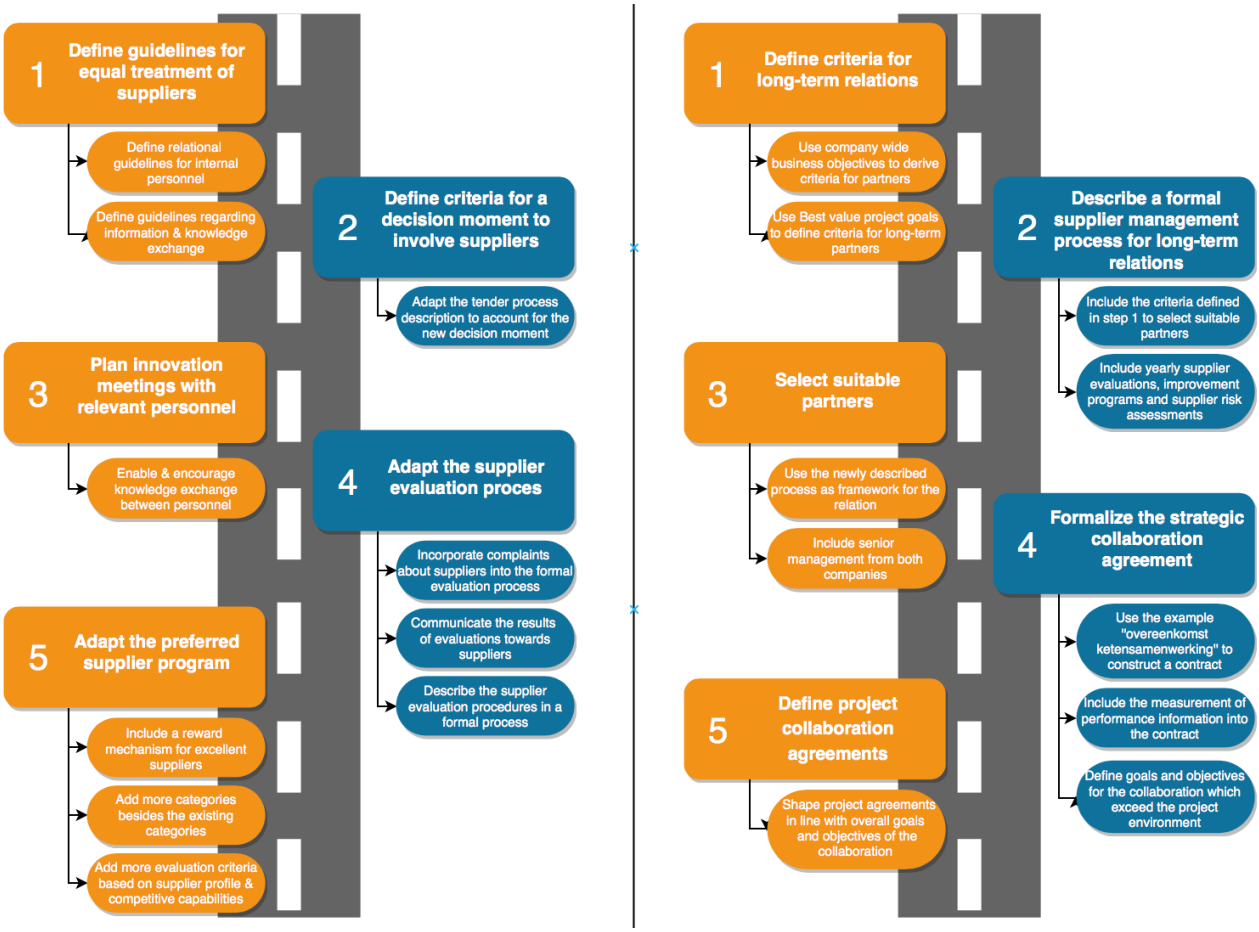

Figure 11: (a) Roadmap for existing processes (b) Roadmap for new supplier management process

The first three steps for the improvement of existing processes are considered to be quick wins in terms of impact of the solution and ease of implementation. These steps can also be conducted simultaneously. The step 1 improvement will enhance the perception of the relational behaviour antecedent and avoid injustice between suppliers & sub-contractors which may also increase trust. The step 2 improvement will increase the perception of

suppliers on the involvement antecedent and may also increase the value of supplier contributions within a tender since there is a more deliberate decision on who to include and/or exclude. The step 3 improvement will enhance internal knowledge sharing and information exchange between personnel, increasing the operative excellence antecedent.

Step 4 & 5 for the improvement of existing processes should focus on creating incentives for suppliers and sub-contractors to perform well. The fourth step describes an adaptation of the preferred supplier program. Currently, suppliers are categorized according to five categories (ABCDE). This classification happens based on experience and supplier evaluations. However, there is no underlying process which weights certain (more important) criteria and incorporates past performance as incentive. It is recommended to increase the number of categories by extending the evaluation criteria of suppliers and describing a formal process on which criteria are used and how good past performance can increase the changes of acquiring work for suppliers and sub-contractors. By communicating the results of evaluations and creating an incentive for sub-contractors and suppliers to perform well (for example a fictive discount based on preferred supplier category), a chance is offered to sub-contractors and suppliers to increase their chance on the acquisition of work. Moreover, a managing contractor is heavily depending on the performances of sub-contractors and suppliers thus, improving the performance of this group will also enhance the overall performance on projects.

The second roadmap entails the follow up from the results of the stage 1 research (see *Figure 3*) in creating long-term relationship continuity between Strukton and excellent suppliers/ sub-contractors. The first step is to define criteria for long-term partners. These criteria should be derived from the overall business objectives, mission, vision and client demands (such as Best value project goals). Together, this will help in selecting partners which fit within the mindset and goals of Strukton and therefore will form a proper basis for long-term collaboration. The next step is to describe a formal supplier management process. Executing a formal process opens up the way for proper control & evaluation criteria and ensures a certain standardization within supplier relationship management. Step 3 is the application of the two previous steps. It is recommended to select a small group (5-10) of suitable partners which show the highest similarity in business attitude, contributions to overall mission & vision and are considered excellent suppliers according to the supplier evaluation categories and past performance. Important in this step is to include the senior

management of these companies in the process. Step 4 & 5 in the roadmap are connected to the engagement and sustainability phases described in the results from research stage 1. First, an overarching agreement must be made which excludes project specific requirements and focusses on the overall relationship. As example for such an agreement, the '*'samenwerkingsovereenkomst keternsamenwerking bouw 2016*'' could be used.[2] Within this contract, agreements can be made regarding the collaboration process, performance information and innovations. Additionally, objectives and goals of the relationship should be agreed upon. Moreover, every project is unique and requires certain project specific agreements. The overarching contract should therefore be used as framework wherein each separate project can be executed in a similar way. Important in both the project contracts as well as the overarching framework is the presence of mutual trust, effective communication and a cooperative business attitude. Recurrent evaluations of the overarching framework should focus on these three aspects. For the evaluation of projects, the goals and objectives for the relationship should be used. *Figure 12* shows the relationship between the framework agreement and the project specific agreements. It is recommended to construct the strategic collaboration agreement based on three layers; (1) general relationship agreements, (2) focal points of the relation and (3) goals & objectives. The mission and vision developed by the partners and the focal points of the relation should be translated into goals and objectives for a certain period of time. Making these goals and objectives bound to a fixed period of time allows for effective control, steering and evaluation. Within every new project, the partners should decide which objectives and goals are suited for the specific project and incorporate those in a project specific contract.

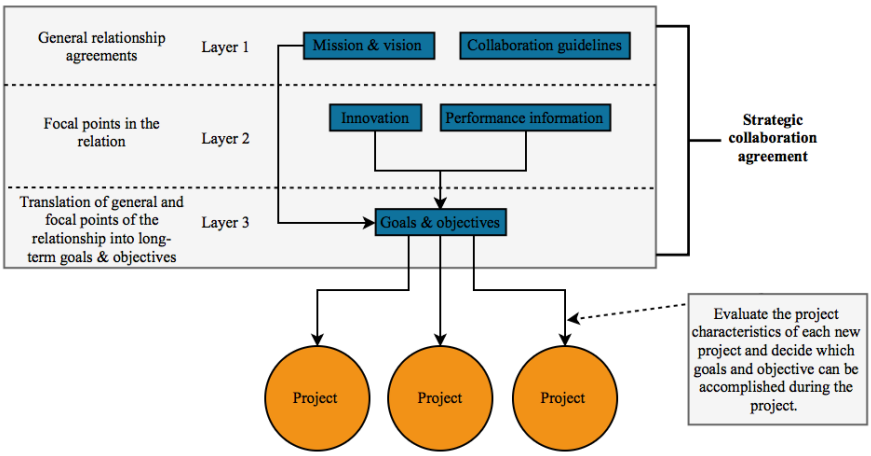

Figure 12: Recommended approach for the development of a long-term contract

[2] Available at https://www.bouwrechtbedrijf.nl/wp-content/uploads/2016/10/Model1_Samenwerkingsovereenkomst_KetenSamenWerking_2016.pdf

9. Limitations, implications and further research directions

As any academic research, also this study has its limitations. First of all, the sample size which was gathered for the supplier satisfaction survey contained only 82 respondents. Based on the approximation of the total industry, a minimal sample size of 400 should be obtained to have a representable sample.[3] This small sample size has poses a limitation since the maturity model is based upon the statistical analysis of the data in the stage I research. However, since the results from the supplier satisfaction show similar antecedents of supplier satisfaction and preferred customer status defined in earlier researches (Hüttinger et al., 2014; Vos et al., 2016), it is expected that this limitation only has a minimal effect on the newly developed model. Secondly, the development of the model is subject to two limitations. Firstly, the development of the model is mostly based on 3 maturity models. These maturity models are subject to assumptions made by the researchers and thus may have excluded certain processes. Moreover, every company has a different organizational structure. Therefore, it is possible that some processes which ought to be to be relevant for Strukton have no meaning to other companies. This limits the generalisability of the developed model. However, a large portion of the model will be applicable for other companies. Another limitation for the development of the model is the fact that both the evaluation/refinement step and the application are executed within the same company. This may have introduced a bias/certain focus on processes which are ought to be important for Strukton while having no important meaning for other companies. The researcher tried to limit the impact of this limitation by using the interviews mostly for the refinement step and using documented evidence for the application step. This separates the ‘’subjective evaluations’’ from the ‘’factual’’ documented processes and thus allows for a better evaluation of the business processes. The use of this factual data is important in case study research opposed to subjective data (Leedy & Ormrod, 2005).

Lastly, the fragmentation present in the supply chain can be brought down to three main types of entities within the supply chain; (1) suppliers & sub-contractors of standardized work, (2) specialist sub-contractors & suppliers and (3) managing contractors. These three types of entities also call for different relationship management. Therefore, the developed model will have a limited applicability for relations with the category 1 suppliers and sub-

[3] Approximation with an industry of 150.000 firms (See https://opendata.cbs.nl/ statline/#/CBS/nl/dataset /81589ned/table?ts=1530281935306) and 5% error margin.

contractors. For relations with category 2 and 3 suppliers and contractors, the developed model is applicable.

The results of this thesis also have several implications. First of all, the supplier satisfaction survey in combination with the maturity model can be used as a tool to track company progress. The results from this thesis can thus be used as benchmark for the current performance of Strukton. By executing the same survey & maturity model, the company can track their progress in the future in relation to relationship management. Moreover, the results show that relationship management is mostly based on experiences and ad hoc decisions, there are only a few formalized processes within the supplier relationship management. This implies that the relationship management processes and their contributions to performance are not widely known to managing contractors. This thesis can therefore help in showing the importance of a formal relationship management process.

For future researchers in the field of supplier relationship management, the research directions which follow from this thesis are dual. First of all, the developed model can be further improved by integrating other managing contractors and maybe even sub-contractors to extend the pool of relevant processes. This can improve the generalizability and applicability of the maturity model. Secondly, future researchers should further strengthen the link between supplier satisfaction/preferred customer status and the maturity model. The research question which could be asked is; Does improving the maturity of the relevant business processes also improve the perception of suppliers and sub-contractors of those processes? Researchers could investigate this link by executing a longitudinal study within several managing contractors.

Lastly, this thesis contributed to the knowledge base about a difficult problem which is present in the construction sector and which is influenced by several distinctive characteristics; the development of long-term relations. The stage I research showed a step-by step framework which divides project and strategic partnering in the construction sector. This second part of the research introduced several key processes which should be present to be eligible for long-term relation with sub-contractors and suppliers. Together they have extended the knowledge about buyer-supplier relation management in the construction sector and showed possible ways to develop and maintain long-term relations which are key to remain competitive in the changing market.

Bibliography

1. Akintoye, A., McIntosh, G., & Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the UK construction industry. ... *of Purchasing & Supply Management*, *6*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0969701200000125

2. Anderson, J. C., & Narus, J. A. (1990). A Model of Distributor Firm and Manufacturer Firm Working Partnerships. *Journal of Marketing*, *54*(1), 42. https://doi.org/10.2307/1252172

3. Bakker, R. M., Cambré, B., Korlaar, L., & Raab, J. (2011). Managing the project learning paradox: A set-theoretic approach toward project knowledge transfer. *International Journal of Project Management*, *29*(5), 494–503. https://doi.org/10.1016/j.ijproman.2010.06.002

4. Batenburg, R., & Versendaal, J. (2008). Maturity matters: Performance determinants of the procurement business function. *Ecis*, (1), 563–574. Retrieved from http://60.88.dyn.lse.ac.uk/asp/aspecis/20080049.pdf

5. Baxter, R. (2012). How can business buyers attract sellers' resources?. Empirical evidence for preferred customer treatment from suppliers. *Industrial Marketing Management*, *41*(8), 1249–1258. https://doi.org/10.1016/j.indmarman.2012.10.009

6. Bayliss, R., Cheung, S. O., Suen, H. C. H., & Wong, S. P. (2004). Effective partnering tools in construction: A case study on MTRC TKE contract 604 in Hong Kong. *International Journal of Project Management*, *22*(3), 253–263. https://doi.org/10.1016/S0263-7863(03)00069-3

7. Beach, R., Webster, M., & Campbell, K. M. (2005). An evaluation of partnership development in the construction industry. *International Journal of Project Management*, *23*(8), 611–621. https://doi.org/https://doi.org/10.1016/j.ijproman.2005.04.001

8. Bemelmans, J., Voordijk, H., & Vos, B. (2012). Assessing Buyer-Supplier Relationship Management : Multiple Case-Study in the Dutch Construction Industry, *138*(February), 163–176. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000418

9. Bemelmans, J., Voordijk, H., Vos, B., & Dewulf, G. (2015). Antecedents and benefits of obtaining preferred customer status. *International Journal of Operations & Production Management*, *35*(2), 178–200. https://doi.org/10.1108/IJOPM-07-2012-0263

10. Benton, W. C., & Maloni, M. (2005). The influence of power driven buyer/seller relationships on supply chain satisfaction. *Journal of Operations Management*, *23*(1), 1–22. https://doi.org/10.1016/j.jom.2004.09.002

11. Black, C., Akintoye, A., & Fitzgerald, E. (2000). Analysis of success factors and benefits of partnering in construction. *International Journal of Project Management*, *18*(6), 423–434. https://doi.org/10.1016/S0263-7863(99)00046-0

12. Blau, P. M. (1968). Interaction: Social exchange. *International Encyclopedia of the Social Sciences*, *7*, 452–458.

13. Blau, P. M. (1989). *Exchange and power in social life*. *TA* -. New York, NY [etc.] : Wiley,.

14. Bygballe, L. E., Jahre, M., & Swärd, A. (2010). Partnering relationships in construction: A literature review. *Journal of Purchasing and Supply Management*, *16*(4), 239–253. https://doi.org/10.1016/j.pursup.2010.08.002

15. Cacciatori, E. (2008). Memory objects in project environments: Storing, retrieving and adapting learning in project-based firms. *Research Policy*, *37*(9), 1591–1601. https://doi.org/10.1016/j.respol.2008.04.028

16. Chan, A. P. C., Chan, D. W. M., Chiang, Y. H., Tang, B. S., Chan, E. H. W., & Ho, K. S. K. (2004). Exploring Critical Success Factors for Partnering in Construction Projects. *Journal of Construction Engineering and Management*, *130*(2), 188–198. https://doi.org/10.1061/(ASCE)0733-9364(2004)130:2(188)

17. Cheng, E. W. L., & Li, H. (2002). Construction partnering process and associated critical success factors: Quantitative investigation. *Journal of Management in Engineering*, *18*(4), 194–202. https://doi.org/10.1061/(ASCE)0742-597X(2002)18:4(194)

18. Cheng, E. W. L., Li, H., & Love, P. E. . (1999). Establishment of critical succes factors for construction partnering. *Engineering*, *16*(June), 142–150. https://doi.org/10.2307/40398617

19. Chiang, R., & Wu, J. (2016). New product development. *IEEE Transactions on Engineering Management*, *63*(2), 248–258. Retrieved from http://www.ingentaconnect.com/content/mcb/007/1993/00000012/00000003/art00001

20. Crespin-Mazet, F., Havenvid, M. I., & Linné, Å. (2015). Antecedents of project partnering in the construction industry - The impact of relationship history. *Industrial Marketing Management*, *50*, 4–15. https://doi.org/10.1016/j.indmarman.2015.07.018

21. Crespin-Mazet, F., & Portier, P. (2010). The reluctance of construction purchasers towards project partnering. *Journal of Purchasing and Supply Management*, *16*(4), 230–238. https://doi.org/10.1016/j.pursup.2010.06.001

22. Dainty, A. R. J., Briscoe, G. H., & Millett, S. J. (2001). Subcontractor perspectives on supply chain alliances. *Construction Management and Economics*, *19*(8), 841–848. https://doi.org/10.1080/01446190110089727

23. Das, T. ., & Teng, B.-S. (2002). Alliance Constellations : A Social Exchange Perspective. *The Acedemy of Management Review*, *27*(3), 445–456.

24. Dubois, A., & Gadde, L.-E. (2002). The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management and Economics*, *20*(7), 621–631. https://doi.org/10.1080/01446190210163543

25. Dyer, J. H., & Hatch, N. W. (2006). Relation-specific capabilities and barriers to knowledge transfers: Creating advantage through network relationships. *Strategic Management Journal*, *27*(8), 701–719. https://doi.org/10.1002/smj.543

26. Egan, J. (1998). Rethinking construction. *Structural Engineer*, *80*(14), 38. https://doi.org/Construction Task Force. Uk Government

27. Elfving, J. A. ., & Ballard, G. . C. (2011). In search of lean suppliers - Structuring a preferred supplier program. *19th Annual Conference of the International Group for Lean Construction 2011, IGLC 2011*, 125–134. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-84876767074&partnerID=40&md5=a2affe0c1e9aca97e5dc0cf4c1ad7eac

28. Ellis, S. C., Henke, J. W., & Kull, T. J. (2012). The effect of buyer behaviors on preferred customer status and access to supplier technological innovation: An empirical study of supplier perceptions. *Industrial Marketing Management*, *41*(8), 1259–1269. https://doi.org/10.1016/j.indmarman.2012.10.010

29. Ellram, L. M., & Edis, O. R. V. (1996). A Case Study of Successful Partnering Implementation. *International Journal of Purchasing and Materials Management*, *32*(4), 20–28. https://doi.org/10.1111/j.1745-493X.1996.tb00227.x

30. Enkel, E., Bell, J., & Hogenkamp, H. (2011). Open Innovation Maturity Framework. *International Journal of Innovation Management*, *15*(06), 1161–1189. https://doi.org/10.1142/S1363919611003696

31. Eriksson, P. E. (2010). Partnering : what is it, when should it be used, and how sould it be implemented? *Construction Management and Economics*, *28*(Level I), 905–917. https://doi.org/10.3113/FAI.2010.1033

32. Essig, M., & Amann, M. (2009). Supplier satisfaction: Conceptual basics and explorative findings. *Journal of Purchasing and Supply Management*, *15*(2), 103–113. https://doi.org/10.1016/j.pursup.2009.01.001

33. Fearne, A., & Fowler, N. (2006). Efficiency versus effectiveness in construction supply chains: the dangers of "lean" thinking in isolation. *Supply Chain Management: An International Journal*, *11*(4), 283–287. https://doi.org/10.1108/13598540610671725

34. Frödell, M. (2009). *Contractor-Supplier Relations in a Large Contractor Organisation*. *Master*. Chalmers university of technology.

35. Frödell, M. (2011). Criteria for achieving efficient contractor-supplier relations. *Engineering, Construction and Architectural Management*, *18*(4), 381–393. https://doi.org/10.1108/09699981111145826

36. Gaaff, T. (2014). *Getting the most out of BVP tenders: An exploratory research into the effects and implications of the introduction of BVP on Dutch construction market*. TU Delft.

37. Gadde, L. E., & Dubois, A. (2010). Partnering in the construction industry-Problems and opportunities. *Journal of Purchasing and Supply Management*, *16*(4), 254–263. https://doi.org/10.1016/j.pursup.2010.09.002

38. Galbraith, J. R. (1977). *Organization design*. Addison-Wesley Pub. Co. Retrieved from https://books.google.nl/books?id=qCNHAAAAMAAJ

39. Garcia, H. (2008). A Capability Maturity Model to Assess Supply Chain Performance. https://doi.org/10.25148/etd.FI10022514

40. Gidado, K. I. (1996). Project complexity: The focal point of construction production planning. *Construction Management and Economics*, *14*(3), 213–225. https://doi.org/10.1080/014461996373476

41. Hagan, G., Bower, D., & Smith, N. (2012). Delivery of Complex Construction Multi-Projects in Contractor-Led Procurement. In *Association of Researchers in Construction Management, ARCOM 2012 - Proceedings of the 28th Annual Conference* (pp. 1121–1131).

42. Hald, K. S., Cordón, C., & Vollmann, T. E. (2009). Towards an understanding of attraction in buyer-supplier relationships. *Industrial Marketing Management*, *38*(8), 960–970. https://doi.org/10.1016/j.indmarman.2008.04.015

43. Hallen, L., Johanson, J., & Seyed-Mohamed, N. (1991). Interfirm Adaptation in Business Relationships. *Journal of Marketing*, *55*(2), 29–37. https://doi.org/10.2307/1252235

44. Handfield, R. B., Ragatz, G. L., Petersen, K. J., & Monczka, R. M. (1999). Involving Suppliers in New Product Development. *California Management Review*, *42*(1), 59–82. https://doi.org/10.2307/41166019

45. Harmon, P. (1995). Process Maturity Models. *Power*.

46. Harmon, P. (2004). Evaluating an Organization's Business Process Maturity. *Business Process Trends*, *2*(3), 1–11.

47. Hartmann, A., & Dorée, A. (2015). Learning between projects: More than sending messages in bottles. *International Journal of Project Management*, *33*(2), 341–351. https://doi.org/10.1016/j.ijproman.2014.07.006

48. Havenvid, M. I., Holmen, E., Linné, Å., & Pedersen, A.-C. (2017). Creating relationship continuity across projects in the construction industry. *IMP Journal*, *11*(2), 207–229. https://doi.org/10.1108/IMP-07-2016-0015

49. Het Europees Parlement. (2014). Richtlijn 2014/24/Eu Van Het Europees Parlement En De Raad, (november 2009), 65–242.

50. Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *Design Science in IS Research MIS Quarterly*, *28*(1), 75–105. https://doi.org/10.2307/25148625

51. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

52. Humphreys, P., Matthews, J., & Kumaraswamy, M. (2003). Pre-construction project partnering: from adversarial to collaborative relationships. *Supply Chain Management: An International Journal*, *8*(2), 166–178. https://doi.org/10.1108/13598540310468760

53. Hüttinger, L., Schiele, H., & Schröer, D. (2014). Exploring the antecedents of preferential customer treatment by suppliers: a mixed methods approach. *Supply Chain Management: An International Journal*, *19*(5/6), 697–721. https://doi.org/10.1108/SCM-06-2014-0194

54. Hüttinger, L., Schiele, H., & Veldman, J. (2012). The drivers of customer attractiveness, supplier satisfaction and preferred customer status: A literature review. *Industrial Marketing Management*, *41*(8), 1194–1205. https://doi.org/10.1016/j.indmarman.2012.10.004

55. Ivanova, M. I. (2016). *Building New Roads in Tendering Towards Selection Based on Values and Competencies*. *TU Delft / Arcadis*. TU Delft.

56. Jeffrey H. Dyer. (1996). How Chrysler Created an American Keiretsu. *Harvard Business Review*.

57. Jongerius, J. (2014). *Quantifiable performance information, the road to winning tenders?* Delft University of Technology.

58. Kanji, G. K., & Wong, A. (1998). Quality culture in the construction industry. *Total Quality Management*, *9*(4–5), 133–140. https://doi.org/10.1080/0954412988758

59. Kashiwagi, D., Halmrast, C., & Tisthammer, T. (1996). Intelligent procurement of construction systems. *Performance Based Studies*, *May*.

60. Kim, S.-Y., & Nguyen, V. T. (2018). A Structural model for the impact of supply chain relationship traits on project performance in construction. *Production Planning & Control*, *29*(2), 170–183. https://doi.org/10.1080/09537287.2017.1398846

61. Koufteros, X., Vickery, S. K., & Dröge, C. (2012). The Effects of Strategic Supplier Selection on Buyer Competitive Performance in Matched Domains: Does Supplier Integration Mediate the Relationships? *Journal of Supply Chain Management*, *48*(2), 93–115. https://doi.org/10.1111/j.1745-493X.2012.03263.x

62. Krause, D. R. (1999). The antecedents of buying firms' efforts to improve suppliers. *Journal of Operations Management*, *17*(2), 205–224. https://doi.org/10.1016/S0272-6963(98)00038-2

63. L.Cheng, E. W., & Li, H. (2004). Development of a Practical Model of Partnering for Construction Projects. *Journal of Construction Engineering & Management*, *130*(6), 790–798. https://doi.org/10.1061/(ASCE)0733-9364(2004)130:6(790)

64. Lambe, C. J., Wittmann, C. M., & Spekman, R. E. (2001). Social Exchange Theory and Research on Business- to-Business Relational Exchange. *Journal of Business-to-Business Marketing*, *0628*(March), 1–36. https://doi.org/10.1300/J033v08n03

65. Larson, E. (1997). Partnering on construction projects: A study of the relationship between partnering activities and project success. *IEEE Transactions on Engineering Management*, *44*(2), 188–195. https://doi.org/10.1109/17.584926

66. Latham, M. (1994). *Constucting the team: joint review of procurement and contractual arrangements in the United Kingdom construction industry*. *HMSO*. https://doi.org/10.1017/CBO9781107415324.004

67. Latham, M. (2001). *Modernising Construction*. London.

68. Leedy, P. D., & Ormrod, J. E. (2005). *Practical research*. Pearson Custom.

69. Lim, B. T. H., & Loosemore, M. (2017). The effect of inter-organizational justice perceptions on organizational citizenship behaviors in construction projects. *International Journal of Project Management*, *35*(2), 95–106. https://doi.org/10.1016/j.ijproman.2016.10.016

70. Lockamy, A., & McCormack, K. (2004). The development of a supply chain management process maturity model using the concepts of business process orientation. *Supply Chain Management: An International Journal*, *9*(4), 272–278. https://doi.org/10.1108/13598540410550019

71. Loosemore, M. (2015). Construction Innovation: Fifth Generation Perspective. *Journal of Management in Engineering*, *31*(6), 04015012. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000368

72. March, J. G., & Simon, H. A. (1993). *Organizations*. Wiley. Retrieved from https://books.google.nl/books?id=4ta1QgAACAAJ

73. Matthews, J. (1996). *A project partnering approach to the main contractor - sub contractor relationship*. Loughborough University. Retrieved from https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/7111/2/DX208394.pdf

74. McGinnis, M. a, & Vallopra, R. M. (1999). Purchasing and Supplier Involvement in Process Improvement: A Source of Competitive Advantage. *Journal of Supply Chain Management*, *35*(4), 42–50. https://doi.org/10.1111/j.1745-493X.1999.tb00243.x

75. Meng, X., Sun, M., & Jones, M. (2011). Maturity Model for Supply Chain Relationships in Construction. *Journal of Management*, *27*(April), 97–105. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000035.

76. Ministery of Economic affairs. (2016). Gids Proportionaliteit.

77. Mortensen, M. H. (2012). Understanding attractiveness in business relationships - A complete literature review. *Industrial Marketing Management*, *41*(8), 1206–1218. https://doi.org/10.1016/j.indmarman.2012.10.005

78. Naoum, S. (2003). An overview into the concept of partnering. *International Journal of Project Management*, *21*(1), 71–76. https://doi.org/10.1016/S0263-7863(01)00059-X

79. Nazarko, J., & Chodakowska, E. (2015). Measuring Productivity of Construction Industry in Europe with Data Envelopment Analysis. *Procedia Engineering*, *122*(Orsdce), 204–212. https://doi.org/10.1016/j.proeng.2015.10.026

80. Nederland, B. (2017). Feiten en cijfers. Retrieved April 18, 2018, from http://www.bouwendnederland.nl/feitenencijfers

81. Ng, S. T., Rose, T. M., Mak, M., & Chen, S. E. (2002). Problematic issues associated with project partnering - the contractor perspective. *International Journal of Project Management*, *20*(6), 437–449. https://doi.org/10.1016/S0263-7863(01)00025-4

82. Nollet, J., Rebolledo, C., & Popel, V. (2012). Becoming a preferred customer one step at a time. *Industrial Marketing Management*, *41*(8), 1186–1193. https://doi.org/10.1016/j.indmarman.2012.10.003

83. Paulraj, A., Chen, I. J., & Flynn, J. (2006). Levels of strategic purchasing: Impact on supply integration and performance. *Journal of Purchasing and Supply Management*, *12*(3), 107–122. https://doi.org/10.1016/j.pursup.2006.08.002

84. Planview. (2013). A New Framework For Assessing Your Innovation Program: Introducing the Innovation Management Maturity Model by Planview. *Whitepaper*, 1–9.

85. Pulles, N. J., Schiele, H., Veldman, J., & Hüttinger, L. (2016). The impact of customer attractiveness and supplier satisfaction on becoming a preferred customer. *Industrial Marketing Management*, *54*, 129–140. https://doi.org/10.1016/j.indmarman.2015.06.004

86. Pulles, N. J., Veldman, J., & Schiele, H. (2016). Winning the competition for supplier resources. *International Journal of Operations & Production Management*, *36*(11), 1458–1481. https://doi.org/10.1108/IJOPM-03-2014-0125

87. Ringe, C., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. Retrieved June 5, 2018, from http://www.smartpls.com

88. Samson, S. (2015). *Implementing Best Value in a Systems Engineering environment*. TU Delft.

89. Scarbrough, H., Swan, J., Laurent, S., Bresnen, M., Edelman, L., & Newell, S. (2004). Project-Based Learning and the Role of Learning Boundaries. *Organization Studies*, *25*(9), 1579–1600. https://doi.org/10.1177/0170840604048001

90. Schiele, H. (2007). Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement-performance link. *Journal of Purchasing and Supply Management*, *13*(4), 274–293. https://doi.org/10.1016/j.pursup.2007.10.002

91. Schiele, H., Calvi, R., & Gibbert, M. (2012). Customer attractiveness, supplier satisfaction and preferred customer status: Introduction, definitions and an overarching framework. *Industrial Marketing Management*, *41*(8), 1178–1185. https://doi.org/10.1016/j.indmarman.2012.10.002

92. Schiele, H., Ellis, S. C., Eßig, M., Henke, J. W., & Kull, T. J. (2015). Managing supplier satisfaction: Social capital and resource dependence frameworks. *Australasian Marketing Journal*, *23*(2), 132–138. https://doi.org/10.1016/j.ausmj.2015.04.008

93. Seth, D., Nemani, V. K., Pokharel, S., & Al Sayed, A. Y. (2018). Impact of competitive conditions on supplier evaluation: a construction supply chain case study. *Production Planning & Control*, *29*(3), 217–235. https://doi.org/10.1080/09537287.2017.1407971

94. Siao, F.-C., & Lin, Y.-C. (2012). Enhancing Construction Interface Management Using Multilevel Interface Matrix Approach. *Journal of Civil Engineering and Management*, *18*(1), 133–144. https://doi.org/10.3846/13923730.2012.657368

95. Sjoerdsma, M., & van Weele, A. J. (2015). Managing supplier relationships in a new product development context. *Journal of Purchasing and Supply Management*, *21*(3), 192–203. https://doi.org/10.1016/j.pursup.2015.05.002

96. Snippert, T. ., Witteveen, W. ., Boes, H. ., & Voordijk, H. . (2015). Barriers to realizing a stewardship relation between client and vendor: The Best Value approach. *Construction Management and Economics*, *33*(7), 569–586. https://doi.org/10.1080/01446193.2015.1078902

97. Snyman, T., & Smallwood, J. (2017). Improving Productivity in the Business of Construction. *Procedia Engineering*, *182*, 651–657. https://doi.org/10.1016/j.proeng.2017.03.175

98. Strukton. (2017). *Inhoud Strukton onderscheidt zich met een aantal unieke specialismen voor de markten railsystemen ,*.

99. Sunil Kumar, C. V., & Routroy, S. (2016). Analysis of preferred customer enablers from supplier's perspective. *Business Process Management Journal*, *22*(6), 1170–1191. https://doi.org/10.1108/BPMJ-10-2015-0135

100. Tenderned. (2012). Dataset Tenderned 2012. Retrieved June 9, 2017, from https://www.tenderned.nl/over-tenderned/datasets-aanbestedingen

101. Tenderned. (2015). Dataset Tenderned 2015. Retrieved June 9, 2017, from https://www.tenderned.nl/over-tenderned/datasets-aanbestedingen

102. The Associated General Contractors of America [AGC]. (1991). Partnering: a concept for success.

103. Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. *Wiley*. New York: Wiley,.

104. Trent, R. J., Monczka, R. M., & Callahan, T. J. (1993). Supply Base Strategies to Maximize Supplier Performance. *International Journal of Physical Distribution & Logistics Management*, *23*(4), 42–54. https://doi.org/10.1108/09600039310041509

105. Van der Rijt, J., & Santema, S. (2013). *Prestatieinkoop*.

106. Vos, F. G. S., Schiele, H., & Hüttinger, L. (2016). Supplier satisfaction: Explanation and out-of-sample prediction. *Journal of Business Research*, *69*(10), 4613–4623. https://doi.org/10.1016/j.jbusres.2016.04.013

107. Vrijhoef, R., & Koskela, L. (2000). The four roles of supply chain management in construction. *European Journal of Purchasing & Supply Management*, *6*(3–4), 169–178. https://doi.org/10.1016/S0969-7012(00)00013-7

108. Whyte, J., Stasis, A., & Lindkvist, C. (2016). Managing change in the delivery of complex projects: Configuration management, asset information and "big data." *International Journal of Project Management*, *34*(2), 339–351. https://doi.org/10.1016/j.ijproman.2015.02.006

109. Winch, G. M. (2010). *Managing Construction Projects*. John Wiley & Sons.

110. Wong, A. (2000). Integrating supplier satisfaction with customer satisfaction. *Total Quality Management*, *11*(4–6), 427–432. https://doi.org/10.1080/09544120050007733

111. Wong, A., & Fung, P. (1999). Total quality management in the construction industry in Hong Kong: A supply chain management perspective. *Total Quality Management*, *10*(2), 199–208. https://doi.org/10.1080/0954412997956

112. Woolthuis, R. K., Hillebrand, B., & Nooteboom, B. (2005). Trust, Contract and Relationship Development. *Organization Studies*, *26*(6), 813–840. https://doi.org/10.1177/0170840605054594

113. Zhang, M., Pawar, K. S., & Bhardwaj, S. (2017). Improving supply chain social responsibility through supplier development. *Production Planning and Control*, *28*(6–8), 500–511. https://doi.org/10.1080/09537287.2017.1309717

Appendix

Appendix A. Results of the first research stage

The first stage of this thesis concerned with research problem 1 (business administration) was conducted prior to the second research stage of the thesis (this report). The first stage research consisted of a quantitative survey amongst the supply base of Strukton Civil in the Netherlands. The survey which was used for this study was developed by Hüttinger et al. (2014) & Vos et al. (2016) and consisted of 82 questions about the basic dimensions of supplier satisfaction, preferred customer status and preferential treatment. Moreover, the respondents were asked to answer an additional question about partnerships in the construction sector. In sum, 82 sub-contractors and suppliers provided the researcher with a completed survey. These results were analyses using SPSS (IBM, version 22) and SmartPLS 3.0 (Ringe, Wende, & Becker, 2015). Altogether, 3 models were analysed with each their unique set of independents & dependent constructs which are shown in *Table 13*. The dependent variables are displayed in bold. The model is considered to fit the data when the square root mean residual (SRMR) is below 0.1 (Hu & Bentler, 1999).

Table 13: Constructs of the measurement models

Model 1 *SRMR: 0.080*	**Model 2** *SRMR: 0.083*	**Model 3** *SRMR: 0.074*
Supplier satisfaction	**Supplier satisfaction**	Supplier satisfaction
Preferred customer status	**Preferred customer status**	**Preferred customer status**
Growth opportunities	Growth opportunities	**Preferential treatment**
Innovation potential	Innovation potential	
Contact accessibility	Contact accessibility	
Relational behaviour	Relational behaviour	
Support/ involvement	Support/ involvement	
Profitability	Profitability	
Reliability	Reliability	
	Contractors operative excellence	

The results show similar results as prior studies which used the questionnaire. Relational behaviour and operative excellence have a positive impact on supplier satisfaction. Growth opportunities, innovation potential and the involvement/support of suppliers have a positive impact on obtaining the preferred customer status. It can thus be stated that using this questionnaire in another industry (project based vs. serial production) does not yield substantial different results. Furthermore, respondents defined mutual trust, quality of communication (open & effective) and the business attitude of the customer as most important factors for developing and sustaining a long-term relation in the construction industry.

The results of this quantitative part are elucidated using the framework of Nollet, Rebolledo, & Popel (2012, p. 1188). This framework is shown in *Figure 13* and elaborates on the four steps needed to become a preferred customer.

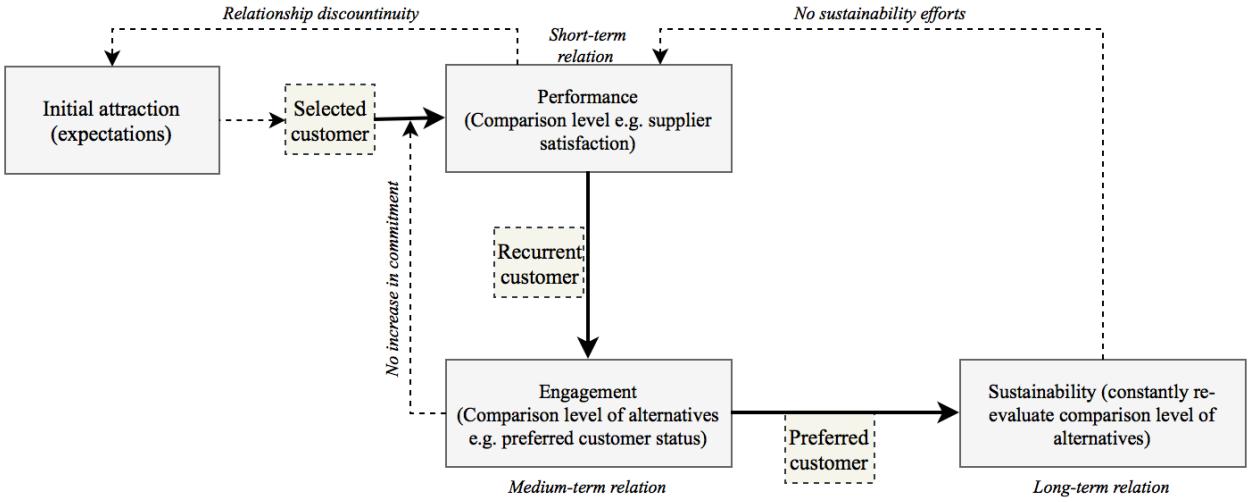

Figure 13: The steps to become a preferred customer (Nollet et al. (2012)

Based on the steps defined by Nollet et al. (2012) and the results from the statistical analysis, an adapted step-by step framework was developed which distinguishes between project-partnering and strategic- partnering. This split is made because of the project-based character of the construction industry. The adapted framework will provide several focal points for both project collaborations and long-term collaborations on the road to become a preferred customer and remain one. The four steps of the new framework will be elaborated below. The adapted framework is shown in *Figure 14*.

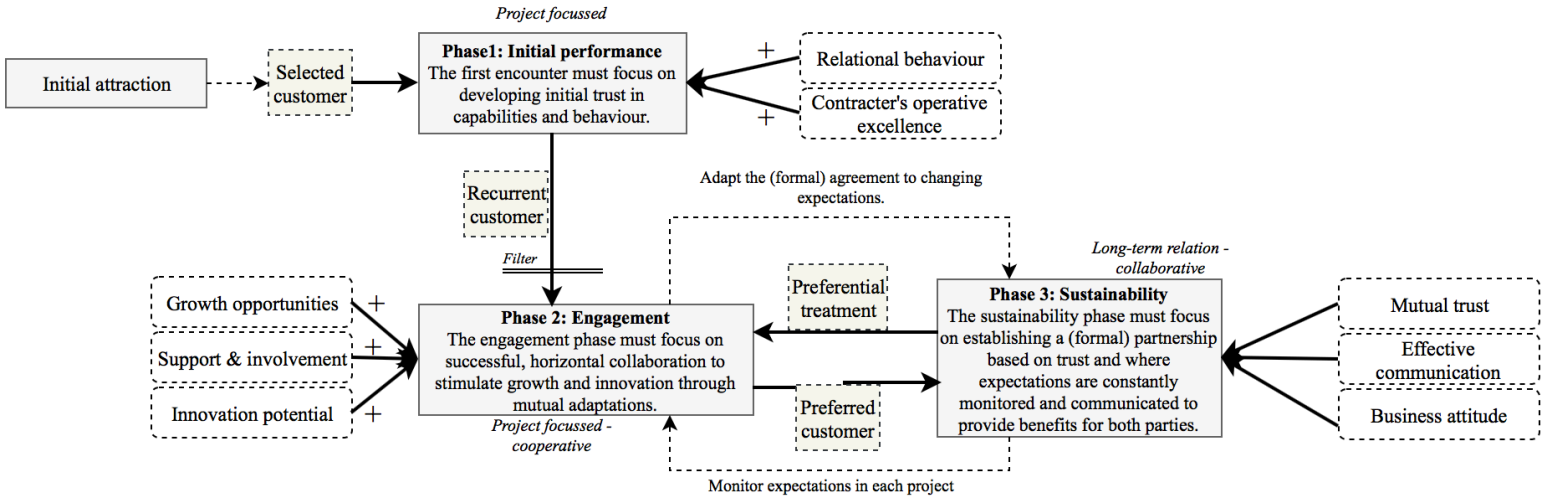

Figure 14: Adapted step-by step framework (Results thesis part 1)

Step 1: Initial attraction

The first step in a relation is the initial attraction between two parties. In a reversed market, the suppliers define the allocation of their resources and thus, they decide with whom they are cooperating in a tender. This is further strengthened by the fact that the construction sector in the Netherlands is growing very fast in the recent year and the best suppliers and sub-contractors are on their maximum production capacity. Therefore, suppliers only work with the managing contractors which they are attracted to.

Step 2: Initial performance

The second step entails the first encounter between managing contractor and sub-contractor in a project environment. In this phase, the performance delivered by both parties is of interest. This performance is called the comparison level (CL) according to Nollet et al. (2012) and is about the satisfaction of the supplier. The results from the statistical analysis show that the relational behaviour and operative excellence of the managing contractor have a positive influence on the satisfaction of the supplier. The first encounter should thus be focussed on developing trust between both parties related to their capabilities and behaviour.

Step 3: The engagement

When step 1 is executed successful and trust is established about each other's capabilities and behaviour, the parties can enter in a recurrent relation and proceed to step 3. The third step is also focussed on projects and moves towards a more cooperative relation between managing contractor and sub-contractor. The results from the survey show that the growth opportunities, innovation potential and support/involvement of suppliers have a positive influence on the chance to become a preferred customer. In the perspective of the construction industry, the engagement phase should be concerned with the implementation of horizontal collaboration during the tender and execution phases. This horizontal collaboration will only work when the sub-contractor is involved and supported in his work. Moreover, by working together as partners and combining each other's knowledge, the quality of solutions may be increased and innovation is stimulated. This, together with synergies and mutual adaptation in processes and behaviour may yield cost-reductions which will increase the chances of winning tenders and therefor stimulate growth.

Next to the above-mentioned factors influencing the attainment of the preferred customer status, several industry specific characteristics must be addressed in this phase. The

construction industry is subject to locally bound, one-of-a kind and technically complex products. In essence, every new project resembles a new product with unique demands and functions. These characteristics result in a very fragmented supply base. The engagement phase described above requires investments from the managing contractor in the form of mutual adaptations. These relation specific investments are also considered an antecedent of preferred customer status (Bemelmans et al., 2015) and therefor deemed necessary to successfully complete the engagement phase. However, since the industry is highly fragmented, managing contractors must carefully consider suitable sub-contractors and supplier to engage with. This aspect is visualised as the filter in *Figure 14*.

Step 4: Sustainability

The last step in the framework is concerned with the sustainability of the relation. According to the respondents, mutual trust, effective communication and business attitude are the most important success factors for partnerships in the construction sector. However, the project-based character of the construction industry makes it hard to develop and maintain relations across various projects. This step is focussed at these longer-term relations and advocates that an overarching agreement must be made between two parties which consists of aspects which are not bound to projects (see *Figure 15*). This agreement follows up on the trust established in step 1 and the mutual adaptations and successful horizontal collaboration in step 2. The aspects which could be part of such an agreement are, for example, joint innovation or the measurement of performance information (QPI). This would represent agreements on the organizational level.

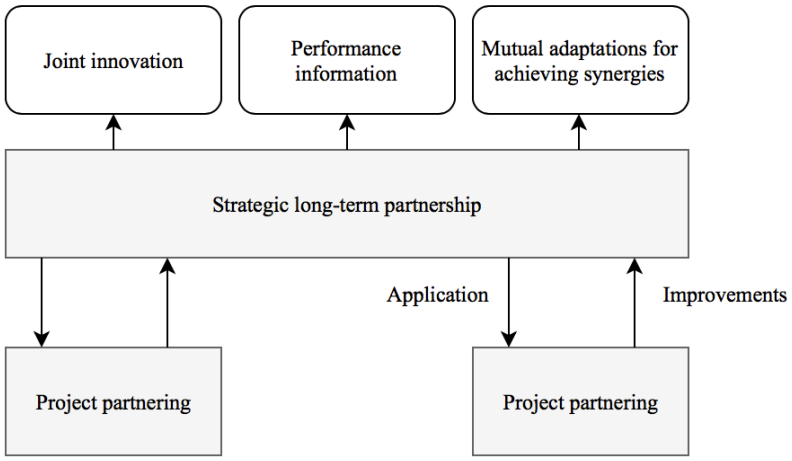

Figure 15: Developing a long-term relation in a project-based industry

The operational level (projects) should still focus on managing the expectations for each individual project for each party (e.g. revisiting step 2 & 3). However, the bilateral agreement can provide a solid framework for a mutual beneficial relation if the expectations are monitored and updated regularly. Important in revisiting the previous steps is the awareness of changing expectations since satisfaction can only be achieved when expectations are met or exceeded (Schiele et al., 2012). Additionally, both literature (Vos et al., 2016) and the results of the survey show that obtaining the preferred customer status will lead to preferential treatment by suppliers. It is thus expected that when a managing contractor enters the final phase with a supplier, this supplier directs preferential resource allocation towards the managing contractor. Lastly, the final phase and the bilateral agreement will only work when mutual trust exists, parties have an effective communication strategy and are able to enable to work towards a win-win situation.

Appendix B. Critical success factors for partnering

Success factors for partnering in construction	
Mutual trust	Black et al., 2000, p. 429; Cheng & Li, 2002, p. 200; Cheng et al., 1999, p. 86; Kim & Nguyen, 2018, p. 176.
Alignment of goals and objectives, actions consistent with objectives & partnering goals.	Black et al., 2000, p. 429; Chan et al., 2004, p. 195; Cheng & Li, 2002, p. 200; Cheng et al., 1999, p. 86; Kim & Nguyen, 2018, p. 176.
Communication (open & effective) & communication strategy.	Black et al., 2000, p. 429; Chan et al., 2004, p. 195; Cheng & Li, 2002, p. 200; Cheng et al., 1999, p. 86; Kim & Nguyen, 2018, p. 176.
Business attitude, commitment to win-win and fair profit.	Chan et al., 2004, p. 195; Kim & Nguyen, 2018, p. 176; Larson, 1997, p. 192.
Length of commitment (long-term)	Cheng & Li, 2002, p. 96; Kim & Nguyen, 2018, p. 176.
Provisions & commitment to continuous improvement.	Black et al., 2000, p. 429; Chan et al., 2004, p. 195; Cheng & Li, 2002, p. 200; Kim & Nguyen, 2018, p. 176; Larson, 1997, p. 192.
Working relationship	Cheng & Li, 2002, p. 200; Kim & Nguyen, 2018, p. 176; Larson, 1997, p. 192.
Clear understanding and coordination of roles, responsibilities & activities.	Black et al., 2000, p. 429; Chan et al., 2004, p. 195; Cheng & Li, 2002, p. 200; Cheng et al., 1999, p. 86.
Flexible with regard to changes	Black et al., 2000, p. 429
Dedicated team, team building & commitment	Black et al., 2000, p. 429; Chan et al., 2004, p. 195; Cheng & Li, 2002, p. 200; Larson, 1997, p. 192.
Conflict identification & resolution	Chan et al., 2004, p. 195; Cheng et al., 1999, p. 86; Larson, 1997, p. 192.
Perceived satisfaction	Cheng et al., 1999, p. 86.
Partnering agreements	Cheng & Li, 2002, p. 200.

Appendix C. Survey data (research stage 1)

I. Survey questions

Code	Question (ENG)
	Contact accessibility
	There is a contact person within Strukton/Reef who…
S_Available_10_1	…coordinates the relevant relationship activities within and outside of Strukton/Reef.
S_Available_10_2	…is, for the employees of our company, the one to contact in regard to partner-specific questions.
S_Available_10_3	…informs employees within Strukton/Reef firm about the needs of our company.
	Growthpotential for your company
	The relationship with Strukton/Reef …
S_Growth_20_1	… provides us with a dominant market position in our sales area.
S_Growth_20_2	… is very important for us with respect to growth rates.
S_Growth_20_3	… enables us to attract other customers.
S_Growth_20_4	… enables us to exploit new market opportunities.
	Innovation potential
S_InnovationPot_30_1	In collaborating with Strukton/Reef, our firm developed a very high number of new products/services.
S_InnovationPot_30_2	In collaborating with Strukton/Reef, our firm was able to bring to market a very high number of new products/services.
S_InnovationPot_30_3	The speed with which new products/services are developed and brought to market with Strukton/Reef is very high.
S_InnovationPot_30_4	Strukton/Reef is able to respond quickly to (technological) developments in the market.
S_InnovationPot_30_5	Strukton/Reef is able to anticipate competitors' (technological) developments.
	Operative excellence
	Strukton/Reef…
S_OperativeExc_40_1	… has always exact and in time forecasts about future demand.
S_OperativeExc_40_2	… provides us with forecasts our firm can rely and plan on.
S_OperativeExc_40_3	… has for our firm simple and transparent internal processes.
S_OperativeExc_40_4	… supports short decision-making processes.
S_OperativeExc_40_5	… stands open for process optimizations.
S_OperativeExc_40_6	… has an optimal payment habit.
	Maturity
	Strukton/Reef…
S_Maturity_45_1	Makes a professional impression on us.
S_Maturity_45_2	Has all relevant information of our files prepared
S_Maturity_45_3	Knows a structural and consequent communication strategy
S_Maturity_45_4	Uses experts for negotiating with us
S_Maturity_45_5	Gives the impression that the internal processes are organized properly
	Reliability
	In working with our company, Strukton/Reef…
S_Collaboration_50_1	… provided a completely truthful picture when negotiating.
S_Collaboration_50_2	… always negotiated from a good faith bargaining perspective.
S_Collaboration_50_3	… never breached formal or informal agreements to benefit themselves.
S_Collaboration_50_4	… never altered facts in order to meet its own goals and objectives.
	Support
	Strukton/Reef …
S_Support_60_1	… collaborates with us to improve our manufacturing processes or services.
S_Support_60_2	… gives us (technological) advice (e.g. on materials, software, way of working).
S_Support_60_3	… gives us quality related advice (e.g. on the use of inspection equipment, quality assurance procedures, service evaluation).
	Involvement
S_Involvement_70_2	We are early involved in the new product/service development process of Strukton/Reef.
S_Involvement_70_3	We are very active in the new product development process of Strukton/Reef.
S_Involvement_70_4	Communication with our firm about quality considerations and design changes is very close.

Code	Question (ENG)
	Relational behaviour
S_RelBehavior_80_1	Problems that arise in the course of the relationship are treated by Strukton/Reef as joint rather than individual responsibilities.
S_RelBehavior_80_2	Strukton/Reef is committed to improvements that may benefit our relationship as a whole and not only themselves.
S_RelBehavior_80_3	We each benefit and earn in proportion to the efforts we put in.
S_RelBehavior_80_4	Our firm usually gets at least a fair share of the rewards and cost savings from our relationship with Strukton/Reef.
S_RelBehavior_80_5	Strukton/Reef would willingly make adjustments to help us out if special problems/needs arise.
S_RelBehavior_80_6	Strukton/Reef is flexible when dealing with our firm.
S_CollSpecialist_80_7	The collaboration with this supplier's operational/specialist department is very good.
	Profitability
	The relationship with Strukton/Reef ...
S_Profitability_90_2	... provides us with large sales volumes.
S_Profitability_90_3	... helps us to achieve good profits.
S_Profitability_90_4	... allows us to gain high margins.
S_Profitability_90_5	... has a positive influence on the profitability of our firm.
S_Profitability_90_6	... enables us to raise our profitability together.
	Customer Satisfaction
S_Satisfaction_100_1	Our firm is very satisfied with the overall relationship to Strukton/Reef.
S_Satisfaction_100_2	On the whole, our firm is completely happy with Strukton/Reef.
S_Satisfaction_100_3	Generally, our firm is very pleased to have Strukton/Reef as our business partner.
S_Satisfaction_100_4	If we had to do it all over again, we would still choose to use Strukton/Reef.
S_Satisfaction_100_5	Our firm does not regret the decision to do business with Strukton/Reef.
S_Satisfaction_100_6	Our firm is satisfied with the value we obtain from the relationship with Strukton/Reef.
	Preferred Customer Status
	Compared to other customers in our firm's customer base...
PC_PC_110_2	... Strukton/Reef is our preferred customer.
PC_PC_110_3	... we care more for Strukton/Reef.
PC_PC_110_4	... Strukton/Reef receives preferential treatment.
PC_PC_110_5	... we go out on a limb for Strukton/Reef.
PC_PC_110_6	... our firm's employees prefer collaborating with Strukton/Reef to collaborating with other customers.
	Preferential treatment
	Our firm...
PC_PrefTreat_120_1	... allocates our best employees (e.g. most experienced, trained, intelligent) to the relationship with Strukton/Reef.
PC_PrefTreat_120_3	... allocates more financial resources (e.g. capital, cash) to the relationship with Strukton/Reef.
PC_PrefTreat_120_4	... grants Strukton/Reef the best utilization of our physical resources (e.g. equipment capacity, scarce materials).
PC_PrefTreat_120_5	... shares more of our capabilities (e.g. skills, know-how, expertise) with Strukton/Reef.
	Operative excellece in execution phase
	Strukton/Reef...
ADD_Executionphase_171_1	...Is safety consencious at the construction site
ADD_Executionphase_171_2	...Pays variations promptly
ADD_Executionphase_171_3	Site staff has a cooperative attitude
ADD_Executionphase_171_4	...Properly notifies you of variations
ADD_Executionphase_171_5	...Coordinated activities between various sub-contractors in an efficient manner

Code	Question (ENG)
	Operative excellece in tender phase
	Strukton/Reef...
ADD_Tenderphase_170_1	...Provides all nesessary contract information on time
ADD_Tenderphase_170_2	...The tenderdocuements are comprehensive and clear in the allocation of responsibilities
ADD_Tenderphase_170_3	...Timely involves your firm for the tenderproces
ADD_Tenderphase_170_4	...Has sufficient knowledge about tenderprocedures to see it through
ADD_Tenderphase_170_5	...Listens and treats your ideas and suggestions on a fair and transparant manner.
	Critical succes factors for partnering
	How much influence do the following aspects have on you satisfaction in your relationship with buyingFirmXY?
ADD_CSF_partner_172_1	Mutual trust between client and supplier
ADD_CSF_partner_172_2	Alignment of goals and objectives.
ADD_CSF_partner_172_3	Actions consistent with objectives & partnering goals.
ADD_CSF_partner_172_4	Level and quality of communication (open & effective) form the client.
ADD_CSF_partner_172_5	Business attitude of the client.
ADD_CSF_partner_172_6	Commitment to win-win and fair allocation of profits.
ADD_CSF_partner_172_7	Provisions & commitment to continuous improvement.
ADD_CSF_partner_172_8	Working relationship
ADD_CSF_partner_172_9	Clear understanding and coordination of roles, responsibilities & tasks.
ADD_CSF_partner_172_10	Flexible with regard to changes.
ADD_CSF_partner_172_11	Dedicated team from the client
ADD_CSF_partner_172_12	Team building between client and supplier.
ADD_CSF_partner_172_13	Conflict identification & resolution
ADD_CSF_partner_172_14	Quality of agreements between client and supplier.
	Length of relationship (in years)
LNGTH_Relationship_230_1	How long has your company been a supplier of Strukton/Reef?
LNGTH_SupplierOfB_230_2	How long have you already been working as an employee of your firm?
LNGTH_EmployeeSupplier_230_3	How long have you already been acting as a sales representative for your company?
LNGTH_SalesRepresent_230_4	How long have you, as a representative of your firm, already been cooperating with Strukton/Reef?
	General information
ORG_Turnover_240_1	Annual Turnover (in €).
ORG_DepTurnover_240_2	Please indicate the annual turnover with Strukton/Reef as % of your total annual turnover (in %, 0=lowest, 100=highest)
ORG_Category_240_3	What is the market category of your company? (material/machinery rental/sub-contractor/ICT/consultant)
ORG_Company_240_4	With which company you worked the most of the time? (Strukton/Reef)
ORG_Size_240_3	How many employees does your company have?
ORG_TypeOwnership_248	What is the ownership structure of your company? [private/public/stock exchange]
ORG_InfluenceSpecs_242	How much influence does BuyingFirmXY have on your product/service design specifications? (in %, 0=lowest, 100=highest)
ORG_KnowledgeB_256_1	I know Strukton/Reef good enough to answer all the questions in this questionnaire

II. Sample characteristics

Characteristic	Category	Amount (n=82)	Percentage
Length of relation between Strukton and respondents' company.	<5 years	14	17,07 %
	5-10 years	28	34,15 %
	11-20 years	16	19,51 %
	>20 years	15	18,29 %
	Unknown	9	10,98 %
Number of employees at respondent's company.	<10 employees	15	18,29 %
	10-50 employees	40	48,78 %
	51-250 employees	18	21,95 %
	251-1000 employees	6	7,32 %
	>1000 employees	1	1,22 %
	Unknown	2	2,44 %
Sector of respondent's company.	Primary	18	21,95 %
	Secondary	16	19,51 %
	Tertiary	46	56,10 %
	Quaternary	2	2,44 %
Length of respondent as sales representative.	<1 year	1	1,22 %
	1-5 years	15	18,29 %
	5-10 years	10	12,20 %
	10-20 years	25	30,49%
	>20 years	28	34,15 %
	Unknown	3	3,66 %
Length of respondent's involvement in relationship with Strukton.	<1 year	1	1,22 %
	1-5 years	23	28,05 %
	5-10 years	17	20,73 %
	10-20 years	25	30,49 %
	>20 years	9	10,98 %
	Unknown	7	8,54 %

Turnover characteristics of the respondents (n=82)	
Between 10 – 50 k	20
Between 50 – 100 k	15
Between 100 – 250 k	16
Between 250 – 500 k	9
Between 500 – 750 k	4
>750k	2
Unknown	16

III. Descriptive statistics of the survey data

Indicator	Mean	SD	Variance	Skewness	Kurtosis
Contact accessibility	**3,39**				
S_Available_10_1	3,43	,889	,791	-,529	,126
S_Available_10_2	3,43	,875	,766	-,507	,244
S_Available_10_3	3,33	,890	,791	-,813	,577
Growth opportunity	**2,96**				
S_Growth_20_1	2,77	,806	,649	-,276	,456
S_Growth_20_2	3,15	,848	,719	-,038	-,503
S_Growth_20_3	3,00	,889	,790	,000	-,218
S_Growth_20_4	2,94	,880	,774	,121	-,114
Innovation potential	**2,70**				
S_InnovationPot_30_1	2,61	,913	,833	-,234	-,695
S_InnovationPot_30_2	2,51	,864	,747	-,274	-,593
S_InnovationPot_30_3	2,50	,805	,648	-,437	-,420
S_InnovationPot_30_4	2,91	,689	,474	-1,051	2,094
S_InnovationPot_30_5	2,98	,608	,370	-1,002	3,124
Operative excellence	**3,03**				
S_OperativeExc_40_1	3,10	,621	,385	-,381	3,063
S_OperativeExc_40_2	2,94	,880	,774	-,437	-,011
S_OperativeExc_40_3	3,21	,782	,611	-,543	,203
S_OperativeExc_40_4	3,02	,816	,666	-,744	,390
S_OperativeExc_40_5	3,33	,721	,520	-,389	,517
S_OperativeExc_40_6	2,61	1,141	1,303	,054	-1,095
Maturity	**3,69**				
S_Maturity_45_1	3,93	,562	,316	-,454	1,601
S_Maturity_45_2	3,46	,688	,474	-,215	-,214
S_Maturity_45_3	3,59	,785	,616	-,525	-,144
S_Maturity_45_4	3,79	,680	,463	-,441	,494
S_Maturity_45_5	3,66	,805	,647	-,899	1,759
Reliability	**3,62**				
S_Collaboration_50_1	3,51	,593	,352	,316	-,444
S_Collaboration_50_2	3,73	,686	,470	-1,010	2,624
S_Collaboration_50_3	3,57	,754	,569	-,344	,835
S_Collaboration_50_4	3,66	,613	,376	,354	-,629
Support of suppliers	**3,16**				
S_Support_60_1	3,24	,825	,681	-,756	,352
S_Support_60_2	3,09	,864	,746	-,167	,072
S_Support_60_3	3,15	,848	,719	-,287	,294

Involvement of suppliers	**2,94**				
S_Involvement_70_2	2,99	,762	,580	-,151	,153
S_Involvement_70_3	2,85	,803	,645	-,753	,504
S_Involvement_70_4	2,96	,853	,727	-,542	,373
Relational behaviour	**3,51**				
S_RelBehavior_80_1	3,46	,688	,474	-,447	-,266
S_RelBehavior_80_2	3,49	,671	,450	-,708	1,358
S_RelBehavior_80_3	3,68	,788	,621	-,931	1,251
S_RelBehavior_80_4	3,26	,750	,563	,257	,905
S_RelBehavior_80_5	3,38	,678	,460	-,150	-,292
S_RelBehavior_80_6	3,63	,746	,556	-,750	1,293
S_CollSpecialist_80_7	3,67	,721	,520	-,624	1,525
Profitability	**2,80**				
S_Profitability_90_2	2,73	,738	,544	-,470	,228
S_Profitability_90_3	2,72	,614	,377	-,409	,407
S_Profitability_90_4	2,61	,681	,463	-,771	,347
S_Profitability_90_5	2,89	,754	,568	-,702	,727
S_Profitability_90_6	3,02	,737	,543	-,608	,576
Preferred customer status	**3,18**				
PC_PC_110_2	3,24	,794	,631	-,318	,549
PC_PC_110_3	3,13	,828	,685	-,257	,540
PC_PC_110_4	3,06	,921	,848	-,026	,136
PC_PC_110_5	3,43	,817	,667	-,246	,147
PC_PC_110_6	3,01	,711	,506	-,018	1,506
Preferential treatment	**3,23**				
PC_PrefTreat_120_1	3,35	,776	,602	,262	-,197
PC_PrefTreat_120_3	2,96	,777	,604	,064	,424
PC_PrefTreat_120_4	3,24	,730	,532	,367	,138
PC_PrefTreat_120_5	3,35	,807	,651	,130	-,403
Supplier satisfaction	**3,77**				
S_Satisfaction_100_1	3,67	,817	,668	-,710	,774
S_Satisfaction_100_2	3,67	,802	,643	-,505	,709
S_Satisfaction_100_3	3,78	,667	,445	-,230	,151
S_Satisfaction_100_4	3,90	,730	,534	-,821	2,287
S_Satisfaction_100_5	4,06	,654	,428	-,332	,365
S_Satisfaction_100_6	3,54	,804	,647	-,414	,419
Professionalism in tender	**3,49**				
ADD_Tenderphase_170_1	3,89	,667	,445	,127	-,714
ADD_Tenderphase_170_2	2,95	,901	,812	-,110	,105
ADD_Tenderphase_170_3	3,66	,593	,351	,267	-,634
ADD_Tenderphase_170_4	3,51	,707	,500	-,259	-,164
ADD_Tenderphase_170_5	3,46	,613	,375	,308	-,215

Professionalism in execution	**3,44**				
ADD_Executionphase_171_1	3,55	,705	,498	-,826	1,343
ADD_Executionphase_171_2	3,41	,666	,443	-,450	1,214
ADD_Executionphase_171_3	3,23	,821	,674	-,457	,037
ADD_Executionphase_171_4	3,50	,572	,327	,203	-,615
ADD_Executionphase_171_5	3,52	,671	,450	-,091	-,147

Appendix D. Background of the construction industry

I. Complexity and interdependencies in the construction industry

The construction industry is a large contributor to almost every national economy. The construction sector in the European union accounts for 5.4% of the total gross value added (Nazarko & Chodakowska, 2015). In the Netherlands, the construction sector accounts for 4,5% of the GDP and reported a revenue of 63,3 billion euro in 2017 (Bouwend Nederland, 2017). Despite the fact that a significant portion of the GDP is generated by the construction industry, there are various researchers that claim that the construction industry is characterised by poor performance (Egan, 1998; Gadde & Dubois, 2010; Latham, 1994, 2001). The UK reports from Egan (1998) and Latham (1994, 2001) were one of the first to show several prevailing, problematic aspects of the construction industry. Both authors recognize the price only procurement methods as one of the main contributors to this lagging performance of the industry. Even today, the performance of the construction industry is a subject of academic research (Nazarko & Chodakowska, 2015; Snyman & Smallwood, 2017). Poor performance of the industry leads to cost overruns, late deliveries, quality problems and conflicts (Crespin-Mazet & Portier, 2010). Two overarching aspects of the construction sector are the underlying cause of the poor performance of the sector. These two aspects are the complexity of- and interdependencies between processes and products.

Managing contractors in the construction industry are in essence, a special kind of service companies for their clients and are thus mostly burdened with the management of information flows (Galbraith, 1977; March & Simon, 1993). They must monitor their environment, gather information, make decisions and ensure that the intended result is achieved (Winch, 2010). However, there is always information missing which is resulting in uncertainty (see *Figure 16*). This uncertainty forms the context in which construction contractors are operating and is therefore one of the drivers for the complexity in this sector.

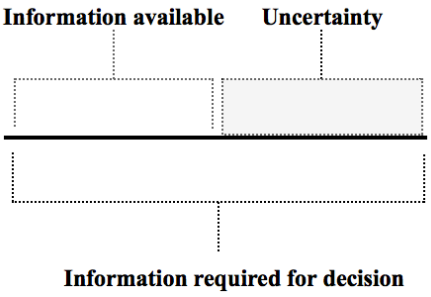

Figure 16: Adapted from Galbraith (1977) fig. 3.1.

Moreover, Gidado (1996) argues that the complexity of the construction industry is continuously increasing due to a variety of reasons such as economic liberalisation and increasing fragmentation of the industry. Fearne & Fowler (2006) further elaborate on the complexity of the construction industry and point to the fragmented structure of the supply chain, adversarial relations, poor information flows and a high degree of dependency between activities and tasks as the source of the uncertainty and complexity. In their paper on complexity and interdependency in the construction industry, Dubois & Gadde (2002) describe the six central features of the construction industry; (1) focus on single projects, (2) local adjustments, (3) utilization of standardised parts, (4) competitive tendering, (5) market-based exchange and (6) multiple roles. These features cause various interdependence and uncertainty problems within the construction industry. A specific elaboration of the sources related to the complexities and uncertainties in the construction industry is shown in *Table 14*.

Table 14: Sources of complexity and uncertainty in construction (Dubois & Gadde, 2002, p. 624).

Complexity	**Uncertainty**
Number of technologies and interdependencies. Rigidity of sequences between various main operations. Overlap of stages or elements of construction.	Lack of complete activity specification. Unfamiliar with local resources and local environment. Lack in uniformity of materials, work and teams with regard to time and place. Unpredictability of the environment.

Another view at complexity is provided by Whyte, Stasis, & Lindkvist (2016) who state that complex projects are characterised by high-tech, capital intensive engineering, which are significant in scale and duration. This type of complexity requires firms to work collaboratively across firm boundaries in project delivery (Whyte et al., 2016). Next to the intra-firm collaboration in one project, a contractor also has to deal with several projects simultaneously. This multi-project environment leads to more interdependencies between resources employed on projects and therefore increases complexity (Hagan, Bower, & Smith, 2012). For a successful project, the main contractor thus has to deal with both internal and external complexity (Siao & Lin, 2012). Winch (2010) refers to a project organisation as a coalition of resource bases within a portfolio of projects (see *Figure 17).* Within the coalition of resource bases (each with own interest), a managing contractor is responsible for the project coordination. Within the portfolios of projects, the managing contractor is responsible for coordination within the firm (Winch, 2010). Furthermore, both internal and external complexity increase the difficulties of managing supply chains, which are often

formed by a large number of sub-contractors and suppliers due to the fragmentation of the industry (Dainty, Briscoe, & Millett, 2001).

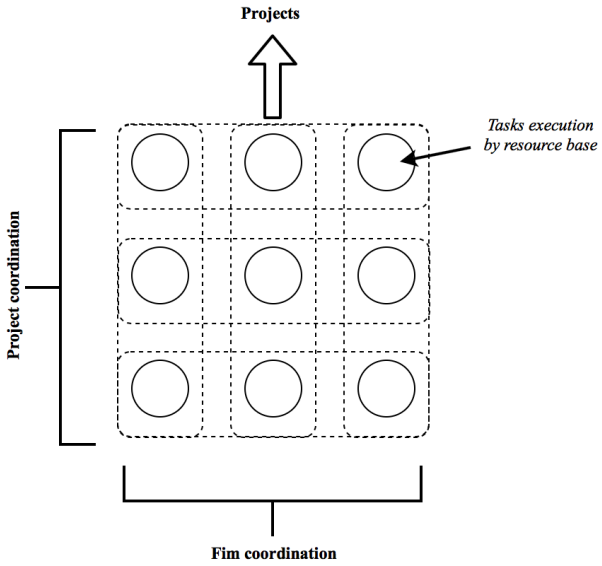

Figure 17: Winch (2010, p. 9) adapted from Fellows et al. (1983) fig. 1.1.

An additional difficulty, which is widely recognized in the construction industry is the management of innovation and learning (Hartmann & Dorée, 2015). Bakker, Cambré, Korlaar, & Raab (2011) describe the learning paradox of construction projects. On the one hand, construction projects are very suited for creating knowledge and stimulating innovation because of their inter-disciplinary and high-tech nature (Scarbrough et al., 2004). But on the other hand, the temporary nature of projects makes it difficult to transfer knowledge between projects (Cacciatori, 2008). Hence, the focus on efficiency on project basis, results in an obstacle for learning and innovation (Dubois & Gadde, 2002).

II. Tender procedures and integrated contracts in the construction industry

This paragraph will elaborate the characteristics and changes of the industry in relation to tender procedures, the regulatory context and the interface which is formed by managing contractors between clients and the downstream supply chain.

Public organizations in the Netherlands have the obligation to follow European procurement laws when approaching the market. For projects above certain thresholds, specific procedures must be followed. The current threshold for a European tender is approximately 5.54 million for construction project (Het Europees Parlement, 2014). Other thresholds are shown in *Figure 18*.

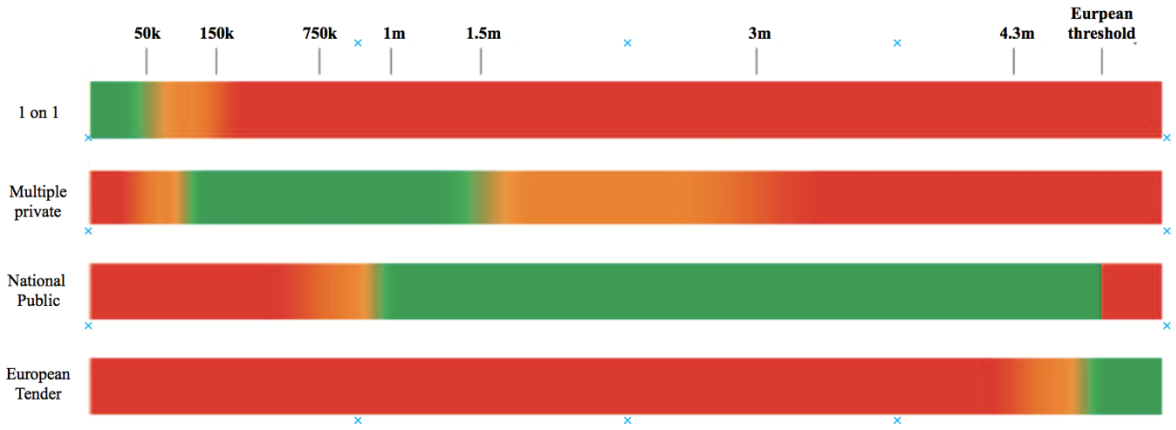

Figure 18: Thresholds for tender procedures.

These thresholds form a guide for public organizations to decide which procedure to follow. For the 1 on 1 and multiple private procedures, the client is free to choose who he wants to invite to participate and is not obligated to publish the tender documents. For the national public and European tender procedure, the client is obligated to publish all documents. In these public procedures, a client can use selection criteria based on the projects characteristics to execute pre-selection and lower the amount participants (Ministery of Economic affairs, 2016). Within these overall procedures, clients must use some sort of MEAT (most economically advantageous tender) criterion in their procedure, the only exception for this are projects which are highly standardised. This MEAT criterion can take on different forms such as Best value procurement or a competitive dialogue. This part of the tender procedures has an impact on the integration of the supply chain since the choice of procedure has influence on the amount of integration in the tender and execution phase. For example, in Best value procedures, the amount of performance information needed stimulates the integration of sub-contractors into the tender process. Additionally, the usage of BVP also stimulates the integration of design, calculation and execution within the supply chain to come up with the optimal solution (Best value).

Furthermore, *Figure 19* shows the flow of information and materials in a typical (traditional) construction supply chain (Vrijhoef & Koskela, 2000). This figure shows that the main contractor forms an important interface between the client to the left and sub-contractors and suppliers the right. It also shows the highly fragmented nature of the construction industry.

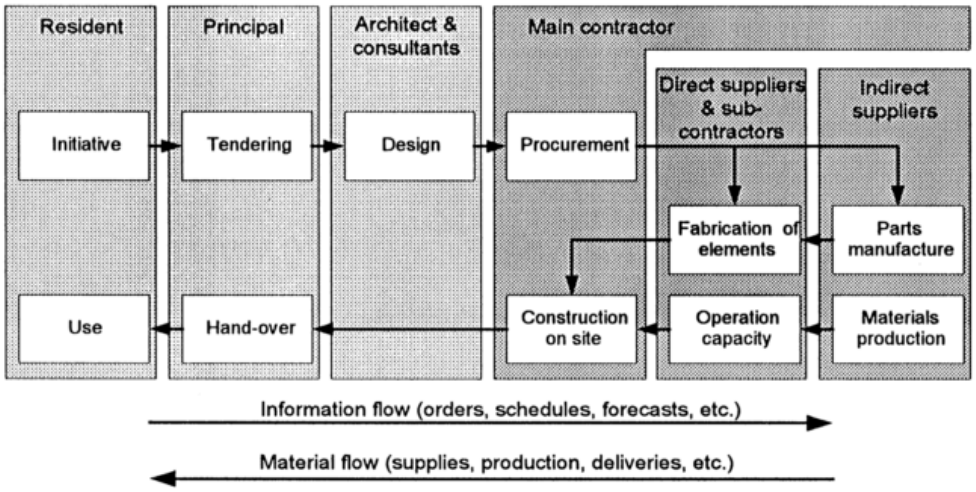

Figure 19: Typical construction supply chain (After; Verhoef & Koskela (2000, p.173))

Nowadays, public clients tend to use more integrated contracts for their projects. These contracts can take on different forms such as Design & Construct (D&C), Design, Build, Finance, Maintenance & Operate (DBFMO) or any other configuration with two or more of these components. Within these integrated contract forms, the situation described in *Figure 19* changes. The more elements are added to the contract, the more integrated the supply chain becomes. For example, a design & construct contract integrates the consultant & architects block with the main contractor. Within this situation there are two options; the main contractor hires external professionals for the design or the main contractor has its own design department. In large projects, sub-contractors are often included in the design phase as well. Additionally, transferring the design to main contractors does not necessary mean that public clients not use consultants anymore. Many public clients use consultants and architects to prepare the tender documents before publishing them. Based on the description above, the figure of Verhoef & Koskela (2000) is adapted to the current situation wherein main contractors form the interface between public clients and private sub-contractors and suppliers. The adapted figure is shown in *Figure 20*. Compared to the original figure, it is shown in *Figure 20* that a main contractor is increasingly engaged in managing all different upstream and downstream entities within the supply chain, making cooperation with supply chain firms a vital part of the main contractor's business processes.

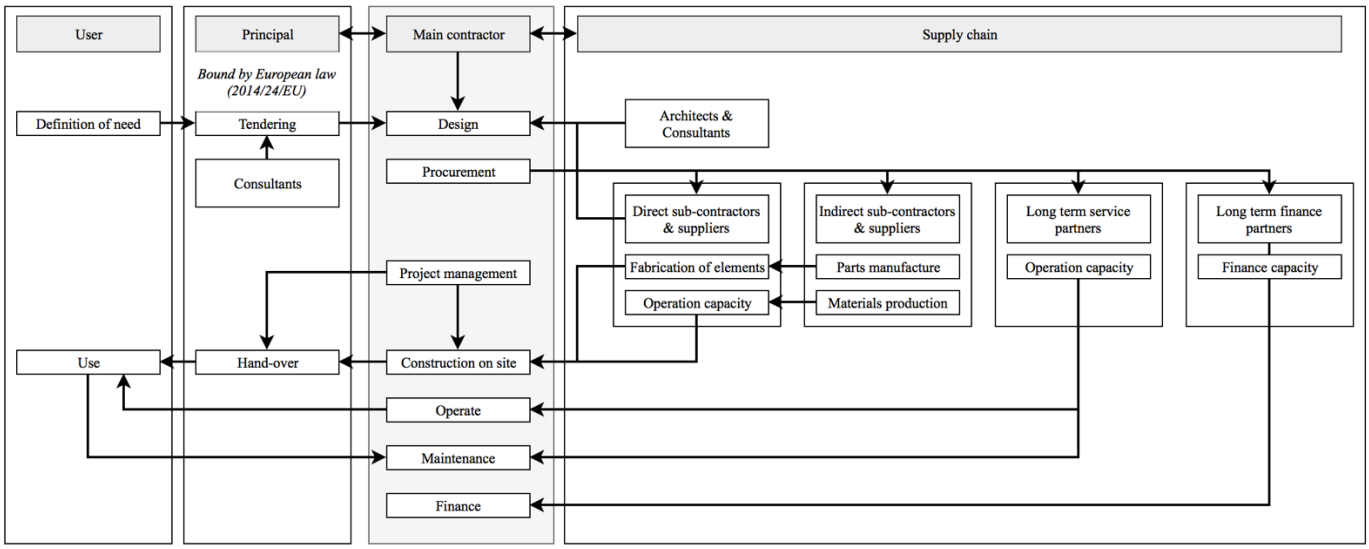

Figure 20: The managing contractor as interface.

Finally, the need & transaction uncertainty of the construction sector is heavily stimulated by the European tender regulations. For main contractors to remain profitable, many business components have been removed from the internal organization and bought externally (similar as the drivers for reversed marketing). This reduces the overhead costs and therefore reduces the risk of having a workforce without work when a couple of tenders are lost.

Furthermore, sub-contractors and suppliers which are connected to several main contractors in a tender will almost always work with the main contractor who has won the tender. Therefore, the focus of this study is on the development of relations with the best sub-contractors and suppliers to ensure exclusivity of the supplier and increase performance on tenders by bundling resources and competences. Being an exclusive customer for a sub-contractor or supplier within a tender procedure is similar to being a preferred customer since there are many other main contractors competing for the best sub-contractors and suppliers. Other authors that have examined buyer-supplier relations, concluded that partnering is a means to obtain the best performance form the supply chain (e.g. the best sub-contractors) (Ellram & Edis, 1996; Wong, 2000). It is therefore expected that both approaches are suitable for obtaining the best performance (performance information) from the supply chain.

Appendix E. Mutual subjects in survey questions

Relational behaviour	
Problems that arise in the course of the relationship are treated by Strukton/Reef as joint rather than individual responsibilities.	Responsibilities & disputes
Strukton is committed to improvements that may benefit our relationship as a whole and not only themselves.	Working relationship
We each benefit and earn in proportion to the efforts we put in.	Equal benefits
Our firm usually gets at least a fair share of the rewards and cost savings from our relationship with Strukton/Reef.	Equal benefits
Strukton would willingly make adjustments to help us out if special problems/needs arise.	Flexibility
Strukton is flexible when dealing with our firm.	Flexibility
The collaboration with this supplier's operational/specialist department is very good.	Working relationship

Operative excellence (tender & execution processes)	
Strukton provides all necessary contract information on time	Communication
The tender documents are comprehensive and clear in the allocation of responsibilities	Responsibilities
Strukton timely involves your firm for the tender process	Involvement of suppliers
Strukton has sufficient knowledge about tender procedures to see it through	General competence
Strukton listens and treats your ideas and suggestions on a fair and transparent manner.	Working relationship
Strukton is safety conscious at the construction site	General competence
Strukton pays variations promptly	General competence
Site staff has a cooperative attitude	Working relationship
Strukton properly notifies you of variations	Communication
Strukton coordinated activities between various sub-contractors in an efficient manner	Communication

Growth opportunities	
Strukton provides us with a dominant market position in our sales area.	Growth opportunities
Strukton is very important for us with respect to growth rates.	Growth opportunities
Strukton enables us to attract new customers.	Growth opportunities
Strukton enables us to exploit new market opportunities.	Growth opportunities

Innovation potential	
In collaborating with Strukton/Reef, our firm developed a very high number of new products/services.	Innovation collaboration
In collaborating with Strukton/Reef, our firm was able to bring to market a very high number of new products/services.	Innovation collaboration
The speed with which new products/services are developed and brought to market with Strukton/Reef is very high.	Speed of innovation
Strukton is able to respond quickly to (technological) developments in the market.	Speed of innovation
Strukton is able to anticipate competitors' (technological) developments.	Speed of innovation

Support & involvement of suppliers	
Strukton collaborates with us to improve our manufacturing processes or services.	Joint improvement
Strukton gives us (technological) advice (e.g. on materials, software, way of working).	Supplier evaluation
Strukton gives us quality related advice (e.g. on the use of inspection equipment, quality assurance procedures, service evaluation).	Supplier evaluation
We are early involved in the new product/service development process of Strukton/Reef.	Involvement of suppliers
We are very active in the new product development process of Strukton/Reef.	Intensity of collaboration
Communication with our firm about quality considerations and design changes is very close.	Intensity of collaboration

Appendix F. Model development

Responsibilities & disputes (1/13)

Survey questions	
1	Problems that arise in the course of the relationship are treated by Strukton/Reef as joint rather than individual responsibilities.
2	The tender documents are comprehensive and clear in the allocation of responsibilities

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
1	New	Are problems which occur during a project handled as individual or mutual responsibilities?	Problems which occur during a project are not handled as mutual responsibilities	Only complex problems which affect the entire project are treated as mutual responsibilities	Only problems which are related to the scope of both parties are treated as mutual responsibilities	Most of the problems are treated as mutual responsibility	All problems in the project are treated as mutual responsibilities. Effort is made to optimize the project result.
2	Meng et al. (2011)	How often do problems in the operational processes lead to disputes and at what level are they resolved?	Problems always lead to disputes.	Problems often lead to disputes	Only complex problems lead to disputes	Most problems are timely resolved at the lowest level	All problems are timely resolved at the lowest level.

Documented evidence	
1	Collaboration contracts
2	The minutes from project meetings

Equal benefits (2/13)

Survey questions	
1	We each benefit and earn in proportion to the efforts we put in.
2	Our firm usually gets at least a fair share of the rewards and cost savings from our relationship with Strukton/Reef.

#		**Question**	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimizing**
3	New	Is there a process for the distribution of (extra) benefits?	Ad hoc distribution of benefits.	Distribution of benefits based on experience.	There is a process for distributing benefits based on multiple criteria	Distribution of benefits is similar across all projects and based on the formal process	As 4 plus, the criteria for the distribution of benefits are regularly evaluated and updated within partnerships.
4	Meng et al. (2011)	Are there any rewards for supply chain partners who take the risk?	No formal rewards for the party taking the risk.	No formal decision process for risk allocation but there are some rewards for the party taking the risk based on experience.	Often appropriate rewards for the party taking the risk based on a formal process.	A formal decision process for risk allocation. The process is used to determine appropriate rewards for a party taking the risk.	Always appropriate rewards for the party taking the risk. The process is constantly evaluated against changing circumstances.

Documented evidence	
1	Collaboration contracts (criteria for distribution of benefits).
2	Risk and value added (RAVA) documents.

Flexibility (3/13)

Survey questions	
1	Strukton/Reef would willingly make adjustments to help us out if special problems/needs arise.
2	Strukton/Reef is flexible when dealing with our firm.

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
5	New	How flexible is your company when there are special needs or problems?	No flexibility towards a supplier.	Only flexible on aspects which also benefits the own company.	Flexibility towards a partner is part of the standard business processes.	Flexibility as form of goodwill towards a project partner. Even if the flexibility is not beneficial for the own company.	Between both parties, mutual flexibility exists as part of the partnership.

Documented evidence	
1	Documentation on special requests from suppliers
2	The minutes from project meetings

Working relationship (4/13)

Survey questions	
1	The collaboration with this supplier's operational/specialist department is very good.
2	Site staff has a cooperative attitude
3	Strukton listens and treats your ideas and suggestions on a fair and transparent manner.

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
6	Meng et al. (2011)	How collaborative is the working relationship between Reef and the main partner on the project?	Confrontation or arm's length	Limited cooperation on crucial parts.	Collaboration on crucial parts.	Collaboration on all parts of a project.	The collaboration is continuously assessed and adapted to changing circumstances.
7	Meng et al. (2011)	What type of trust is present?	No trust between the parties	Only trust based on the contract	Trust based on competences of the supplier.	Trust is based on short-term goodwill trust.	The partner is always trusted on his capabilities and goodwill.
8	Meng et al. (2011)	To what extend did you monitor the work of the main partner in the project?	Checking and double checking	Checking, but no double checking.	Checking only parts of the critical path are checked.	Almost no checks, only very crucial parts are checked.	Checking almost unnecessary
9	Enkel et al. (2011)	Are you focused on satisfying your partner?	Collaboration is only based on affection between workers.	Focus on satisfying itself, collaboration is based on experience	Behavioural guidelines are defined. Collaboration is part of a formal process.	Partner satisfaction and the use of guidelines are stimulated and reviewed by management.	Partner satisfaction is monitored constantly.
10	Meng et al. (2011)	How much confidence did you have in the behaviour of the main partner in the project?	Little confidence	limited confidence, only in competences.	Confidence in competences and behaviour	Much confidence in competences and behaviour.	Full confidence in all aspects of relational behaviour and competences.

Documented evidence	
1	----

Communication (5/13)

Survey questions	
1	Strukton properly notifies you of variations
2	Strukton coordinated activities between various sub-contractors in an efficient manner
3	Strukton provides all necessary contract information on time

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
11	Bemelmans et al. (2012) & Meng et al. (2011)	How is the communication between two parties handled by your company?	Communication between parties happens based on ad hoc decisions.	There is a superficial formal communication framework based on earlier experiences.	A formal communication framework is present and relational guidelines are described.	Relations with suppliers are often discussed and are a fixed part of management meetings. Some open book policy exists between partners.	As 4 plus, the communication framework (including guidelines) is continuously improved and adapted for changing circumstances. There is also an extensive full open book policy between strategic partners.

Documented evidence	
1	Open book policy
2	Behavioural guidelines
3	Communication plans
4	Agenda of management meetings

General competences of a managing contractor (6/13)

	Survey questions
1	Strukton is safety conscious at the construction site
2	Strukton pays variations promptly
3	Strukton has sufficient knowledge about tender procedures to see it through

Question number 2 is left out of the analysis due to the fact that the payment terms are part of the general purchasing terms which are accepted by all suppliers of Strukton. This payment term is set at 60 days for all invoices.

Moreover, the safety of processes is partly assured by evaluating and selecting suppliers which fulfil the demands regarding safety, for example a higher level on the safety ladder (certificate ‘’veiligheidsladder’’) can result in a higher chance of selecting that supplier.

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
12	Enkel et al. (2011)	Are your employees trained in how to start, run and finish partnerships?	Employees handle on ad hoc basis, no training present.	Employees gain skills through experience on the job in interdisciplinary teams.	Champions set examples of how to deal with partners.	Employees are specifically trained in partnering.	As 4 plus, Employees continuously share new skills and knowledge about specific partners.
13	Bemelmans et al. (2012) & Meng et al.	How is the selection of suppliers organized? And what criteria are used?	Only ad hoc selection, no formal process.	Selection is based on price and availability.	There is a formal documented process based on price, availability and quality.	There is a formal process with multiple criteria based on specific project characteristics and accounting for current needs. Preferred supplier lists are also available.	As 4 plus, multi criteria based on project characteristics, soft skills and future needs.

14	Bemelmans et al. (2012)	To what extent are targets and objectives set and used for reviewing supplier performance?	No evidence of predefined targets and objectives for selecting suppliers on a project. Decisions are made on ad hoc basis.	There are some targets set for purchasers.	Project objectives are clearly set (including timing, quality, and costs), and translated into purchasing and supplier objectives.	Multi-level project objectives are set and translated into purchasing and supplier objectives.	As 4 plus, supplier performance is measured and reviewed against the predefined targets and industry benchmarks.
15	Bemelmans et al. (2012)	Is there any form of market research?	Ad hoc market research.	There is formal market research with the objective to learn more about potential suppliers.	There is a formal process with the possibility to spend money and time on market research.	The formal process of market research is a structural part of a purchaser's tasks.	As 4 plus, there are time and resources available for structural and fundamental market research with the objective to optimize the supply base based on future needs.

Documented evidence	
1	Supplier selection process
2	Available trainings
3	Previous market research

Involvement of suppliers (7/13)

Survey questions	
1	Strukton timely involves your firm for the tender process
2	We are early involved in the new product/service development process of Strukton/Reef.

#		**Question**	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimizing**
16	Bemelmans et al. (2012)	Is there a formal decision process to determine the moment of supplier involvement?	Decision to involve suppliers is based on ad hoc evaluation of requirements.	Decision to involve suppliers is based on experience and a superficial process.	There is a formal process for the decision to involve suppliers which is based on the projects goals and possible contributions of suppliers to those goals.	There is a formal process for the decision to involve suppliers which is based upon project exceeding goals.	As 4 plus, the criteria for the involvement of suppliers are part of a formal process which is continuously evaluated and improved.
17	Bemelmans et al. (2012)	How is the cooperation between your own company and strategic partners organized?	No common, project exceeding goals with strategic partners.	There are partnership agreements available which focus on improving the relation.	Senior management from both companies is included to lead and manage the relationship based on the partnership agreements.	Strategic suppliers are integrated early on in tenders. Also, shared project exceeding objectives are formalized with suppliers. There is a joint objective setting and joint planning process in place. Little evidence of alignment of future strategies and objectives	As 4 plus, there are mutual (ambitious) improvement programs focussed on achieving synergies, aligning strategies and technology investments.

Documented evidence	
1	Tender process (determine moment of involvement)
2	Goal setting documents
3	Communication plans
4	Partnership agreements

Joint improvements (8/13)

Survey questions	
1	Strukton/Reef is committed to improvements that may benefit our relationship as a whole and not only themselves.
2	Strukton collaborates with us to improve our manufacturing processes or services.

#		**Question**	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimizing**
18	Bemelmans et al. (2012)	To what extent is there mutual effort between Reef and their partners to improve the performance of both parties?	Ad hoc supplier-improvement actions, without structured follow-up.	There is a formal process for developing improvement programs based on experiences.	There is a formal process wherein the performance measurement is aligned with the internal organization and there is a further development of the supplier-improvement program.	There is evidence of proactive supplier development concentrating efforts to the most important commodities/product groups and suppliers.	As 4 plus, supplier assessment and joint/mutual trainings are organized to learn in two directions and to establish common improvement programs (with targets and follow-up)

Documented evidence	
1	Supplier selection process
2	Supplier improvement programs

Growth opportunities (9/13)

Survey questions	
1	Strukton provides us with a dominant market position in our sales area.
2	Strukton is very important for us with respect to growth rates.
3	Strukton enables us to attract new customers.
4	Strukton enables us to exploit new market opportunities.

#		**Question**	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimizing**
19	Meng et al. (2011)	Is there any guarantee for suppliers for future work?	No continuity of work for suppliers.	Only future work through tendering based on price.	Only future work through tendering based on price and quality criteria.	Preferred suppliers have a guarantee for future work.	As 4 plus, the preferred supplier lists are continuously updated and reviewed.

Documented evidence	
1	Preferred supplier lists
2	Supplier selection process

Supplier evaluation (10/13)

Survey questions	
1	Strukton gives us (technological) advice (e.g. on materials, software, way of working).
2	Strukton gives us quality related advice (e.g. on the use of inspection equipment, quality assurance procedures, service evaluation).

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
20	Bemelmans et al. (2012)	What performance measurement system is in place to assess supplier performance ?	Ad hoc response to supplier problems (e.g. Poor quality or late delivery). No supplier assessment process described.	A general supplier performance measurement system is in place.	A formal evaluation process is defined and several formal supplier audits have taken place.	Strategic suppliers are audited to understand their current and future capabilities. Additionally, a process control system is agreed upon between the strategic suppliers.	As 4 plus, On-site audits have taken place. The measurement system is extended with the costs of non-delivery. Additionally, targets are set and there are personnel available to manage strategic supplier quality and development
21	Bemelmans et al. (2012)	How is the supplier rating system organized?	Supplier rating on the basis of an ad hoc qualitative perception of performance	There is a standard supplier rating system in place. At least quality and delivery performance is measured.	The rating system is extended with basic categorizations of suppliers and suppliers are also rated on risk and revenue	The criteria for supplier ratings are aligned with business objectives. Strategic suppliers are often informed about changing business objectives.	As 4 plus, the criteria also incorporate future needs of the company and the overall objective of the system is to maximise performance from suppliers.

22	Bemelmans et al. (2012)	Are the results of supplier evaluations and performance assessments communicated towards suppliers and partners?	No communication of performance evaluations towards suppliers.	The general supplier performance assessments are communicated towards suppliers.	Supplier visits and/or days are organized for supplier recognition/evaluation and to structurally communicate business strategy and purchasing objectives	Information about process studies and audits are effectively communicated towards strategic suppliers and is internally accessible for all personnel.	As 4 plus, Results from performance measurements are communicated towards all suppliers and key stakeholders.
23	Bemelmans et al. (2012)	Is there a supplier complaint system in place?	The is no complaint system in place which makes it possible to make complaints about suppliers.	There is an informal system in place for complaints about suppliers.	A formal procedure is in place to identify and communicate complaints about suppliers.	The formal procedure incorporates a rating system with criteria to value each complaint.	The complaint procedure is regularly evaluated together with strategic suppliers.

Documented evidence	
1	Supplier performance measurements
2	Supplier rating system
3	Supplier selection process
4	Supplier complaint process
5	Communication agreements/plan between managing contractor and supplier.

Intensity of collaboration (11/13)

Survey questions	
1	We are very active in the new product development process of Strukton/Reef.
2	Communication with our firm about quality considerations and design changes is very close.

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
24	Enkel et al. (2011)	How much knowledge do you exchange with your partners and how often?	No regulated collaboration, only ad hoc.	Knowledge sharing only if one party ought its necessary based on experience.	Standard process for the sharing of knowledge with partners during projects.	Standard process for sharing knowledge with partners also exceeding project environment.	The process for sharing knowledge is updated regularly in collaboration with partners.
25	Enkel et al. (2011)	How standardized is your partnership process?	No standardization	Informal way of dealing with partners, no plan upfront.	Standardized tools for partnerships are present, clear ownership of project	Most common partnerships are standardized	The standardization of agreements is balanced with the special need originated from the specification of a project plan.
26	Bemelmans et al. (2011)	How is the selection of long-term partners organized? Is there a deliberate process?	No specific policy to select long-term partners.	There is a formal process in place to identify the criteria and objectives for relationships within a project, in line with the project purchasing plan.	A formal process is in place to identify the criteria and objectives for each relationship, in line with the project exceeding purchasing plan and the business objectives.	Next to the formal process is an open book policy to share cost calculations and cost breakdowns with strategic suppliers exceeding multiple projects.	As 4 plus, a continuous assessment of the partnership against predefined objectives.
27	Enkel et al. (2011)	Are you capable to work with diverse partners and in diverse forms of partnerships?	Arbitrary partnering	Focus on few, dominant forms of partnerships	Diversity in partnership forms with existing partners.	Specific partnership forms are used, diversity is increased with unknown, small and medium partners.	There are partnerships in all parts of the value chain

28	Enkel et al. (2011)	Have you built a network of diverse contacts and (potential) partners?	Only one-off contacts.	Repeating contacts with several parties	Previously used parties gathered in network system	Network is expanded with more diverse, new parties	Network is linked with other firms and strategically expanded.

Documented evidence	
1	Supplier selection process
2	Partnership agreements + process description
3	Communication plans
4	Network system (preferred supplier lists)

Innovation collaboration (12/13)

Survey questions	
1	In collaborating with Strukton/Reef, our firm developed a very high number of new products/services.
2	In collaborating with Strukton/Reef, our firm was able to bring to market a very high number of new products/services.

#		**Question**	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimizing**
29	Enkel et al. (2011)	Are your employees able to share and access knowledge gained through innovation activities?	Only ad hoc knowledge sharing.	Knowledge is only shared in project teams.	Irregular contact between departments to share knowledge.	There are project owners appointed to facilitate knowledge sharing	Knowledge is widely accessible through database for every department.
30	Enkel et al. (2011)	Are your employees able to exploit the knowledge gained through innovation?	Only individual absorption.	Informal sharing of new knowledge and ideas between employees.	Employees are actively stimulated to absorb and share knowledge.	Intra-organizational knowledge sharing (between departments).	External knowledge is fully exploited in products and in the internal organization.

Documented evidence	
1	Innovation database
2	Innovation processes

Speed of innovation (13/13)

Survey questions	
1	The speed with which new products/services are developed and brought to market with Strukton/Reef is very high.
2	Strukton is able to respond quickly to (technological) developments in the market.
3	Strukton is able to anticipate competitors' (technological) developments.

#		Question	Initial	Repeatable	Defined	Managed	Optimizing
24	Enkel et al. (2011)	Is the innovation incorporated into a communicated strategy?	Innovation is not mentioned in a strategy.	Innovation is verbally supported by management.	Innovation is incorporated into the organization's strategy.	Innovation strategy is explained and stimulated by management.	Innovation strategy is demonstrated by management who "walk the walk".
25	Enkel et al. (2011)	Are employees assessed and rewarded on the basis of innovation targets?	No assessment based on Innovation activities.	Informal assessment of innovation initiatives.	Assessment is based partly on Innovation strategy and targets.	Champions are awarded on the basis of predefined targets.	Innovation based assessment for all employees, specified per location/site.
26	Enkel et al. (2011)	Are employees willing to take initiative and be entrepreneurial?	Little initiative taken by employees.	Individual initiatives at the lower levels of the organization.	Champions are appointed to demonstrate entrepreneurship	Champions are stimulating entrepreneurship	Employees in all parts of the organization are willing to take initiative.
27	Enkel et al. (2011)	Are there communicated targets which are in line with the open innovation strategy of the organization?	No targets are set.	Lower level initiatives are used for target setting.	Targets are set in line with the Innovation strategy.	Targets are set for and communicated to employees.	Targets are continuously adjusted for each activity.
35	Enkel et al. (2011)	Are examples of how to do open innovation communicated throughout the organization?	There are no success stories at present.	Successes are shared informally, by word of mouth.	Some success stories are shared by management.	Success stories are shared in a regulated way.	Success stories are used for strategic purposes.

36	Enkel et al. (2011)	Are your open innovation activities communicated throughout the organization	Informal communication of initiatives.	Initiatives communicated in small team or groups.	Communication among management via regular meetings.	Initiatives communicated via widely accessible intranet.	Employees brought into contact via central position.

Documented evidence	
1	Innovation database
2	Innovation processes

Appendix G. Evaluation & refinement of the assessment model

I. Questionnaire results

Confidential

II. Interview results

Confidential

III. Changes to the original model

#	Subject	Changes
1	**Responsibilities & disputes**	Both the complexity and effect on overall project result were already present in the model. The aspect of the agreements in the collaboration contract was not present and is added to the managed & optimizing level.
2	**Responsibilities & disputes**	The question text is changed to ''on-site'' processes. Furthermore, the level 1-2-3 text is adapted. For each, the levels at which problems are resolved are added to the text. The text for level 4 is altered to account for problems which affect the total project result.
3	**Equal benefits**	The text for level 2 is adapted to incorporate a distribution based on work packages. The text for level 3 & 4 is adapted to account for the agreements in collaborative contracts.
4	**Equal benefits**	The text for level two has been adapted to include the rewards for taking risk based on work packages. In level 3, the advice component is added. For level 4, risks are handled together and rewards are divided. Level 5 relates to the pre-determined agreements in the collaborative contract which define the allocation of rewards.
5	**Flexibility**	The terminology is altered on level 2 & 4 from beneficial for own company to beneficial to total project.
6	**Working relationship**	Too specific for assessment on organizational level. This however, could be used to determine suitable partners. This question is deleted from the model.
7	**Working relationship**	The text for Level 2 has been altered to ''all suppliers''. For level 3, a division is added between new and recurrent suppliers.
8	**Working relationship**	This question is similar to question no. 7 and therefore deleted from the model.
9	**Working relationship**	No changes
10	**Working relationship**	Similar to question 7 & 8 and therefor deleted from the model.
11	**Communication**	The part related to the open book policy between partners is excluded from this question.
12	**General competence**	No changes
13	**General competence**	No changes
14	**General competence**	No changes
15	**General competence**	No changes

16	**Involvement of suppliers**	The formulation of the managed level is adapted: The past performance and preferred supplier lists are used to determine possible supplier contributions.
17	**Involvement of suppliers**	No changes
18	**Joint improvement**	No changes
19	**Growth opportunities**	The text for level 4 & 5 have been altered to account for a division between evaluations on hard skills and soft skills.
20	**Supplier evaluation**	The aspect of supplier audits for level 3 is excluded.
21	**Supplier evaluation**	No changes
22	**Supplier evaluation**	No changes
23	**Supplier evaluation**	No changes
24	**Intensity of collaboration**	No changes
25	**Intensity of collaboration**	The text for level 3 has been adapted to clarify ‘’ownership’’. The text for level 4 is also clarified by adding goal, objectives and contract considerations for each partner as part of a managed process. In the text for level 5, ‘’processes’ is added to account for project specific needs within processes and not only within agreements.
26	**Intensity of collaboration**	No changes
27	**Intensity of collaboration**	For level 4 the text has been clarified by adding ‘’adapting each contract to the specific partner’’. Level 5 has been rewritten to account for the construction industry wherein partnering within the entire value chain is unlikely to happen because of need & transaction uncertainty. The optimized level is now formulated to add a constant improvement of the used contracts by training employees and sharing knowledge.
28	**Intensity of collaboration**	No changes.
29	**Innovation collaboration**	To the optimized level, the aspect of regular meetings between project owners to stimulate knowledge sharing is added.
30	**Innovation collaboration**	For level 5, also internal knowledge is added to the text.
31	**Speed of innovation**	The text ‘’ walk the walk’’ is deleted form the level 5 text.
32	**Speed of innovation**	No changes.
33	**Speed of innovation**	The text for level 3 has been altered, now it also states that employees are stimulated to take initiative. Level 4 has been completely re-formulated.
34	**Speed of innovation**	The word ‘’open’’ is deleted from the question text to prevent confusion.
35	**Speed of innovation**	The word ‘’open’’ is deleted from the question text to prevent confusion.
36	**Speed of innovation**	The optimized level is adapted in a way that employees are brought in contact through a central position and person. Moreover, the word ‘’open’’ is deleted from the question text to prevent confusion.

Appendix H. Application of the model

I. Description of each process

Responsibilities & Disputes

The first process of the model is about the management of problems and responsibilities. During the interviews, several respondents pointed out that the handling of problems is mostly based on the division of work packages. In general, only problems which have an effect on the total project result, such as permits, are handled as mutual responsibilities. During project kick off sessions, responsibilities and objectives are part of the agenda. One of the objectives of such a session is to adjust the objectives of each party to define a mutual objective. Also, the stimulation of teambuilding and commitment is one of the objectives in the kick-off sessions. Both mutual objective and teambuilding may help in treating more problems as mutual responsibilities. However, these kick-off sessions are often only held with the client and not with down-stream sub-contractors and/or suppliers. Hence, despite the fact that standard formats treat mutual objectives and teambuilding, most of the problems are not treated as mutual responsibilities if the contract does not explicitly state that. Therefore, the maturity level of the first process is defined at level 2: Repeatable.

1	Are problems which occur during a project handled as individual or mutual responsibilities?	Problems which occur during a project are not handled as mutual responsibilities.	**Only complex problems which affect the entire project are treated as mutual responsibilities.**	Problems which occur within the interface between both parties are treated as mutual responsibilities.	Most of the problems are treated as mutual responsibility. Superficial agreements related to problems are defined in a collaboration contract.	All problems in the project are treated as mutual responsibilities. Collaborative contracts define mutual responsibilities and procedures to follow.

Secondly, the treatment of disputes during projects. The maturity level for this process is party determined by the sub-contractors and suppliers in the project. However, during the interviews is was made clear to the researcher that the on-site personnel is solving most problems without escalation. Two exceptions where stated; (1) problems which have an effect on the total project result are escalated to higher management and (2), problems and disputes which surface repeatably are also escalated. For problems regarding the type one exception, the management team of the firm is involved. For problems with a type 2 exception, the project manager is involved. The maturity level for this process is defined at level 4: Managed.

2	How often do problems in the on-site processes lead to disputes and at what level are they resolved?	Problems always lead to disputes. Disputes are always escalated to higher management.	Problems often lead to disputes. Only minor problems are resolved on-site. The remainder of the problems is escalated.	Only complex problems lead to disputes and are escalated to higher management. Most regular problems are resolved on-site.	**Most problems are timely resolved at the lowest level. Except for problems which have an influence on the total project result, these are escalated.**	All problems are timely resolved at the lowest level.

Equal benefits

The distribution of profits and losses is the second aspect treated in the model. The first process is about the process for the distribution of the profits and losses. Within the standard agenda for the kick-off meetings, the financial aspect is one of the subjects. Within this subject, one of the agenda points is called division of revenue and profits. This subject is also included in the standard UAV-gc process (Step 2: project organization). Furthermore, during the interviews, the respondents stated that most divisions of profits and losses are based upon the allocation of work packages amongst the suppliers and sub-contractors. Additionally, only suppliers and sub-contractors who have a significant influence on profits and losses are included in the allocation of those extra revenues or losses. Thus, except for the notion in the UAV-gc process and kick-off agenda, no further description of the process is formulated and therefore, the maturity level of process 3 is defined as 2: Repeatable.

3	Is there a process for the distribution of (extra) benefits?	Ad hoc distribution of benefits.	**Distribution of benefits based on separation of work packages.**	There is a process for distributing benefits based on multiple criteria, which originate from a collaborative contract.	Distribution of benefits is similar across all projects and based on the formal process. This process is altered in each collaborative contract to account for project specific need.	As 4 plus, the criteria for the distribution of benefits are regularly evaluated and updated within partnerships.

The second process relates to the division and rewards of risks. The risk management process for UAV-gc projects described the division of risks and their financials for the internal organization. For external partners who take risks there are no further process description available. During the interviews it became clear that the risks are divided based on work packages. If a sub-contractor or suppliers is allocated a work package, the risks associated with that package are also for the sub-contractor. Another type of risk distribution is present when there is a horizontal collaboration with a sub-contractor. Most of the project with

horizontal collaboration use a mutual risk provision. When the money that is withheld for risk management is not spend on controlling the risk, it is divided between partners. The exact division of that left-over money is sometimes based upon the collaboration contract and sometimes it is just discussed during project meetings. The maturity level of the fourth process is determined at level 4: Managed.

4	Are there any rewards for supply chain partners who take the risk?	No formal rewards for the party taking the risk.	No formal decision process for risk allocation. Risks are allocated based on work packages. Rewards originate from proper control of the risk.	Risks are allocated based on work packages. The control (and rewards) of these risks is in the hands of the risk bearer. Partners do advise each other on the risks.	**The risks are controlled together. Rewards originate from the proper control of these risks (in the form of left-over money from the risk provisions).**	The risks are controlled together. Rewards originate from the proper control of these risks. And the division of this money is based on the collaborative contract.

Flexibility

The next aspect in the maturity model is related to the flexibility of the managing contractor. One of the collaboration contracts used in a project included a passage which treats advices and suggestions from the sub-contractor. Within that contract it is stated that every suggestion and advice given by sub-contractors has to be directed at the Strukton manager on-site. This on-site manger has to accept every change in writing before something may be executed. Moreover, the respondents from the interviews stated that Strukton is flexible towards sub-contractors provided that (1) the solution improves the entire project (lower price/ better MEAT) and (2) the solution has no negative consequences for Strukton. Thus, flexibility is part of standard business process, however suggestions and ideas are only included if there are no negative consequences for Strukton or for the project. Based on this, the maturity level for flexibility is set at level 3: Defined.

5	How flexible is your company when there are special needs or problems?	No flexibility towards a supplier.	Only flexible on aspects which benefits the total project.	**Flexibility towards a partner is part of the standard business processes.**	Flexibility as form of goodwill towards a project partner. Even if the flexibility is not beneficial for the project.	Between both parties, mutual flexibility exists as part of the partnership.

Working relationship

The working relationship between managing contractor and sub-contractor consists of two sub-processes in the developed model. The first process is about the type of trust and

goodwill present at Strukton. During the interviews it became clear that recurrent suppliers are treated differently than new suppliers. For recurrent suppliers, experiences from the past define the type of trust that is present. These recurrent suppliers are often trusted for their capabilities. New suppliers are monitored more extensively during a project. These are less trusted on their capabilities and checked more often than recurrent suppliers. This shows that the short-term goodwill for suppliers is not always present for new suppliers. Therefore, the maturity level of process 6 is set at level 3: Defined.

6	What type of trust is present?	No trust between the parties	Only trust based on the contract for all suppliers.	**Trust based on competences of a recurrent supplier. Trust in new suppliers is solely based on the contract.**	Trust is based on short-term goodwill trust.	The partner is always trusted on his capabilities and goodwill.

The second working relationship process related to the focus in a relation. Within Strukton, no specific guidelines are set for the relationship management of sub-contractors and suppliers. However, the general integrity guidelines treat suppliers and sub-contractors as subject. These guideline state that no agreements with sub-contractors or suppliers are allowed to be made if they limit the competition in the market. But, these guidelines do not include further rules for the treatment of suppliers and sub-contractors. Moreover, the respondents during the interviews stated that the collaboration with each partner is different and based upon earlier collaborations (experience). Therefore, the maturity level of process 7 is defined as level 2: Repeatable.

7	Are you focused on satisfying your partner?	Collaboration is only based on affection between workers.	**Focus on satisfying itself, collaboration is based on experience.**	Behavioural guidelines are defined. Collaboration is part of a formal process.	Partner satisfaction and the use of guidelines are stimulated and reviewed by management.	Partner satisfaction is monitored constantly.

Communication

The communication between different parties on a project is based on ad hoc decisions and experience of the employees. In the standard collaboration contracts used by Strukton, a statement is made about information and communication: *Strukton provides all information to the supplier which is needed by that supplier to successfully complete his job*. There are no further provisions on how Strukton should do that. Moreover, during the interviews it became clear that there are no communication frameworks for the communication between

Strukton and sub-contractors. Generally, there are two types of collaboration which also define the amount of information shared; horizontal & vertical. Wherein the horizontal collaboration means that both parties are more or less equal and share (all) information. Vertical collaboration is mostly used for ordering commodities and only necessary information is shared to this group (like product requirements). The maturity level for process 8 is defined as level 2: Repeatable.

8	How is the communication between two parties handled by your company?	Communication between parties happens based on ad hoc decisions.	**There is a superficial formal communication framework based on earlier experiences.**	A formal communication framework is present and relational guidelines are described.	Relations with suppliers are often discussed and are a fixed part of management meetings.	As 4 plus, the communication framework (including guidelines) is continuously improved and adapted for changing circumstances.

General competence

The general competences code contains four processes within the developed model. The first process is related to the training of employees. Within Strukton Civil, there are some training programs available for employees. The subjects offered in these programs are of a wide variety. However, there are no specific training days for employees which cover relationship management or partnerships with suppliers and sub-contractors. Most of the knowledge about relationship management is based upon the experience of employees. Therefore, the maturity level of process 9 is determined at level 2: Repeatable.

9	Are your employees trained in how to start, run and finish partnerships?	Employees handle on ad hoc basis, no training present.	**Employees gain skills through experience on the job in interdisciplinary teams.**	Champions set examples of how to deal with partners.	Employees are specifically trained in partnering.	As 4 plus, Employees continuously share new skills and knowledge about specific partners.

The second process related to the general competence of the contractor is concerned with the supplier selection process. Within Strukton, there is a process for the selection of suppliers and sub-contractors. This process is called the supplier management process and is shown in *Figure 21*. Next to this process, there is a general purchasing process containing a more specific outline of the steps within the four phases of the supplier management process. The standard purchasing process contains the phases specify, selection, contract,

order, control and evaluate. Both processes use the preferred supplier lists to select potential suppliers. These are updated through evaluations of suppliers (see phase 4 in *Figure 21*) Based on these two process descriptions, the maturity level of process 10 is determined at level 4: Managed.

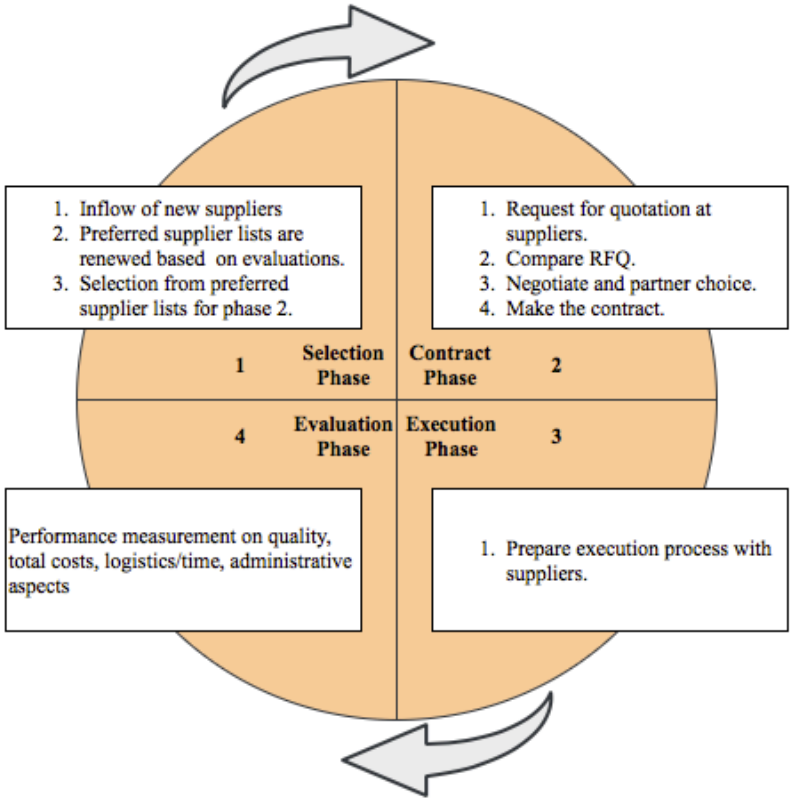

Figure 21: Supplier management process Strukton

10	How is the selection of suppliers organized? And what criteria are used?	Only ad hoc selection, no formal process.	Selection is based on price and availability.	There is a formal documented process based on price, availability and quality.	**There is a formal process with multiple criteria based on specific project characteristics and accounting for current needs. Preferred supplier lists are also available.**	As 4 plus, multi criteria based on project characteristics, soft skills and future needs.

The next process is concerned with the purchasing targets which are set during projects. Within each project, Strukton uses a purchasing plan. This purchasing plan specifies every part of the project which has to be sourced externally. Every part has its own responsible person. After the calculation for the tender phase, the amounts needed are clear and budgets are set for the purchasers. These budgets are used to evaluate all quotations received by suppliers and sub-contractors. Further targets regarding quality are already incorporated in the preferred supplier lists through supplier evaluations. However, for the selection of

suppliers for a project, price is often the only target used. Therefore, the maturity level for process 11 is determined at 2: Repeatable.

11	To what extent are targets and objectives set and used for reviewing supplier performance?	No evidence of predefined targets and objectives for selecting suppliers on a project. Decisions are made on ad hoc basis.	**There are some targets set for purchasers.**	Project objectives are clearly set (including timing, quality, and costs), and translated into purchasing and supplier objectives.	Multi-level project objectives are set and translated into purchasing and supplier objectives.	As 4 plus, supplier performance is measured and reviewed against the predefined targets and industry benchmarks.

The last process for code general competences is about market research. Within the standard purchasing process, the second step: selection, includes market research. This process is thus part of the standard tasks of the general purchaser when selecting potential suppliers. The maturity level of this process is therefore determined at level 4: managed.

12	Is there any form of market research?	Ad hoc market research.	There is formal market research with the objective to learn more about potential suppliers.	There is a formal process with the possibility to spend money and time on market research.	**The formal process of market research is a structural part of a purchaser's tasks.**	As 4 plus, there are time and resources available for structural and fundamental market research with the objective to optimize the supply base based on future needs.

Involvement of suppliers

The involvement of suppliers is brought down to 2 processes. The first process is about the decision to involve suppliers. Within three internal processes there are descriptions about the involvement of suppliers. For the tender management process, step 2 (project preparation) includes the involvement of partners. The work preparation process also includes the purchasing of sub-contractors and suppliers in step 1 and 2. The execution process treats the selection of suppliers in step 2, the coordination with suppliers in step 3 and the communication in step 4. The most important process of these three is considered to be the tender management process. *Figure 22* shows that the potential influence on cost and time of the project is highest at the start of the project (e.g. tender process). Involving key sub-contractors and suppliers early on thus may have a positive influence on the overall project result. However, there are no formal criteria which define the moment for supplier involvement in a tender. These decisions are based upon an ad hoc evaluation of needs and potential contributions of sub-contractors and suppliers to those needs. The maturity level

for process 13 is there for defined at level 2: Repeatable due to the absence of a formal decision framework.

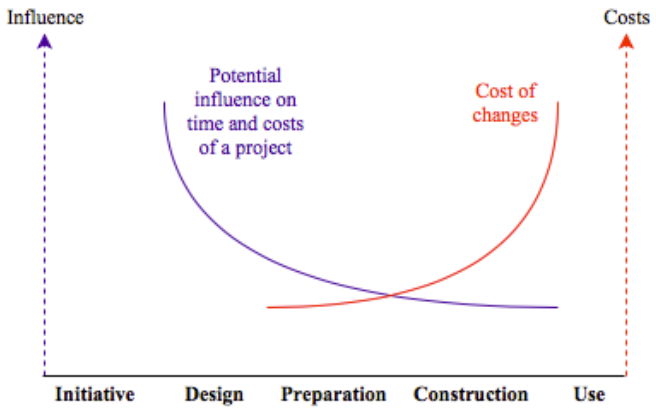

Figure 22: Influence of suppliers on project outcome

13	Is there a formal decision process to determine the moment of supplier involvement?	Decision to involve suppliers is based on ad hoc evaluation of requirements.	**Decision to involve suppliers is based on experience and a superficial process.**	There is a formal process for the decision to involve suppliers which is based on the project's goals and possible contributions of suppliers to those goals.	There is a formal process for the decision to involve suppliers which is based upon project goals and contributions of suppliers. These are matched with prior evaluations of suppliers within the preferred supplier lists.	As 4 plus, the criteria for the involvement of suppliers are part of a formal process which is continuously evaluated and improved.

The next process relates to the cooperation between Strukton and their partners exceeding a single project. None of the processes from the overall management system or any of the answers from the interviews showed any formal, project exceeding relations with partners. There is however some yearly evaluation with partners (such as Van Heteren) wherein the performance is discussed. This is an informal process without any targets or common goals. The maturity level of process 14 is therefore defined as level 1: Initial.

14	How is the cooperation between your own company and strategic partners organized?	**No common, project exceeding goals with strategic partners**.	There are partnership agreements available which focus on improving the relation.	Senior management from both companies is included to lead and manage the relationship based on the partnership agreements.	Strategic suppliers are integrated early on in tenders. Also, shared project exceeding objectives are formalized with suppliers. There is a joint objective setting and joint planning process in place. Little evidence of alignment of future strategies and objectives.	As 4 plus, there are mutual (ambitious) improvement programs focussed on achieving synergies, aligning strategies and technology investments.

Joint improvements

Similar as the description for process 14, there is no formal process for joint improvements. The improvement actions which are executed are mostly ad hoc and without a follow-up. There are no formal programs for supplier improvement, only some informal ones (as discussed in process 14). The maturity level of joint improvements is therefore defined as level 1: Initial.

15	To what extent is there mutual effort between Reef and their partners to improve the performance of both parties?	**Ad hoc supplier-improvement actions, without structured follow-up**.	There is a formal process for developing improvement programs based on experiences.	There is a formal process wherein the performance measurement is aligned with the internal organization and there is a further development of the supplier-improvement program.	There is evidence of proactive supplier development concentrating efforts to the most important commodities/product groups and suppliers.	As 4 plus, supplier assessment and joint/mutual trainings are organized to learn in two directions and to establish common improvement programs (with targets and follow-up)

Growth opportunities

Within Strukton, there are preferred supplier list available at the purchasing department. These use the classification of suppliers which is shown in *Table 15*.

Table 15: Preferred supplier classifications

Preferred supplier classifications	
A	Internal company of Strukton group or holders of framework agreements.
B	Suitable supplier
C	Potential supplier
D	Grey list
E	Black list

Based on those lists, it is possible for sub-contractors and suppliers to gain future work. However, there are no guarantees for future work. For each project, several of the class A/B/C suppliers are contacted for a request for quotation. Based on an evaluation of price and sometimes quality considerations, a supplier is chosen. Thus, being on the preferred supplier list alone is not enough to have guarantees for future work. Therefore, the maturity level of process 16 is set at level 3: Defined.

16	Is there any guarantee for suppliers for future work?	No continuity of work for suppliers.	Only future work through tendering based on price.	**Only future work through tendering based on price and quality criteria.**	Preferred suppliers have a guarantee for future work. These lists are based on evaluations of suppliers on their hard skills.	As 4 plus, the soft skills of suppliers are incorporated in the evaluations. The preferred supplier lists are also continuously updated and reviewed.

Supplier evaluation

Next are the supplier evaluation processes starting with the performance measurement system. Within Strukton there are standard formats for the evaluation of suppliers. This happens once every project. The process of evaluating suppliers is part of the standard purchasing process. The elements measured in this evaluation are; (1) quality of supply, (2) price/ quality ratio, (3) communication, (4) fulfilment of agreements, (5) working relationship, (6) after-care, (7) compliance of safety regulations, (8) Safe and environment consensus processes, (9) compliance with personal protective equipment, (10) handling of dangerous situations and (11) amount of improvement regarding safe behaviour of the supplier. Each of the evaluations is done by at least two separate persons. The results from the evaluations are used to update the preferred supplier lists. Moreover, several forms are in place to evaluate products which are delivered on the construction site and suppliers must agree upon corporate sustainability demands (People/Planet/Profit) before they are suitable for delivery or collaboration. However, this supplier evaluation process is not described in a separate formal process and is only present as part of other processes. Lastly, during the interviews it became clear that no supplier audits have taken place in the past, and none are planned for the future. The maturity level for process 17 is therefore defined as level 2: Repeatable.

17	What performance measurement system is in place to assess supplier performance?	Ad hoc response to supplier problems (e.g. Poor quality or late delivery). No supplier assessment process described.	**A general supplier performance measurement system is in place.**	A formal evaluation process is defined.	Strategic suppliers are audited to understand their current and future capabilities. Additionally, a process control system is agreed upon between the strategic suppliers.	As 4 plus, On-site audits have taken place. The measurement system is extended with the costs of non-delivery. Additionally, targets are set and there are personnel available to manage strategic supplier quality and development

The supplier rating system that is in place is based upon the standard supplier evaluations from process 17. The suppliers are assessed based on the 11 subjects discussed under process 17. There are no extra assessments based on revenue and risk and therefore the maturity level for process 18 is defined as level 2: Repeatable.

18	How is the supplier rating system organized?	Supplier rating on the basis of an ad hoc qualitative perception of performance	**There is a standard supplier rating system in place. At least quality and delivery performance is measured.**	The rating system is extended with basic categorizations of suppliers and suppliers are also rated on risk and revenue	The criteria for supplier ratings are aligned with business objectives. Strategic suppliers are often informed about changing business objectives.	As 4 plus, the criteria also incorporate future needs of the company and the overall objective of the system is to maximise performance from suppliers.

The results from the evaluations of suppliers are internally communicated towards the purchasing department. Once a year there is a safety day for all recurrent suppliers and sub-contractors During this day business objectives of Strukton are communicated towards suppliers and several hypothetical situations related to those objectives are discussed in groups. However, there is no structural supplier days for discussing performance on other subjects. The maturity level for process 19 is therefore determined at level 1: Initial.

19	Are the results of supplier evaluations and performance assessments communicated towards suppliers and partners?	**No communication of performance evaluations towards suppliers.**	The general supplier performance assessments are communicated towards suppliers.	Supplier visits and/or days are organized for supplier recognition/evaluation and to structurally communicate business strategy and purchasing objectives	Information about process studies and audits are effectively communicated towards strategic suppliers and is internally accessible for all personnel.	As 4 plus, Results from performance measurements are communicated towards all suppliers and key stakeholders.

The last process related to supplier evaluations is about complaints. Within Strukton, complaints about suppliers are communicated towards the purchasing department. When necessary, this department updates the preferred supplier list according to the complaints. Small complaints are usually handled by the project manager. The maturity level is determined at level 2: Repeatable.

20	Is there a supplier complaint system in place?	The is no complaint system in place which makes it possible to make complaints about suppliers.	**There is an informal system in place for complaints about suppliers.**	A formal procedure is in place to identify and communicate complaints about suppliers.	The formal procedure incorporates a rating system with criteria to value each complaint.	The complaint procedure is regularly evaluated together with strategic suppliers.

Intensity of collaboration

The next subject are the processes related to the intensity of collaboration. The first process is about the exchange of information amongst partners. The amount of information shared with partners depends on the type of collaboration (vertical/ horizontal) and the specific agreements made between Strukton and sub-contractors. As stated before, the collaboration agreement obligates Strukton to provide any information that is needed by the supplier to execute his work successfully. Based on information gathered during the interviews, it is clear that every project has specific agreements on the sharing of information between partners. There is however no formal process which defines the exchange of information with external parties next to the general integrity guidelines. The maturity level of process 21 is therefore determined at level 2: Repeatable.

21	How much knowledge do you exchange with your partners and how often?	No regulated collaboration, only ad hoc.	**Knowledge sharing only if one party ought its necessary based on experience**.	Standard process for the sharing of knowledge with partners during projects.	Standard process for sharing knowledge with partners also exceeding project environment.	The process for sharing knowledge is updated regularly in collaboration with partners.

Process 22 includes the standard agreements with partners and internal ownership of relations. Based on the interviews it is found that most recurrent suppliers have a fixed contact person within Strukton. Also within projects, clear owners are defined in the purchasing plans for each product and subsequent suppliers. Lastly, there are several standard contracts forms available which are also checked by the legal department of

Strukton. Other tools like supplier evaluation forms are also defined, however these are limited. Therefore, the maturity level of process 22 is set at level 3: Defined.

22	How standardized is your partnership process?	No standardization	Informal way of dealing with partners, no plan upfront.	**Standardized tools for partnerships are present, clear internal ownership of specific partners. Contracts used are standardised.**	There is a formal process in place which defines goals and objectives for each partnership. Contracts are adapted to specific partners based on pre-defined guidelines.	The standardization of agreements and processes is balanced with the special need originated from the specification of a project plan.

The next process is concerned with the selection of long-term strategic partners. Within Strukton, every project is treated separately. As stated above, every project defines a purchasing plan with owners per product group. Within these purchasing plans, also objectives and criteria for suppliers are incorporated. However, these are concerned with the product or process and not with the relation itself. Therefore, the maturity level or process 23 is defined as level 1: Initial.

23	How is the selection of long-term partners organized? Is there a deliberate process?	**No specific policy to select long-term partners.**	There is a formal process in place to identify the criteria and objectives for relationships within a project, in line with the project purchasing plan.	A formal process is in place to identify the criteria and objectives for each relationship, in line with the project exceeding purchasing plan and the business objectives.	Next to the formal process is an open book policy to share cost calculations and cost breakdowns with strategic suppliers exceeding multiple projects.	As 4 plus, a continuous assessment of the partnership against predefined objectives.

As stated before, there are a few contract forms which are used within Strukton. These contracts have also been checked by the legal department and form the basis of every collaboration with external parties. The differentiation between vertical and horizontal collaboration is also present in the types of contracts used. However, these contracts are limited in agreements related to the relation between Strukton and a sub-contractor or supplier. These contracts are mostly concerned with the product/process and legal liability and not with the relationship itself. The maturity level for process 24 is therefore defined as level 1: Initial.

24	Are you capable to work with diverse partners and in diverse forms of partnerships?	**Arbitrary partnering**	Focus on few, dominant forms of partnerships	Diversity in partnership forms with existing partners.	Specific partnership forms are used, diversity is increased by adapting each new contract to the specific partner.	As 4 plus, employees receive training in specific partnership forms and share their knowledge about specific partnering forms.

The supplier and sub-contractor pool of Strukton consists of a large amount of local /regional and national suppliers and can be seen as a network system (preferred supplier list). This network system is constantly updated and extended to provide sufficient capacity and capabilities to fulfill the demands from Strukton's clients. The maturity level for process 25 is thus defined as level 4: Managed.

25	Have you built a network of diverse contacts and (potential) partners?	Only one-off contacts.	Repeating contacts with several parties	Previously used parties gathered in network system	**Network is expanded with more diverse, new parties.**	Network is linked with other firms and strategically expanded.

Innovation collaboration

The collaboration on innovation consist of two processes. These processes are concerned with the absorption and sharing of knowledge gained through innovation activities. At first, the sharing of knowledge. Based on the answers given by the respondents in the interviews, it became clear that there is no regulated way of knowledge sharing between internal employees/departments. Only informal contact between employees can result in the sharing of knowledge. This situation applies to ideas/ suggestions and solutions which are used in projects (mostly practical solutions). These solutions are also added to a database on intranet, however, this is not actively communicated.

For the organization's overall innovation effort, the information is periodically shared through an innovation letter. This overall innovation effort is concentrated at 4 teams which all treat one of four subjects; (1) big data, (2) circularity, (3) mobility and (4) smart working. These teams also periodically meet to discuss progression. Thus, for the solutions and innovations that are not part of one of the four teams, the maturity level is defined at level 1: Initial. For the knowledge sharing about the general innovation activities, the maturity level is defined at level 4: Managed.

26	Are your employees able to share and access knowledge gained through innovation activities?	**Only ad hoc knowledge sharing.**	Knowledge is only shared in project teams.	Irregular contact between departments to share knowledge.	**There are project owners appointed to facilitate knowledge sharing.**	Knowledge is widely accessible through database for every department. There are also regular meetings between different project owners to stimulate knowledge sharing.

For the absorption and exploitation of knowledge, the same arguments can be used as for process 26. Lower level solutions and innovation are subject to informal communication (maturity level 2). Innovations which are part of one of the four teams are communicated throughout the organization (maturity level 4).

27	Are your employees able to exploit the knowledge gained through innovation?	Only individual absorption.	**Informal sharing of new knowledge and ideas between employees**.	Employees are actively stimulated to absorb and share knowledge.	**Intra-organizational knowledge sharing (between departments).**	External & internal knowledge is fully exploited in products and in the internal organization.

Speed of innovation

The last subject of the model is the speed of innovation. Within this final subject, six processes will be elaborated. The first process is about the company strategy. Within the public communicated strategy, no innovation aspects are mentioned. In this communicated strategy, there are notions about complex technical solutions and the sustainability goals of Strukton. However, innovation is not explicitly mentioned. Internally, there is a communicated strategy regarding innovation. This strategy is called the IDL-SDC process and is shown in *Figure 23*.

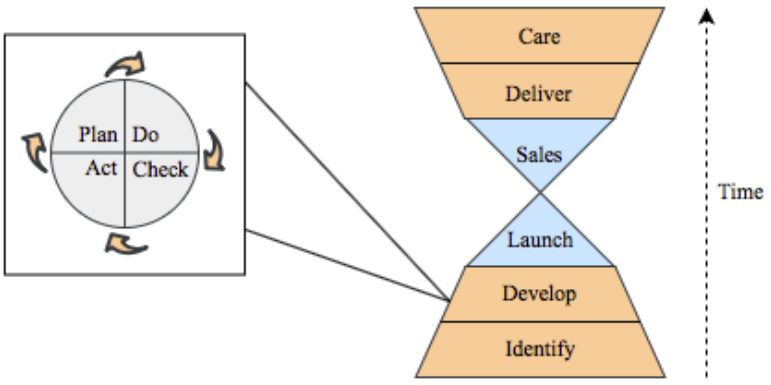

Figure 23: Innovation process Strukton

Within Strukton they are now extending this general innovation process with individual process steps and descriptions through the four main innovation themes (big data, circularity, mobility and smart working). The maturity level for process 28 is therefore determined at level 3: Defined.

28	Is the innovation incorporated into a communicated strategy?	Innovation is not mentioned in a strategy.	Innovation is verbally supported by management.	**Innovation is incorporated into the organization's strategy**.	Innovation strategy is explained and stimulated by management.	Innovation strategy is demonstrated by management.

Next are the innovation rewards that are offered by Strukton. Based on the four interviews, none of the respondents had ever seen rewards for innovation activities. The only reward that is possible to earn is through an idea can where a winner is determined every year for the best idea. Therefore, the maturity level of process 29 is determined at level 1: initial.

29	Are employees assessed and rewarded on the basis of innovation targets?	**No assessment based on innovation activities.**	Informal assessment of innovation initiatives.	Assessment is based partly on Innovation strategy and targets.	Champions are awarded on the basis of predefined targets.	Innovation based assessment for all employees, specified per location/site.

Within the innovation process and the four focus teams, there are sponsors appointed for each of the four teams. These sponsors originate form one of the regions of Strukton Civil and are higher management positions. These sponsors are appointed to stimulate innovation within each of the regions, enhance the cohesion between the regions (''Samen sterk'' & ''op weg naar één Strukton Civiel'') and control results. In the brochure, employees are also stimulated to come up with ideas and solutions. However, there is no set platform for employees to show their initiatives. Based on this argumentation, the maturity level for process 30 is set at level 3: Defined.

30	Are employees willing to take initiative and be entrepreneurial?	Little initiative taken by employees.	Individual initiatives at the lower levels of the organization.	**Champions are appointed to demonstrate entrepreneurship. Individual employees are stimulated to take initiative.**	There is a platform wherein employees can show their initiatives with the help of champions.	Employees in all parts of the organization are willing to take initiative.

Each of the four focal teams has their own innovation targets. Smart working must enhance the tender ‘’hit’’ rate to at least 1 on 3. Big data, circularity and mobility must generate at least 60 million of revenue in 2022 with at least 10% profit. These targets are also communicated to employees through the periodical innovation letter. The maturity level of process 31 is therefore set at level 4: Managed.

31	Are there communicated targets which are in line with the innovation strategy of the organization?	No targets are set.	Lower level initiatives are used for target setting.	Targets are set in line with the Innovation strategy.	**Targets are set for and communicated to employees.**	Targets are continuously adjusted for each activity.

Some success stories are shared with the employees through the intranet. Example is the concrete blend without cement. The successes of the overall innovation strategy and the four focal teams are also communicated through intranet or email. The maturity level of process 32 is thus defined as level 4: managed.

32	Are examples of how to do innovation communicated throughout the organization?	There are no success stories at present.	Successes are shared informally, by word of mouth.	Some success stories are shared by management.	**Success stories are shared in a regulated way.**	Success stories are used for strategic purposes.

The last process is concerned with the communication of initiatives. The lower level initiatives (solutions/innovations) with mostly practical applications in projects are not communicated in a regulated way. These are only added to the database on intranet but not actively communicated towards employees. For the initiatives which are taken by one of the four focal teams, these are communicated through the innovation letter and through intranet. The maturity level of process 33 is therefore defined as level 4: Managed.

33	Are your innovation activities communicated throughout the organization	Informal communication of initiatives.	Initiatives communicated in small team or groups.	Communication among management via regular meetings.	**Initiatives communicated via widely accessible intranet.**	Employees brought into contact via a central position/ person.

II. Documented evidence

Confidential

Appendix I. Interview transcriptions (Dutch)

Confidential

Appendix J. Refined model

#	Code	Source	Question	Initial	Repeatable	Defined	Managed	Optimizing
1	Responsibilities & disputes	*New*	Are problems which occur during a project handled as individual or mutual responsibilities?	Problems which occur during a project are not handled as mutual responsibilities.	Only complex problems which affect the entire project are treated as mutual responsibilities.	Problems which occur within the interface between both parties are treated as mutual responsibilities.	Most of the problems are treated as mutual responsibility. Superficial agreements related to problems are defined in a collaboration contract.	All problems in the project are treated as mutual responsibilities. Collaborative contracts define mutual responsibilities and procedures to follow.
2	Responsibilities & disputes	*Meng et al. (2011)*	How often do problems in the on-site processes lead to disputes and at what level are they resolved?	Problems always lead to disputes. Disputes are always escalated to higher management.	Problems often lead to disputes. Only minor problems are resolved on-site. The remainder of the problems is escalated.	Only complex problems lead to disputes and are escalated to higher management. Most regular problems are resolved on-site.	Most problems are timely resolved at the lowest level. Except for problems which have an influence on the total project result, these are escalated.	All problems are timely resolved at the lowest level.
3	Equal benefits	*New*	Is there a process for the distribution of (extra) benefits?	Ad hoc distribution of benefits.	Distribution of benefits based on separation of work packages.	There is a process for distributing benefits based on multiple criteria, which originate from a collaborative contract.	Distribution of benefits is similar across all projects and based on the formal process. His process is altered in each collaborative contract to account for project specific need.	As 4 plus, the criteria for the distribution of benefits are regularly evaluated and updated within partnerships.
4	Equal benefits	*Meng et al. (2011)*	Are there any rewards for supply chain partners who take the risk?	No formal rewards for the party taking the risk.	No formal decision process for risk allocation. Risks are allocated based on work packages. Rewards originate from proper control of the risk.	Risks are allocated based on work packages. The control (and rewards) of these risks is in the hands of the risk bearer. Partners do advise each other on the risks.	The risks are controlled together. Rewards originate from the proper control of these risks (in the form of left-over money from the risk provisions).	The risks are controlled together. Rewards originate from the proper control of these risks. And the division of this money is based on the collaborative contract.

5	Flexibility	New	How flexible is your company when there are special needs or problems?	No flexibility towards a supplier.	Only flexible on aspects which benefits the total project.	Flexibility towards a partner is part of the standard business processes.	Flexibility as form of goodwill towards a project partner. Even if the flexibility is not beneficial for the project.	Between both parties, mutual flexibility exists as part of the partnership.
6	Working relation	Meng et al. (2011)	What type of trust is present?	No trust between the parties	Only trust based on the contract for all suppliers.	Trust based on competences of a recurrent supplier. Trust in new suppliers is solely based on the contract.	Trust is based on short-term goodwill trust.	The partner is always trusted on his capabilities and goodwill.
7	Working relation	Enkel et al. (2011)	Are you focused on satisfying your partner?	Collaboration is only based on affection between workers.	Focus on satisfying itself, collaboration is based on experience.	Behavioural guidelines are defined. Collaboration is part of a formal process.	Partner satisfaction and the use of guidelines are stimulated and reviewed by management.	Partner satisfaction is monitored constantly.
8	Communication	Bemelmans et al. (2012) & Mans et al.	How is the communication between two parties handled by your company?	Communication between parties happens based on ad hoc decisions.	There is a superficial formal communication framework based on earlier experiences.	A formal communication framework is present and relational guidelines are described.	Relations with suppliers are often discussed and are a fixed part of management meetings.	As 4 plus, the communication framework (including guidelines) is continuously improved and adapted for changing circumstances.
9	General competence	Enkel et al. (2011)	Are your employees trained in how to start, run and finish partnerships?	Employees handle on ad hoc basis, no training present.	Employees gain skills through experience on the job in interdisciplinary teams.	Champions set examples of how to deal with partners.	Employees are specifically trained in partnering.	As 4 plus, Employees continuously share new skills and knowledge about specific partners.
10	General competence	Bemelmans et al. (2012) & Meng et al. (2011)	How is the selection of suppliers organized? And what criteria are used?	Only ad hoc selection, no formal process.	Selection is based on price and availability.	There is a formal documented process based on price, availability and quality.	There is a formal process with multiple criteria based on specific project characteristics and accounting for current needs. Preferred supplier lists are also available.	As 4 plus, multi criteria based on project characteristics, soft skills and future needs.

11	General competence Bemelmans et al. (2012)	To what extent are targets and objectives set and used for reviewing supplier performance?	No evidence of predefined targets and objectives for selecting suppliers on a project. Decisions are made on ad hoc basis.	There are some targets set for purchasers.	Project objectives are clearly set (including timing, quality, and costs), and translated into purchasing and supplier objectives.	Multi-level project objectives are set and translated into purchasing and supplier objectives.	As 4 plus, supplier performance is measured and reviewed against the predefined targets and industry benchmarks.
12	General competence Bemelmans et al. (2012)	Is there any form of market research?	Ad hoc market research.	There is formal market research with the objective to learn more about potential suppliers.	There is a formal process with the possibility to spend money and time on market research.	The formal process of market research is a structural part of a purchaser's tasks.	As 4 plus, there are time and resources available for structural and fundamental market research with the objective to optimize the supply base based on future needs.
13	Involvement of suppliers Bemelmans et al. (2012)	Is there a formal decision process to determine the moment of supplier involvement?	Decision to involve suppliers is based on ad hoc evaluation of requirements.	Decision to involve suppliers is based on experience and a superficial process.	There is a formal process for the decision to involve suppliers which is based on the project's goals and possible contributions of suppliers to those goals.	There is a formal process for the decision to involve suppliers which is based upon project goals and contributions of suppliers. These are matched with prior evaluations of suppliers within the preferred supplier lists.	As 4 plus, the criteria for the involvement of suppliers are part of a formal process which is continuously evaluated and improved.
14	Involvement of suppliers Bemelmans et al. (2012)	How is the cooperation between your own company and strategic partners organized?	No common, project exceeding goals with strategic partners.	There are partnership agreements available which focus on improving the relation.	Senior management from both companies is included to lead and manage the relationship based on the partnership agreements.	Strategic suppliers are integrated early on in tenders. Also, shared project exceeding objectives are formalized with suppliers. There is a joint objective setting and joint planning process in place. Little evidence of alignment of future strategies and objectives.	As 4 plus, there are mutual (ambitious) improvement programs focussed on achieving synergies, aligning strategies and technology investments.

15	Joint improvements Bemelmans et al. (2012)	To what extent is there mutual effort between Reef and their partners to improve the performance of both parties?	Ad hoc supplier-improvement actions, without structured follow-up.	There is a formal process for developing improvement programs based on experiences.	There is a formal process wherein the performance measurement is aligned with the internal organization and there is a further development of the supplier- improvement program.	There is evidence of proactive supplier development concentrating efforts to the most important commodities/product groups and suppliers.	As 4 plus, supplier assessment and joint/mutual trainings are organized to learn in two directions and to establish common improvement programs (with targets and follow-up)
16	Growth opportunities Meng et al. (2011)	Is there any guarantee for suppliers for future work?	No continuity of work for suppliers.	Only future work through tendering based on price.	Only future work through tendering based on price and quality criteria.	Preferred suppliers have a guarantee for future work. These lists are based on evaluations of suppliers on their hard skills.	As 4 plus, the soft skills of suppliers are incorporated in the evaluations. The preferred supplier lists are also continuously updated and reviewed.
17	Supplier evaluation Bemelmans et al. (2012)	What performance measurement system is in place to assess supplier performance?	Ad hoc response to supplier problems (e.g. Poor quality or late delivery). No supplier assessment process described.	A general supplier performance measurement system is in place.	A formal evaluation process is defined and several formal supplier audits have taken place.	Strategic suppliers are audited to understand their current and future capabilities. Additionally, a process control system is agreed upon between the strategic suppliers.	As 4 plus, On-site audits have taken place. The measurement system is extended with the costs of non-delivery. Additionally, targets are set and there are personnel available to manage strategic supplier quality and development
18	Supplier evaluation Bemelmans et al. (2012)	How is the supplier rating system organized?	Supplier rating on the basis of an ad hoc qualitative perception of performance	There is a standard supplier rating system in place. At least quality and delivery performance is measured.	The rating system is extended with basic categorizations of suppliers and suppliers are also rated on risk and revenue	The criteria for supplier ratings are aligned with business objectives. Strategic suppliers are often informed about changing business objectives.	As 4 plus, the criteria also incorporate future needs of the company and the overall objective of the system is to maximise performance from suppliers.

19	Supplier evaluation	Bemelmans et al. (2012)	Are the results of supplier evaluations and performance assessments communicated towards suppliers and partners?	No communication of performance evaluations towards suppliers.	The general supplier performance assessments are communicated towards suppliers.	Supplier visits and/or days are organized for supplier recognition/evaluation and to structurally communicate business strategy and purchasing objectives	Information about process studies and audits are effectively communicated towards strategic suppliers and is internally accessible for all personnel.	As 4 plus, Results from performance measurements are communicated towards all suppliers and key stakeholders.
20	Supplier evaluation	Bemelmans et al. (2012)	Is there a supplier complaint system in place?	The is no complaint system in place which makes it possible to make complaints about suppliers.	There is an informal system in place for complaints about suppliers.	A formal procedure is in place to identify and communicate complaints about suppliers.	The formal procedure incorporates a rating system with criteria to value each complaint.	The complaint procedure is regularly evaluated together with strategic suppliers.
21	Intensity of collaboration	Enkel et al. (2011)	How much knowledge do you exchange with your partners and how often?	No regulated collaboration, only ad hoc.	Knowledge sharing only if one party ought its necessary based on experience.	Standard process for the sharing of knowledge with partners during projects.	Standard process for sharing knowledge with partners also exceeding project environment.	The process for sharing knowledge is updated regularly in collaboration with partners.
22	Intensity of collaboration	Enkel et al. (2011)	How standardized is your partnership process?	No standardization	Informal way of dealing with partners, no plan upfront.	Standardized tools for partnerships are present, clear internal ownership of specific partners. Contracts used are standardised.	There is a formal process in place which defines goals and objectives for each partnership. Contracts are adapted to specific partners based on pre-defined guidelines.	The standardization of agreements and processes is balanced with the special need originated from the specification of a project plan.
23	Intensity of collaboration	Bemelmans et al. (2011)	How is the selection of long-term partners organized? Is there a deliberate process?	No specific policy to select long-term partners.	There is a formal process in place to identify the criteria and objectives for relationships within a project, in line with the project purchasing plan.	A formal process is in place to identify the criteria and objectives for each relationship, in line with the project exceeding purchasing plan and the business objectives.	Next to the formal process is an open book policy to share cost calculations and cost breakdowns with strategic suppliers exceeding multiple projects.	As 4 plus, a continuous assessment of the partnership against predefined objectives.

24	Intensity of collaboration Enkel et al. (2011)	Are you capable to work with diverse partners and in diverse forms of partnerships?	Arbitrary partnering	Focus on few, dominant forms of partnerships	Diversity in partnership forms with existing partners.	Specific partnership forms are used, diversity is increased by adapting each new contract to the specific partner.	As 4 plus, employees receive training in specific partnership forms and share their knowledge about specific partnering forms.
25	Intensity of collaboration Enkel et al. (2011)	Have you built a network of diverse contacts and (potential) partners?	Only one-off contacts.	Repeating contacts with several parties	Previously used parties gathered in network system	Network is expanded with more diverse, new parties.	Network is linked with other firms and strategically expanded.
26	Innovation collaboration Enkel et al. (2011)	Are your employees able to share and access knowledge gained through innovation activities?	Only ad hoc knowledge sharing.	Knowledge is only shared in project teams.	Irregular contact between departments to share knowledge.	There are project owners appointed to facilitate knowledge sharing.	Knowledge is widely accessible through database for every department. There are also regular meetings between different project owners to stimulate knowledge sharing.
27	Innovation collaboration Enkel et al. (2011)	Are your employees able to exploit the knowledge gained through innovation?	Only individual absorption.	Informal sharing of new knowledge and ideas between employees.	Employees are actively stimulated to absorb and share knowledge.	Intra-organizational knowledge sharing (between departments).	External & internal knowledge is fully exploited in products and in the internal organization.
28	Speed of innovation Enkel et al. (2011)	Is the innovation incorporated into a communicated strategy?	Innovation is not mentioned in a strategy.	Innovation is verbally supported by management.	Innovation is incorporated into the organization's strategy.	Innovation strategy is explained and stimulated by management.	Innovation strategy is demonstrated by management.

29	Speed of innovation Enkel et al. (2011)	Are employees assessed and rewarded on the basis of innovation targets?	No assessment based on innovation activities.	Informal assessment of innovation initiatives.	Assessment is based partly on Innovation strategy and targets.	Champions are awarded on the basis of predefined targets.	Innovation based assessment for all employees, specified per location/site.
30	Speed of innovatio Enkel et al. (2011)	Are employees willing to take initiative and be entrepreneurial?	Little initiative taken by employees.	Individual initiatives at the lower levels of the organization.	Champions are appointed to demonstrate entrepreneurship. Individual employees are stimulated to take initiative.	There is a platform wherein employees can show their initiatives with the help of champions.	Employees in all parts of the organization are willing to take initiative.
31	Speed of innovation Enkel et al. (2011)	Are there communicated targets which are in line with the innovation strategy of the organization?	No targets are set.	Lower level initiatives are used for target setting.	Targets are set in line with the Innovation strategy.	Targets are set for and communicated to employees.	Targets are continuously adjusted for each activity.
32	Speed of innovation Enkel et al. (2011)	Are examples of how to do innovation communicated throughout the organization?	There are no success stories at present.	Successes are shared informally, by word of mouth.	Some success stories are shared by management.	Success stories are shared in a regulated way.	Success stories are used for strategic purposes.
33	Speed of innovation Enkel et al. (2011)	Are your innovation activities communicated throughout the organization	Informal communication of initiatives.	Initiatives communicated in small team or groups.	Communication among management via regular meetings.	Initiatives communicated via widely accessible intranet.	Employees brought into contact via a central position/ person.