

# **Changing roles and positions in the Dutch construction industry: Actors' perspectives**

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## **Preface**

This thesis has been written to conclude my master Management Studies at Wageningen University. For executing this research project, I was to a large extent depending on several organizations in the Dutch construction industry, who took the time and effort to participate in my research project and gave me the motivation to continue this project because of their enthusiasm concerning the subject. I am really grateful that they would participate and would like to thank the people that I have interviewed for their openness and cooperation. Furthermore, without the support of several people, this thesis would not have been written. I would like to thank some people specially. Firstly, I would like to thank Dr. Nel Wognum and Dr. Jacques Trienekens from Wageningen University for their feedback and support during the writing of this thesis.

A big 'thank you' goes to Tibor Goossens, my company supervisor, for his feedback, enthusiasm and motivation during this project. Without his contribution, this thesis would not have been as it is now. Finally, thanks to my 'colleagues' at Van Spaendonck Management Consultants, especially Toni and Isabelle, for reading my report and for their enthusiasm concerning this project.

Astrid van den Hoek

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## **Management abstract**

The Dutch construction industry should change. Social developments encourage this change, but also the fact that the fragmentation of the construction industry is leading to problems contributes to the growing need of reorganising the industry. To reform an industry, changes in roles and positions of involved actors are deemed necessary. However, in the past 20 years not many improvements in the way of working in the construction industry have been observed. Within this research project, the hypothesis is, that if perceptions of actors in the Dutch construction industry about changes in their roles and positions differ, a reason might be found why a fundamental change in the Dutch construction industry is not happening.

Within this project, which was carried out for Van Spaendonck Management Consultants, an instrument is created for measuring perceptions about developments in roles and positions of actors in the Dutch construction industry. The objective of this research project can be stated as follows:

*To design an instrument, which will measure the perspectives of actors in the Dutch construction industry on the development of roles and positions, by analyzing the configuration of the Dutch construction industry, identifying factors that influence the roles and positions of actors based on network theory, designing a draft instrument and pre-testing this instrument in the Dutch construction industry.*

After a theoretical review, which was based on network theory, factors were found from which variables could be extracted to measure changes in roles and positions of actors. The following table provides an overview of the factors and variables and whether or not they are an indicator of roles and/or positions.

<b>Factors</b>	<b>Variables</b>	<b>Indicator of:</b>
Actors	Type of strategy	Roles (tasks)
Cooperative environment	Type and level of collaboration	Positions
Network density	Frequency of interaction and importance of other actors	Positions and roles (authorities)
Exchange of resources	Type and amount of resources	Roles (tasks) and positions
Exchange of information	Type and amount of information	Positions
Exchange of influence	Relative division of power	Positions and roles (authorities)
Coordination	Type of coordination mechanism	Roles (tasks)
Adaptation	Type and level of adaptation	Positions and roles (authorities)
Safeguarding	Type of contracts and importance of relational norms	Roles (tasks and responsibilities)

After analyzing theory about research instruments, a survey turned out to be the most appropriate research instrument. The variables found in the theoretical review have then been translated into questions to create a draft survey. A distinction was made between the perceptions of actors about their own development and the development of other actors, with respect to roles and positions. After the draft survey was designed, this survey has been pre-tested before it was finalized. The pre-test was done by executing interviews within two or three organizations from each group of main actors (constituents, architects, contractors, subcontractors and suppliers). In total, 13 interviews have been carried out.

From the results of the pre-test, the most interesting differences and similarities in perspectives of actors could be visualized. Opinions of actors largely differ about the tasks of architects, the responsibilities of contractors, the position of trade organizations, the position and authorities of producers and the tasks of constituents in the future. Actors agreed about the (coordination) task and position of contractors in the future and the fact that labour is scarce and critical. However, opinions differ about the consequences of this shortage of labour forces in the future.

From these results, preliminary conclusions could be drawn about developments in roles and positions of actors in the Dutch construction industry. The position of trade organizations and architects is most threatened in the future, where as contractors have the strongest position, now and in the future. Furthermore, developments can be viewed with respect to tasks in the execution stage of building processes. Tasks of subcontractors are moving towards suppliers, where as subcontractors partly take over tasks of contractors. Responsibilities during a building process are shifting to contractors, who in their turn move those responsibilities partly towards suppliers. Furthermore, perceptions of actors differ a lot, and therefore, it is likely that this has influence on the delay in a fundamental change in the Dutch construction industry.

To quantify the above mentioned results, the final survey was designed. The factors exchange of information and adaptation were deleted from the survey and open questions were replaced by closed questions and statements, based on Likert-scale. This final survey is able to measure developments in roles and positions of actors in the Dutch construction industry. However, the results from the final survey can only be generalized to the sector residential and non-residential building and to the five main groups of actors, because this research project was limited to this sector and these actors. Other actors involved and other sectors in the Dutch construction industry have not been taken into account.

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## **Chapter 1. Introduction**

Within this chapter, the background of this research project will be introduced. Furthermore, the problem will be described, after which the starting points and research questions of this project will follow. After that, the company for which this research project was carried out will be introduced. Finally, a reading guide for this report will be given.

### **1.1. Background**

The Dutch construction industry should change. Social developments and conclusions of the parliamentary survey, which took place after the discovery of the large scale fraud of the Dutch construction industry in 2002, encourage this change, but also the fact that the fragmentation of the construction industry is leading to problems contributes to the growing need of reorganising the industry. However, to reform an industry, changing roles and positions of involved actors are deemed necessary. If the perceptions of actors in the Dutch construction industry about changes in their roles and positions differ, this could be a reason why a fundamental change in the Dutch construction industry is not happening. More information about the background of this research project can be found in chapter 2, where the Dutch construction industry is introduced.

### **1.2. Problem description**

This research project is part of a larger investigation. Within this project, an instrument was created, which measures developments in roles and positions of actors. After this project, this instrument will be used to conduct a research within a larger sample of the Dutch construction industry and conclusions can be drawn about the influence of (differences in) perceptions of actors, on the developments of roles and positions in the construction industry. The latter will however be outside the scope of this research project. The problem in this research project is therefore:

*To find out which research instrument can measure perspectives of actors in the Dutch construction industry on the development of roles<sup>1</sup> and positions and how the content and layout of this instrument should be.*

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<sup>1</sup>Within this research project, roles are the set of responsibilities, activities and authorizations of an actor in a network. Actors can have multiple roles.

Within this research project, a few starting points were taken:

- Supply chain integration and a higher level of collaboration between actors in the construction industry is considered to be the solution to a lot, if not all, problems the industry faces, this development will be considered as given. A starting point was therefore, that the Dutch construction industry is developing towards further integration and a higher level of collaboration (more information can be found in chapter 2).
- Furthermore, another starting point has been the theory which was used: network theory. This theory has not been used before to identify problems in the Dutch construction industry. Therefore, it is likely that the use of this theory will provide new insights in the question why the Dutch construction industry is not fundamentally changing.
- Finally, five groups of actors were involved in this research project: constituents, architects, contractors, subcontractors and suppliers. Other stakeholders in the Dutch construction industry will not be included. This choice is made, because the previous mentioned five groups of actors are main actors and are involved in every building process which is conducted. A description of what is meant with Dutch construction industry within this research project can be found in appendix 1, glossary of terms.

### **1.3. Research design**

To find an answer to the main problem described above, the following research objective was formulated:

*To design an instrument, which will measure the perspectives of actors in the Dutch construction industry on the development of roles and positions, by analyzing the configuration of the Dutch construction industry, identifying factors that influence the roles and positions of actors based on network theory, designing a draft instrument and pre-testing this instrument in the Dutch construction industry.*

From this research objective, the following main research question followed:

*Which research instrument can measure developments in roles and positions of actors in the Dutch construction industry and what should be the content and lay-out of this instrument?*

The steps, which are taken to reach above mentioned research objective can be summarized in the research framework on the next page (figure 1.1).

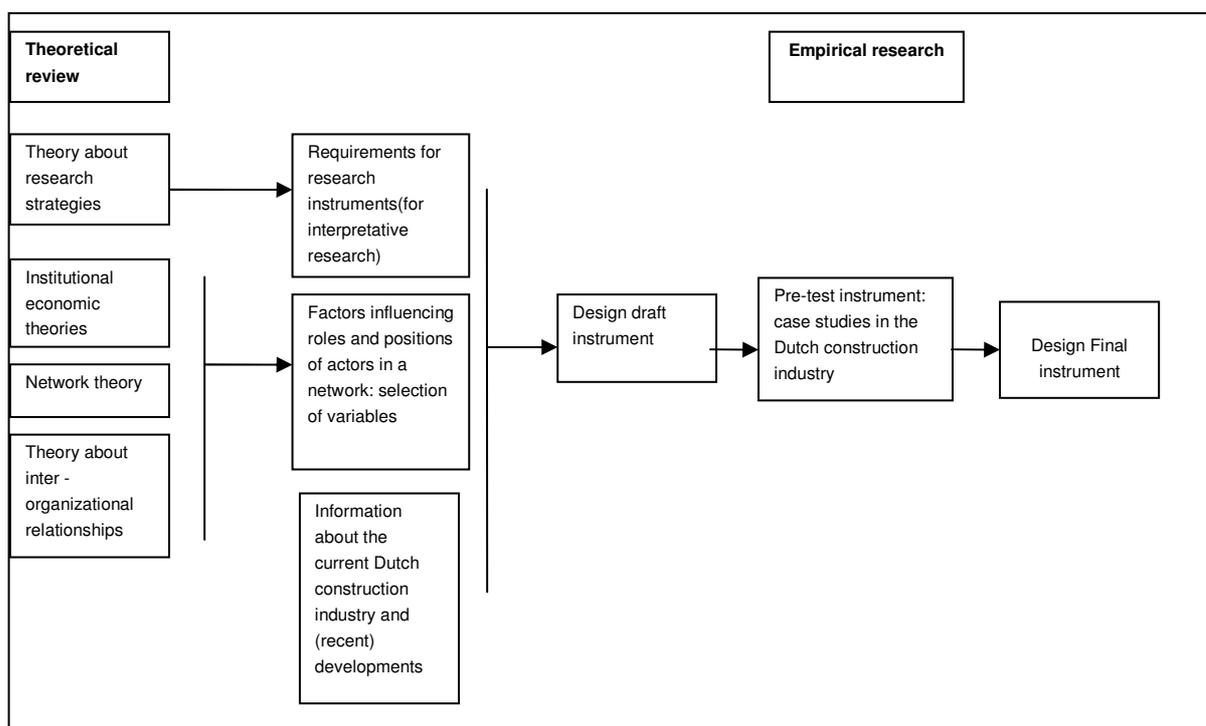


Figure 1.1 Research framework

From this research framework, research questions followed which were answered during this research project:

*Research question 1: How is the current Dutch construction industry configured?*

Within this research question, an overview was given of the Dutch construction industry, the problems which arise there and the expected solutions. This information was used to answer research question 2.

*Research question 2: Which factors determine the roles and positions of actors in a network?*

The answer to this question provided a basis on which networks can be described. Furthermore, the factors which influence roles and positions of actors became clear. These factors have lead to variables, which were used to create a measurement instrument.

*Research question 3: Which instrument is suitable for this research project and what methodological requirements should this instrument satisfy?*

The variables, which can measure roles and positions of actors in a network and theory about research instruments and research design, have lead to the choice for, and design of the draft

instrument. When research question 3 was answered, the theoretical review was finished and the draft instrument designed.

*Research question 4: What should be the content and lay-out of the draft instrument?*

After the theoretical review, the content of the draft instrument was designed. This draft instrument was pre-tested by conducting interviews with two to three organizations from each group of actors.

*Research question 5: What can be learned from the case studies to improve the instrument?*

During the research project, interviews were carried out to pre-test the instrument and find out which improvements can be made. This has led to the design of the final instrument. Furthermore, preliminary conclusions can be drawn about developments in roles and positions of actors in the Dutch construction industry.

#### **1.4. Principal**

The organization for which this research project has been carried out is van Spaendonck Management Consultants. This consultancy firm has about 30 employees and serves three markets: 'health industry', 'profit organizations' and 'government'. The firm has several clients in the Dutch construction industry. To better serve the needs of these clients, new insights into the Dutch construction industry are necessary. The knowledge, found in this research project, can be used to advise the clients of the organization about strategic issues and give further insights into developments in the Dutch construction industry.

#### **1.5. Reading guide**

This report starts with an introduction of the Dutch construction industry and the problems which arise there (chapter 2). After that, the theoretical review will be presented in chapter 3. This theoretical review is based on network theory and consists of three main dimensions: (1) actors and the way they are linked, (2) content of an exchange relationship and (3) governance of an exchange relationship. Chapter 4 provides the methodology of this research project, which is followed by the results and analysis of the empirical research in chapter 5. Chapter 6 consists of the design of the final survey, after which the conclusion and recommendations are presented in chapter 7.

## Chapter 2. The Dutch construction industry

This chapter is meant as a short introduction to the Dutch construction industry and the problems which arise there. The information from this chapter has been used as a background during the theoretical review in chapter 3.

### 2.1. Overview and configuration of the Dutch construction industry

The construction industry is an important sector in the Netherlands. In 2006, the Dutch construction industry consisted of 81.690 enterprises in which approximately 460.000 people were employed (CBS, 2006). In 2007, the Dutch construction industry had a turnover of over € 80 billion, which is 10% more than in 2006. Within the Netherlands, the construction industry is divided into three parts: residential and non-residential building (in Dutch: Burgerlijke & Utiliteitsbouw), Civil engineering (in Dutch: Grond-, Weg-, en Waterbouw) and building services (in Dutch: installatietechniek) (Management scope, 2008). The biggest part of the Dutch construction industry consists of residential and non-residential building, which is the construction, maintenance and renovation of houses and other buildings, like offices (NMA, 2002).

In the following picture, the generic configuration of a traditional supply chain in (residential) building is showed (Vrijhoef & Koskela, 1999). This picture (figure 2.1) shows the main actors in the Dutch construction supply chain. The resident is the user of the final building, where as the principal is the constituent of the construction project. Designing the building(s) is done by the architect, after which the chosen main contractor is going to construct the building together with subcontractors and (in)direct suppliers. Within a building process, rule-setting parties, like authoritative platforms, governmental or community bodies are also involved.

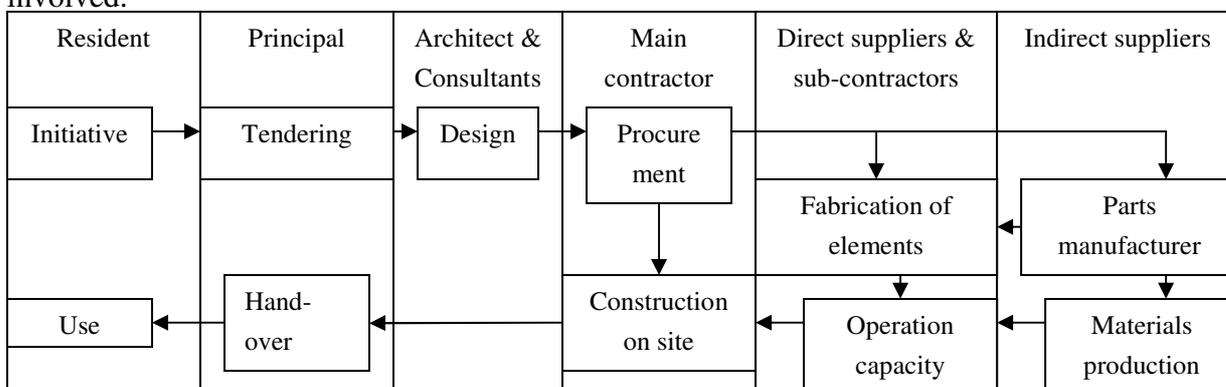


Figure 2.1 Generic configuration of a traditional supply chain

This picture of a traditional supply chain was used by Vrijhoef & Koskela to conduct a case study about problems in the construction supply chain (from supply chain management perspective). From this case study three main conclusions could be drawn:

1. “Even in normal situations much waste (inefficiencies) and problems exist in the construction supply chain” (Vrijhoef & Koskela, 1999). Most actors seem to be managing just their own part of the chain and not the chain as a whole. They are just thinking about their own business. Decisions in the supply chain are made with missing information or a lack of understanding. For example, orders done by suppliers can be incomplete because of an incomplete design the supplier got from the architect (Vrijhoef & Koskela, 1999).
2. “Most of the waste and problems are caused in another (earlier) stage of the construction supply chain other than where they are found” (Vrijhoef & Koskela, 1999). Therefore, the waste in one part of the chain is mostly caused by an actor in another part of the chain.
3. “Waste and problems are largely caused by myopic control of the construction supply chain” (Vrijhoef & Koskela, 1999). Many actors of one link in the chain are just not interested in what goes on in another part of the chain. They do not consider the effect of their activities on the supply chain as a whole. For example, each actor in the supply chain adds a time buffer for himself in the schedule, optimizing just his own activities. Every actor is doing this in a different speed or sequence, thereby creating problems for other parties in the chain (Vrijhoef & Koskela, 1999).

The three points above indicate that the problems in the construction supply chain are largely characterized by interdependency between organizations (Vrijhoef & Koskela, 1999). In the next figure an overview is presented of the specific problems for every link in the construction supply chain (figure 2.2). These specific problems can be related to the three conclusions which Vrijhoef and Koskela (1999) found. Within the figure, certain colours (and thereby problems in the next figure) are related to the three conclusions of Vrijhoef & Koskela. The black coloured problems in the next picture are related to the first conclusion, the green coloured problems to the second conclusion and the blue coloured problems to the third conclusion of Vrijhoef and Koskela (1999).

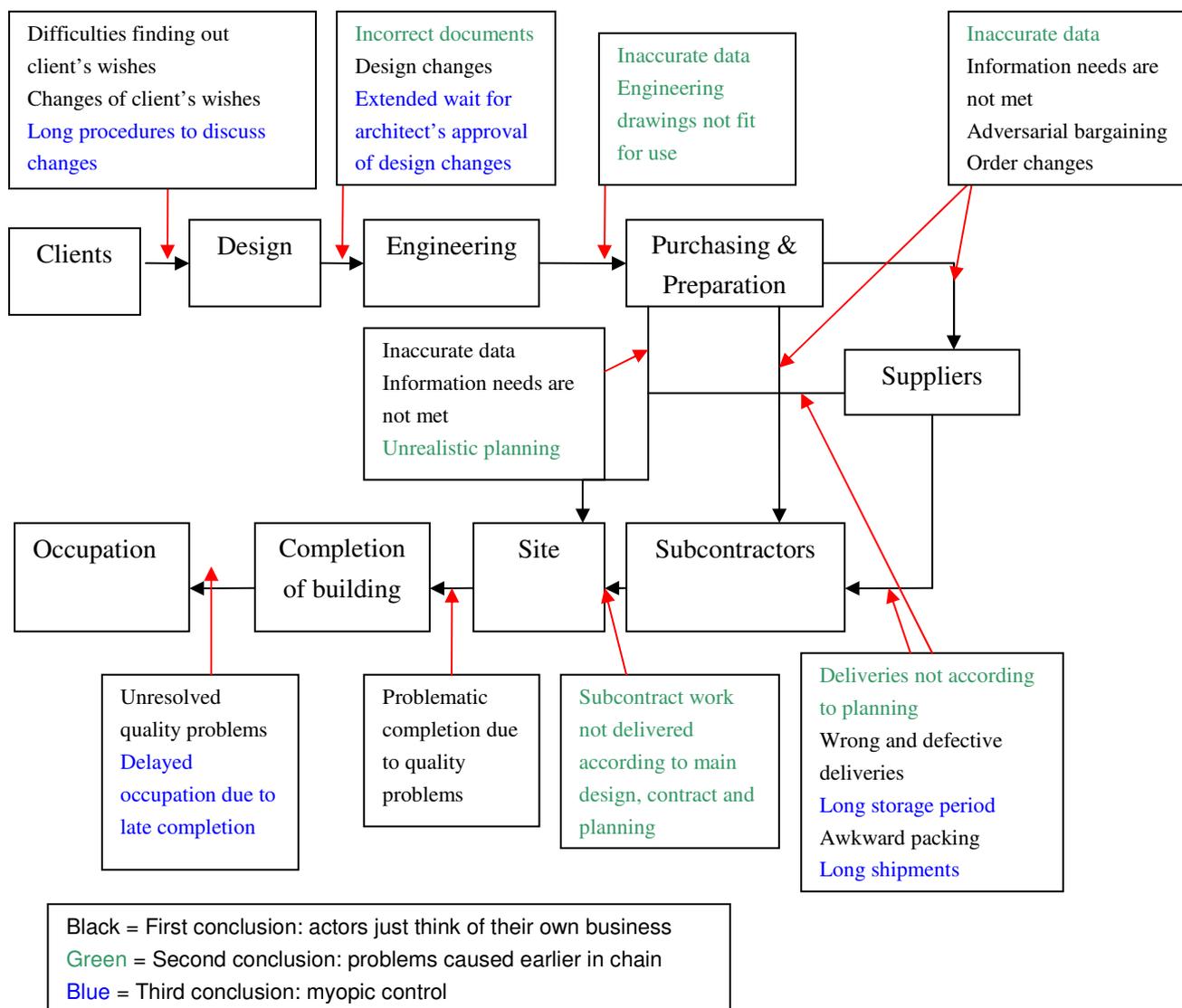


Figure 2.2 Generic problems in the construction process (Vrijhoef, 1998)

The problems above arise in the current price-oriented market, which is dominated by short-term visions and mistrust. One of the most often named solutions for these problems in the construction industry is (system) integration (Vrijhoef & de Ridder, 2005). A higher level of integration and repetitiveness should lead to an improved performance of the construction industry. However, despite all research in the area of reorganising the Dutch construction industry, a fundamental change has not happened yet. Some actors already work with integrated systems, whereas other actors still work in the traditional way. The cause of this delay in the development of the construction industry is not completely clear yet.

To reach this supply chain integration, the current Dutch construction industry should develop towards a network of longer term arrangements and relationships. However, to reform an industry, changes in the organizations which are involved in the reforming process are indispensable. Changing role patterns between actors in the industry are therefore deemed necessary. Therefore, it is interesting to find out if the perceptions on the development of roles and positions of the different actors in the construction industry differ, because this could be a reason why the construction industry is not fundamentally changing. Furthermore, it is interesting to find out how different actors in the construction industry think about the development of roles and positions in the sector. By getting insight into the perspectives of actors on the future shifts in roles and positions of actors in the industry, knowledge can be generated which can contribute to the understanding of the delay in the change process of the industry. To measure those perspectives of actors, network theory will be used. Therefore, chapter 3 consists of a literature review about network theory.

### **Chapter 3. Theoretical review**

In this chapter, the most important and relevant results of the literature study will be presented. This literature study is based on network theory and has been viewed in the context of the Dutch construction industry, as presented in chapter 2. The results of this literature study have been used as a basis to design a measurement instrument, which can measure developments in roles and positions of actors.

Since this research project is about the perceptions of actors in the Dutch construction industry on the development of roles and positions of actors in that industry, it is necessary to find out what the factors are, which influence the division of roles and positions of actors in a sector. Roles of actors in the industry include the tasks (activities), authority<sup>2</sup> and responsibilities of actors. To get a clear view of the division of these roles and positions in the construction industry, network theory is used. Within this theory, networks are described in many different ways but these definitions all share as a common denominator 'an agreed notion that networks are about different types of relationships, whether these are the objectively measurable resource or economic ties or subjective emotional links' (Keast & Brown, 2005).

The focus on relationships between organizations, which is characteristic for network theory, is useful within this research project, because to determine the position<sup>3</sup> of actors in a network, it is necessary to get a clear overview of the way actors are related to each other. Furthermore, integration and collaboration between actors in an industry is based on the relationships which actors maintain with each other. Since supply chain integration is supposed to be the solution to a lot of problems in the Dutch construction industry, this relationship perspective is expected to be interesting to find out how actors in the industry view the development of roles and positions within the industry in relation with further integration and collaboration.

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<sup>2</sup> Authority grants the position holder certain rights, including the right to give direction to others, and the right to punish and reward (positional powers) (Hatch, 1997: 164)

<sup>3</sup> The place which the different actors in the network possess with respect to each other. 'A company's position in a network is an aggregation of its individual and separate direct and indirect interfaces with the other companies that form part of the network surrounding it' (Möller & Wilson, 1995: 337)

Furthermore, network theory focuses on three dimensions: actors, activities and the governance of an exchange relationship (New & Westbrook, 2004). The governance<sup>4</sup> of an exchange relationship within a network focuses on coordination, adaptation and safeguarding. These three items can give information about the responsibilities and authorities of actors in a network. The description of these three dimensions will provide a basis for which roles of actors in the Dutch construction industry can be determined. This basis will be used in chapter 4 to design a draft instrument to measure the perspectives of actors on developments of roles and positions.

Networks in the Dutch construction industry can mainly be found on a project level, because collaboration between particular actors is mostly ad-hoc (one-off projects). One comment should be made: within the production part of the construction supply chain, it turns out that the main contractor most of the times works with the same subcontractors and suppliers if that is possible within the given project context (Goossens, 2002). But because complete networks<sup>5</sup> are seldom formed within the Dutch construction industry, actors are clustered in groups (for the purpose of this research project). For example, the group 'main contractor' is supposed to have long-term arrangements (and therefore forms a network) with the group 'subcontractor'. However, this does not mean that a particular main contractor has to have a long term relationship with one particular subcontractor. The main contractor does, however, need subcontractors within (almost) every project he carries out. This also counts for the other groups of actors in the construction industry. Because the purpose of this research is to create a survey which can measure the differences in perspective of the different groups of actors in the industry, this clustering is expected to be valid. Ultimately, statements will be made about the perspectives of five groups of main actors: constituent, architect, main contractor, subcontractor and suppliers<sup>6</sup>.

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<sup>4</sup> Within this project, the term 'governance' refers to mechanisms which regulate the coordination, adaptation and safeguarding within a network (New & Westbrook, 2004).

<sup>5</sup> Within this research project, networks are considered to be complete when all five main actors are involved during longer-term collaborations and relationships.

<sup>6</sup> These five groups of actors are chosen as main actors, because they are indispensable within every building process.

### 3.1. Scope of network theory

Supply chain management has become increasingly important the last couple of years. However, the term chain is criticized because of the fact that it gives the impression of a linear unidirectional flow (New & Westbrook, 2004). In real life, a supply chain has bidirectional flows and several ties and paths that connect actors in a supply chain with each other. Therefore, the term network is used more and more. The term network generally refers to 'a vast range of inter-organizational relationships', which are characterized by continuity, informality and social embeddedness (New & Westbrook, 2004).

Looking at relationships from a network point of view, a firm can be seen as an actor, performing activities and employing resources (Anderson, Hakansson & Johanson, 1981). Because of the basic invisibility of networks, actors have bounded knowledge about the networks in which they are engaged. However, for the purpose of the analysis of a network, a network horizon can be defined which shows 'how extended the view of an actor is' (Anderson et. al. 1981). The part within the network horizon, which is of interest for an actor, is the network context. Network contexts are partly shared by network actors, at least by actors which are close to each other. However, the network identities<sup>7</sup> of actors, which are the way actors see themselves in a network and the way they are seen by other actors, are not always perceived similarly by different actors. Since network identity is represented as the perception of an actor, the context in which an actor reflects his perception is crucial. The network context of a firm is the vantage point for the perception of a firm about network identities. As Anderson et. al. (1994) stated: 'a network identity depends at least partly on the network context of the viewer; a focal firm has a distinct, though perhaps congruent, identity to each other firm in the network. Similarly, a firm's perception of its own network identity (the firm's strategic network identity) is based on its own network context. This captures the overall perception of its own attractiveness as an exchange partner to other firms within its network context. It is a reference point against which the firm perceives and judges its own and other firm's actions' (Anderson et.al. 1994).

A detailed definition for the term network is: 'two (dyad) or more actors, at least in part autonomous, which give rise to an exchange relationship, according to certain modalities and forms' (New & Westbrook, 2004). This definition can be divided into three dimensions:

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<sup>7</sup> 'Network identity is meant to capture the perceived attractiveness of a firm as an exchange partner due to its unique set of connected relations with other firms, links to their activities, and ties with their resources' (Anderson et. al. 1994).

actors, exchange relationship and certain modalities and forms. The first dimension ‘actors and the way there are linked’ will be about actors (their strategy), and inter-organizational relationships. The second dimension ‘exchange relationship’ consists of three parts: exchange of resources, exchange of information and exchange of influence. Finally, the third dimension ‘certain modalities and forms’ is about the governance of an exchange relationship. This governance consists of coordination, adaptation and safeguarding. Within the following picture, those three dimensions are visible. This picture shows two actors. However, this picture is also applicable when more actors are involved. Within every paragraph, this picture will be shown and the dimension which is meant will be highlighted.

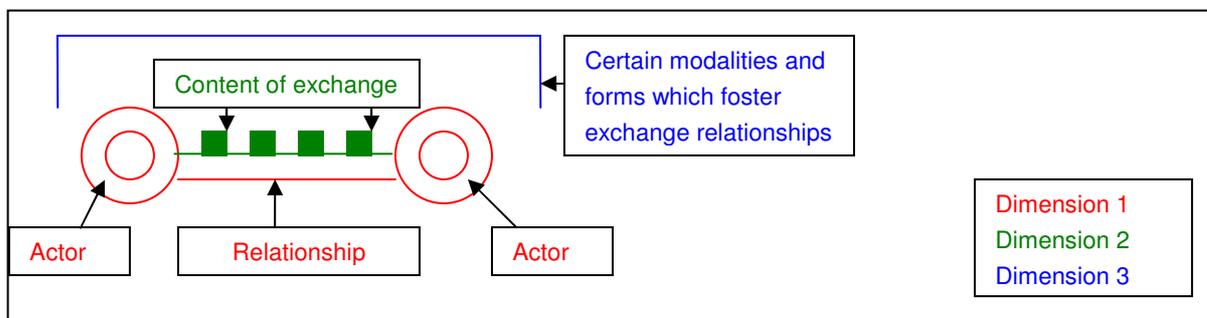


Figure 3.1 Overview dimensions

These three dimensions will be further described in the next paragraphs.

### 3.2. The first dimension: actors and the way they are linked

A network consists of a whole set of nodes and ties which relate actors to each other. The first dimension represents the overall structure of a network, which includes the parties that are engaged in a relationship and the way they are linked.

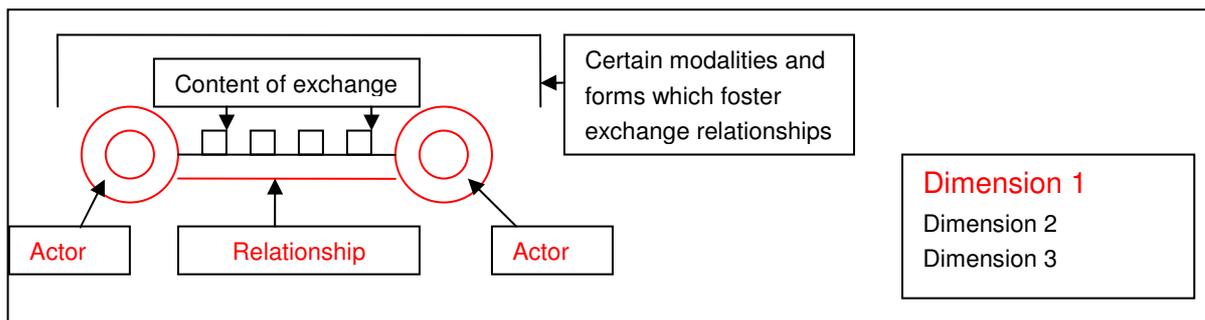


Figure 3.2 Overview first dimension

Within this paragraph, the first dimension will be introduced, which consists of actors, and their type of strategy, and inter-organizational relationships.

#### 3.2.1. Actors

Actors are all those parties who have an active involvement in the identification, preparation and/or implementation of, for example, a project. As such, 'actors' are a special type of stakeholder, although the terms are sometimes used interchangeably. The number of actors determines the size of a network. Furthermore, the strategy of actors in a network also influences roles and positions of an actor in an industry. Five types of strategy can be distinguished: horizontal and vertical integration, product and market diversification and specialisation (Johnson, Scholes & Whittington, 2005). If, for example, an organization has a (vertical) diversification strategy, the company is broadening her activities towards those of her suppliers or customers. The strategy of an organization also influences the level of collaboration of actors, because the type of strategy partly determines the need for collaboration partners. For example, within the construction industry, this can be observed when a supplier is not just supplying materials anymore but also assembles the materials. In this situation, the supplier starts to move towards the tasks of the main and subcontractors and is less likely to collaborate with those actors. Within the construction industry, actors have to a large extent a broad orientation. A broad orientation can lead to a shift in activities from one actor to another. Therefore, this factor is of importance to measure the development in roles (tasks) of actors in the construction industry.

### 3.2.2. *Inter-organizational relationships*

The overall architecture of a network refers to relationships between actors and can be described by inter-organizational relationships theory. This theory states that inter-organizational relationships are built up through interaction between organizations (Ritter & Gemünden, 2003). A (focal) firm's position in a network can be determined by analyzing (in)-direct relationships with other actors (Möller & Wilson, 1995: 31). Within inter-organizational theory, the concept of 'network centrality' (the position of an actor in a network, relative to others) is mentioned. This network centrality measures the location (position) of an actor in a network. High central actors in a network are those who have influence on decisions and who play meditative roles. Actors that are more central within a network have more influence (related to the increased legitimacy) than those actors that are positioned less central (Scott, 2000). A centralized network will have many of its links dispersed around one or a few nodes, while a decentralized network is one in which there is little variation between the links each node possesses (Borgatti, 2005). There are three types of centrality: (1) degree centrality (the number of direct connections an actor has), (2) closeness centrality (the degree to which an individual is near to all others in the network, the pattern of actor's connections allows them to have the shortest path to all others<sup>8</sup>) and (3) betweenness centrality (degree to which an individual lies between other actors, an actor has for example a high centrality, when he is between two important other actors) (Borgatti, 2005).

Within inter-organizational relationship theory, the following positions of actors can be distinguished:

- Star: an actor who is highly central to a network;
- Liaison: an actor who has links to two or more groups that would otherwise not be linked, but is not a member of either group;
- Bridge: an actor who is a member of two or more groups;
- Gatekeeper: an actor who mediates or controls the flow (is the single link) between one part of a network and another;
- Isolate: an actor who has no links, or relatively few links to others" (Borgatti, 2005).

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<sup>8</sup> The path distance can be measured by 'closeness', which means that an average will be taken of the path distances by counting the direct and indirect links. A direct link is counted as one; indirect links receive proportionately less weight.

These types of positions indicate the links which an actor possesses. These links provide information about the level of collaboration of a particular actor. To describe the links each node possesses, inter-organizational relationship theory is important. Below, the concept of inter-organizational relationships will be further described.

#### *Organizational characteristics*

The ability of an organisation to design and conduct an inter-organizational relationship (with a collaborative focus) depends on a number of organizational characteristics and properties. The first characteristic is about the existence of potential resources that may be gathered through inter-organizational relationships. These resources have to make an inter-organizational relationship attractive for both actors. Whether or not actors want to explore resources themselves or collaborate with other actors to achieve the resources they need determines partly the roles and position an actor takes within a network. However, because resources are part of the second dimension, this factor will be further described within paragraph 3.3.1.

A second characteristic is the general cooperative environment of individual actors. Whether or not the environment enhances cooperation is an important factor when it comes to the development of inter-organizational relationships. This can be determined by the amount of encouragement to create and maintain inter-organizational relationships. The history of an organization, with respect to (successful) inter-organizational relationships, and incentives or supports within an organization (which contribute to voluntary collaborative relationships) are important aspects. Currently, commitment within inter-organizational relationships in the construction industry is rare, because most relationships are short-term oriented. On a project level, organizations within the construction industry have to collaborate. However, the current construction industry does not seem to enhance long-term collaboration between actors. If the existence of cooperative (network) environments increases in the future, the level of interdependency between actors in a network becomes higher. When the level of interdependency between actors increases, the position of an actor can change and the likelihood of (longer-term) collaboration increases. Since collaboration within the construction industry is the context in which this research is carried out, this factor is of importance to determine future positions of actors in the Dutch construction industry.

The third factor that influences the development of inter-organizational relationships is the amount of congruence between the organizations goals and the goal of a relationship. This

measure is focused on the creation of a particular relationship between two actors. Since this research focuses on the development of roles and positions in the total construction industry and not within a particular relationship between two actors, this measure will not be taken into account further. The above mentioned three properties have the potential to positively (or negatively) influence the development of inter-organizational relationships (Intrilligator, 1983).

When an inter-organizational relationship is already set up, three types of characteristics also matter: structural, relational and process characteristics.

#### *Structural characteristics*

Structural properties of a relationship determine how well actors fit together and include coordination mechanisms (this factor will be further described in paragraph 3.4.1), demographic conditions (homogeneity and geographic location), size and resource contribution of different actors (more information about resource contribution can be found in paragraph 3.3.1) (Intrilligator, 1983). Demographic conditions include the geography, but also a structural composition of the involved organization. Organizations with the same organizational structure are more likely to collaborate and to form inter-organizational relationships. Furthermore, in the past, the location of organizations also influenced the decision of organizations in choosing relationship partners. The question is if this is still the case, given the rapid innovations in (information) technologies. However, demographic conditions are not applicable within this research project because this research is about groups of actors and not about particular actors. Furthermore, this research project is not about the particular choice of an actor for collaboration partners and that is what this measure is mostly about. Therefore, this factor will not be taken into account further.

The number of inter-organizational relationships (size of total network) is also an important characteristic. The size of a network can be measured by 'network range', which includes 'the diversity of actors, heterogeneity and/or number of actors in the network' (Burt, 1980). The range of a network could be measured in two ways; by the total number of actors (size) and by the number of different actor groups (heterogeneity). To further describe the size of a network, an overview of the existing ties between actors in a network is also necessary. One concept is therefore of importance: network density (Scott, 2000). Network density is 'the extent to which all actors in a network are connected' (Scott, 2000). Density describes the general level of linkage among members and measures the ratio of the number of ties that exists in a network to the number of possible ties, if each network member were tied to every

other member. If all actors have ties to one another, it is a complete network and has a density of one (Scott 2000). According to network theory, the purpose of measuring density is to find out how close relationships are and how important these relationships are to actors in a network. Furthermore, it is argued that the denser networks are, the better the exchange of information and the diffusion of norms and values in a network becomes. Therefore, it is stated that if network density increases, the potential for coalition and collaboration increases (Scott, 2000) (Keast & Brown, 2005). Within the current construction industry, the (resource) ties between actors are often weak and adapted solutions (relationship-specific) are rarely developed. Therefore, strong ties between actors are not very common. Collaboration is often ad-hoc. Therefore, relationships do not seem very important to actors in the current construction industry. However, when the construction industry develops towards further integration, relationships between actors in the industry will most likely become more long-term oriented and the level of interdependency will increase.

Within the scope of this research project, the factor 'size' is therefore of importance to measure developments in roles (authorities) and positions of actors, and can be measured by (1) the frequency of interaction and (2) importance of actors to each other.

1. The frequency of interaction between actors is an indicator about the level of interdependency between actors. It can be stated that: the more frequent the interaction, the higher the level of dependency between actors and the higher network density. Looking from a collaborative perspective, a higher level of interdependency indicates a stronger commitment to a relationship and more intense collaboration between actors.
2. Importance of an organization for another organization is also an indicator about the level of interdependency between actors and degree of collaboration. This interdependency provides information about the relative position of an actor to other actors. Furthermore, if both actors state that they are really important to each other, this could also be an indication that those actors reached a high level of (longer-term) collaboration.

#### *Relational characteristics*

Second, relational characteristics are important. Studies of relational properties seek to understand why a network exists and how the functions are performed by relations among actors. Two aspects of relational properties are important: (1) transactional content and (2) the nature of relationships. 'Transaction content refers to what flows or what is exchanged in networks' (Streeter & Gillespie, 1992). There are four basic types of subjects that can be exchanged: resources, information, influence, and social support. However, since the content of an exchange relationship is described in the second dimension (paragraph 3.3), this factor

will not be taken into account further within this paragraph. The nature of relationships refers to the importance of a relationship for every actor, frequency of interaction, formalization of a relationship (official recognition) and standardization of an agreement (defined procedures and units of exchange) (Streeter & Gillespie, 1992). Frequency of interaction is also of importance to measure network density and therefore, this variable will not be taken into account further here. Formalization of a relationship and standardization of an agreement will be further described in paragraph 3.4.3.

#### *Process characteristics*

Finally, process characteristics are also important to evaluate relationships. These characteristics include degree of formality<sup>9</sup>, features of an exchange process (standardization, intensity and reciprocity) and patterns of influence (domain in consensus, authority and power) (Intriligator, 1983). When a total network is the unit of analysis, it is not partitioned into subgroups. The measures used at this level describe the overall patterns of relationship among all members of a network. Within paragraph 3.4, these factors will be described further and therefore, these factors will not be taken into account within this paragraph.

To summarize, the following table provides an overview of the variables which followed from the first dimension and the values which belong to a variable. Furthermore, an overview is given about whether or not this factor is an indicator of roles and/or positions.

Table 3.1 Overview variables dimension 1

<b>Factor</b>	<b>Variable(s)</b>	<b>Values</b>	<b>Indicator of:</b>
Actors	Type of strategy	Horizontal and vertical integration, market and product diversification, specialization.	Roles (tasks)
Cooperative environment	Level and type of collaboration	Level: low – medium – high Type: short or long-term	Positions
Size (network density)	Frequency of interaction and importance of actors	Frequency of direct contact with other actors (not at all – sometimes – often - always) and importance of other actors (low – medium – high)	Roles (authorities) and positions

<sup>9</sup> Formality is defined as the extent to which each member organization has officially sanctioned its participation in the inter-organizational relationship (Intriligator, 1983).

### 3.3. The second dimension: the content of an exchange relationship

The second dimension is about the content of the transaction: what is exchanged? The following picture indicates which part of network theory this paragraph is about.

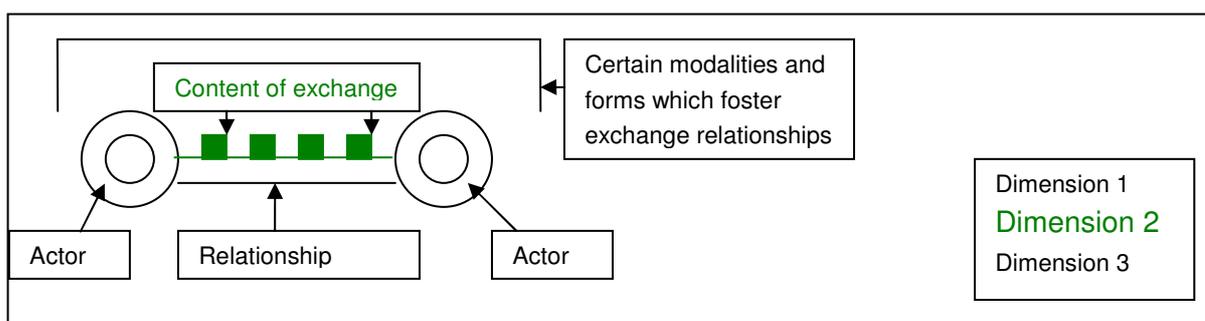


Figure 3.3 Overview dimension 2

Within this dimension, four concepts, which can be exchanged, can be distinguished, namely resources, information, influence and social support. However, before these four concepts will be described in the following paragraphs, first an overview of a building process will be given. This overview is needed, because in order to capture exchange processes, an overview of episodes in a building process is necessary. Episodes are ‘actions or outcomes of actions performed by organizations or their representatives. In order to understand the dynamic nature of interaction between organizations, a stream of episodes can be analysed (Möller & Wilson, 1995). A stream of episodes can give an overview of the tasks (activities) of organizations, when it comes to exchanging resources, within a process or collaboration agreement. Within the Dutch construction industry, exchange processes during the building process can be described through these episodes.

To describe activities within a construction process through episodes, an overview of the several stages of a construction process is provided (Witholt, 2007).

<b>1. Building program</b>	<b>2. Design</b> (provisional and final)	<b>3. Implementation:</b> bill of materials and budget	<b>4. Realisation:</b> preparation work, execution and transfer
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Figure 3.4 Overview building process

On the next page, the stages of a construction process will be further described.

1. Building program. This is the first phase of the building process and it includes the determination of the content of the project (by the constituent). This phase is divided into three steps: (1) initiative, (2) feasibility study and (3) project definition.
2. Design. This step in the construction project is mainly about the design of the building and therefore, the architect is the main actor in this stage. This architect needs to translate the program of demands of the constituent into a design which also satisfies technical and legal demands. This phase consists of the following sub phases: (1) structural design, (2) provisional design and (3) final design.
3. Implementation. In this phase, the architect has finished the main part of his job and the main contractor becomes involved. This phase starts with the design of a bill of materials (in Dutch: het bestek). This includes a technical elaboration of the final design, after which the negotiations about price are starting (in the case of tendering). In the 'bill of materials stage' the final design is technical elaborated and based on this bill of materials; licenses (which are necessary to construct a building) can be requested by governmental agencies. The constituent has to approve the final bill of materials. After this, the main contractor, who will carry out the job, has to be selected. The price offer of the main contractor (budget) will be based on the bill of materials. It depends on the contract in which stage of the process, which actor is involved. For example, the main contractor is, in the case of a building team, earlier involved in the process than in the case of tendering (more information about contractual forms can be found in paragraph 3.4.3). In this phase, a risk analysis is also carried out to see if the project is feasible with respect to the budget.
4. 'Realisation'. This stage of the project is the most important stage for the main contractor. The constituent and the architect do not care how the work is done, as long as it is within the agreed time, quality, space and budget. Within this step, the following phases can be distinguished: (1) preparation of the work (in Dutch: werkvoorbereiding), (2) execution (in Dutch: uitvoering) and (3) transfer (in Dutch: oplevering). The first part, preparation of the work, includes the work budget which makes all the costs which are necessary to conduct the project clear. Furthermore, a planning is necessary to make sure the building is completed within the given time range. This planning is also important to estimate the costs involved with hiring labour, purchase, logistics and subcontractors. If the preparation of the work is done properly, the executants on the building site can work much more efficient. The next step is the implementation. The building site has to be cleaned and made ready for the construction of a building. After that, the pilings have to be put into place and the foundation of the building can be finished. As the building of the walls is finalized, the

masonry is finished. After the masonry, the finishing stage starts. Finally, the building is transferred to the constituent. During this final stage, the building is checked by the constituent to see if the building really is complete and satisfies the demands of the constituent. In some cases, the maintenance of the building is also part of the tasks of one of the actors in the construction process (Witholt, 2007)<sup>10</sup>.

Within this research project, a distinction will be made (when necessary) between the first two steps: building program and design, (together called ‘the design stage’) and the last two steps, implementation and realisation (together called ‘the execution stage’). This distinction is made because the collaboration between actors within the design stage and actors within the execution stage is, according to several researchers, considered to be a source of problems within a construction process (Vrijhoef & Koskela, 1999, Vrijhoef & de Ridder, 2005). Therefore, this distinction will most likely provide the most useful information about changes in roles and positions due to more intense collaboration.

Within network theory, the following four concepts, which can be exchanged, are distinguished: (a) resources, (b) information, (c) influence and (d) social support (New & Westbrook, 2004). These four subjects will be described in the following paragraphs.

### **3.3.1. Resources**

The relationship between the exchange of resources in a network and the power and dependence of network actors can be described with the use of the ‘Resource-Dependence theory’. According to this theory, the relationship between power and dependence within business networks depends on the need for resources of every actor. These resources are controlled by the environment (total network). Analyzing resources starts with identifying the need for resources of every actor and tracing back resources to their source. These resources can be classified through criticality and scarcity. Organizations that have resources which are critical to others (important, without these resources the organization can not function) and scarce, have more power and are less dependent on other actors within a network than other organizations (Hatch, 1997: 78-80). Organizations which possess different resources which are needed within a process are less dependent on other actors than an organization which possesses a small amount of resources. The latter is obliged to collaborate (to a large extent)

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<sup>10</sup> It has to be noted that the involvement of actors within several stages can differ, depending mainly on the type of contract which is used (Witholt, 2007)

with other actors. The type of resources that are exchanged can be divided in three categories: (1) physical goods, (2) personnel and (3) services (like sharing knowledge). The first type of resources, physical goods, can be further divided in raw material, equipment, final products and capital.

The (amount and type of) resources an actor possess and needs, can provide information about the division of power during the different stages of a building process. Furthermore, the resources which an actor contributes to a relationship determine to a large extent the activities of an actor within an inter-organizational relationship. The exchange of resources, which are critical and/or scarce, during a building process, can provide information about the level of interdependency, division of power and activities of actors. If actors possess more resources in the future themselves, which they now receive from other actors, the level of collaboration between those actors changes. For example, when a main contractor starts to make the (final) design by themselves, a (close) relationship with architects is not necessary anymore. Currently, most actors in the construction industry are broad-oriented and offer a large scope of services to their customers. The question is, however, if this situation remains or that changes are about to happen. When this is the case, roles and positions of actors in the Dutch construction industry will change. Therefore, the exchange of resources is an indicator of the development of roles (tasks) and positions of actors.

### ***3.3.2. Information***

Information can also be exchanged between actors in a network. There are different types of information: descriptions, opinions, ideas and facts. The pattern of relationships between actors reveals the likelihood that individuals will be exposed to particular data (Haythornthwaite, 1996). There are three attributes of relationships which are important when it comes to exchange of information between actors: (1) content, (2) direction and (3) strength (Haythornthwaite, 1996, Haythornthwaite & Wellman, 1998). When information is passed from one actor to another, an indication is given about the direction in which information flows. Furthermore, the strength of a relationship is also important. 'A relationship in which a large number of goods or information is exchanged is stronger than a relationship in which few goods are exchanged or in which information is exchanged infrequently' (Haythornthwaite, 1996). This concept of strength also describes the ties between actors. The strength of ties between actors is important, because they indicate the likelihood that information will flow from one actor to another. 'Strong ties have been considered to be conducive to the exchange of information' (Haythornthwaite, 1996). Combinations of

frequency of contact, duration of the association, intimacy of the tie and provision of reciprocal services have been used to measure strength of ties. The strength or weakness of a tie affects the exposure to specific kind of information within a network. 'The more relationships actors maintain, the more reciprocal a relationship, the more long-lasting and the more personal relationships, the stronger the ties. Strong ties connote willingness to share information, but actors which have weak ties with others may have access to more and different information (due to their connections with other networks)' (Haythornthwaite, 1996). The process of information exchange is therefore also important to get more insight into inter-organizational relationships within a network. Since the existing ties between actors are already measured by the variables of the factor size (network density) in the first dimension, the strength of ties will not explicitly be taken into account within this paragraph. However, during the analysis of the results, strength of ties should be taken into account when analyzing the exchange of information between actors.

Receiving or owning information means having power. Actors who have information which other actors need, but do not possess, are more powerful than other actors. Inter-organizational relationships and frequency of interaction (strength of ties) are also related to (information) exchange. Gaining insight into the level of information exchange is therefore interesting to (partly) determine positions of actors. An actor with much information is more powerful than another, who possesses less (critical) information, and therefore, the first actor possesses a stronger position than other actors. Actors which collaborate closely are likely to share information which they possess as well. When there is little commitment or trust within a relationship, this might be an obstacle in reaching a high(er) level of collaboration. Therefore, the power aspect of information sharing within an inter-organizational relationship is important when it comes to more intense collaboration between actors. To summarize, strength of ties and the type and amount of information which is exchanged are relevant to measure the development in roles and positions of actors in an industry. However, since frequency of interaction and importance of other actors (to measure strength of ties) are already mentioned in paragraph 3.1.1.2, strength of ties will not explicitly be taken into account further within this dimension.

Within the Dutch construction industry, the frequency and content (critical and/or scarce) of information transfer changes with the role an actor plays (Pekerikli et. al. 2003). For example, when the contractor is the coordinator of the building process, information exchange with other actors is much more frequent (and critical) compared to a situation in which the contractor only has to carry out the job. The construction industry is characterized by

standardisation in terms of products and routines and therefore a low degree of interdependence among individual actors (on a network level). However, on a project level, the interdependence between the involved actors is high. Therefore, the information dependency between actors involved in a project is considered to be high. However, the involved actors show more tendencies to keep information for themselves (Pekerikli et. al. 2003). To reach a higher degree of collaboration, a higher level of information sharing would be necessary. Since information exchange is a task during a building process and has influence on interdependencies between actors, this factor is an indicator of changes in positions.

### ***3.3.3. Influence***

Exchanging influence between involved actors has to do with power, prestige, legitimation and advice. Influence of one organization on another organization involves some interdependence between those organizations. Furthermore, exchanging influence is about the division of power within inter-organizational relationships (New & Westbrook, 2004). More intense collaboration leads to a larger amount of dependency between actors. A higher level of interdependency can lead to a change in the division of power. Therefore, actors sometimes doubt whether or not more intense collaboration with other actors will improve their position within the industry. Influence, more specifically the division of power and interdependency between actors, has therefore also to do with trust and commitment within an inter-organizational relationship. When it comes to the identification of roles and positions of actors in an industry, the division of power and level of interdependency between actors is crucial. Emerson (1962) has stated that ‘the relative dependence between two actors in an exchange relationship determines their relative power’. All power is relationship specific: it exists within the relationship between social actors rather than residing within the actors themselves. Power can be used by actors to reach a certain outcome (Hatch, 1997: 282-283).

To conclude, the authority of an actor (positional power) and changes in positions of actors can be measured by the factor exchange of influence. The division of power is an interesting factor to determine the positions of actors relative to each other. When an actor has a large influence on the activities and decision making process of another actor, this actor has relatively more power than the other actor involved. Actors with more or less power possesses different positions within a network. Furthermore, an actor who has most influence on other actors can take a lead when it comes to collaboration and integration between organizations. Within the construction industry, the influence of actors on each other is high, since most

actors are largely dependent on each other to carry out their tasks (during a project). However on a network level, interdependency between actors is currently low. The constituent and main contractors seem to have relatively more power than other actors in the construction industry. Within the first part of a building process, the constituent determines which main contractor is going to carry out the job. After the main contractor is chosen, this actor is responsible for choosing subcontractors and suppliers. Therefore those two actors have, in different stage of a building process, more power than other actors involved.

### 3.3.4. Social support

The exchange of social support involves encouragement, inspiration and comfort. These items are not always very common within business relationships (New & Westbrook, 2004). Due to the one-off projects within the construction industry, social support between actors is not very common. The longer the relationships between actors last, the more social support becomes involved in a relationship. Social support is therefore an indicator of the duration of an inter-organizational relationship. This factor is all about (soft) indicators, which are hard to measure within a survey (broad oriented research). Therefore, it is decided to not include this factor within the research project.

To summarize, the following table provides an overview of the variables which followed from the second dimension and the values which belong to a variable.

Table 3.2 Overview variables dimension 2

<b>Factor</b>	<b>Variable(s)</b>	<b>Values</b>	<b>Indicator of:</b>
Exchange of resources	Type and amount of resources	Type: scarce and/or critical Amount: none – little – a lot	Roles (tasks) and positions
Exchange of information	Amount and type of information exchange between actors	Type: critical or not critical Amount: none – little – a lot	Positions
Exchange of influence	Relative division of power between actors <sup>11</sup>	Rank five groups of actors from lowest power (1) till highest power (5)	Roles (authorities) and positions

<sup>11</sup> Within this variable, a distinction will be made between execution and design stage of a project, because the division of power is likely to differ between those two stages.

### 3.4. The third dimension: the governance of an exchange relationship

Within this dimension, the focus is on adaptation, coordination and safeguarding of exchanges (figure 3.5).

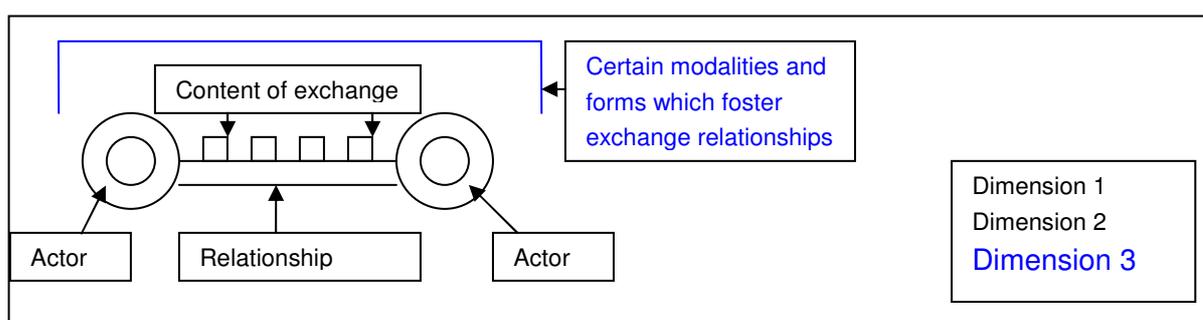


Figure 3.5 Overview third dimension

Within the above picture, certain modalities and forms are mentioned, together called a governance structure. ‘A governance structure is an institutional arrangement consisting of the rules by which an exchange is carried out and administered’ (Slangen, 2007). Therefore, a governance structure determines how collaboration agreements between actors are managed. Exchanges or transactions are largely influenced by the institutional environment and are coordinated by the governance structure. Therefore, the governance of an exchange relationship can be helpful in determining the responsibilities and authorities of actors in a network. Furthermore, adaptations are also part of a governance structure and influence the level of interdependence between organizations. To finalize, each partner in a network assumes certain obligations, rights and gains through formal and informal agreements (safeguards). Furthermore, the governance structure provides the legal boundaries of an exchange relationship (Slangen, 2007). The three subjects mentioned above, coordination, adaptation and safeguarding, will be further described in the following paragraphs.

#### 3.4.1. Coordination

‘Coordination refers to the development and use of mechanisms that facilitate the control of exchange processes’ (Moller & Wilson, 1995: 27). ‘Coordination processes include decisions, rules and procedures concerning the physical flow of resources, as well as ‘the terms of trade’ between firms which generally presume some kind of monitoring and evaluating of the performance’ (Möller & Wilson, 1995: 27). To get an overview of the way tasks and activities within a network are coordinated, the coordination process has to be described. This coordination process also influences the relationships between actors in a network and thereby

collaboration between actors. Successful collaboration between actors needs some sort of coordination.

Coordination in organizations is about managing interdependency. Two common types of interdependence are task dependency and task uncertainty. Inter-organizational task dependence is the extent to which organizations are dependent upon another to perform their individual tasks (Wong, Johansen & Hvolby, 2004). This task dependence increases when organizations become more specialized. Task uncertainty refers to 'the difficulty and variability of the work' (Wong et.al. 2004). This uncertainty may increase, because of lack of information. Within organization theory, it is stated that the level of interdependency determines the coordination mechanism. Tasks which are standardized and programmed need less coordination than uncertain and continuously changing jobs (Wong et.al. 2004).

The above mentioned coordination mechanisms link the organization members in an inter-organizational system (network). A coordination mechanism refers to 'predetermined rules of interactions/decisions among involved parties to achieve agreed objectives or courses of action' (Wong et.al. 2004). Three groups of coordination mechanisms can be distinguished: (1) coordination by standardisation, (2) coordination by direct supervision or planning and (3) coordination by mutual adjustment. In reality, a combination of different coordination mechanisms is common. Coordination can also be done ad-hoc when needed, without a clear coordination mechanism.

Coordination mechanisms are related to different types of contracts (Slangen, 2007: 112). For example, in relational contracts, coordination mechanisms are mutual adjustment and common values and norms are often long-term contracts (Slangen, 2007: 112-113). Different types of contracts can give information about the authorities and responsibilities of the involved actors.

To summarize, within a collaboration agreement between two or more actors, coordination is necessary. Different types of coordination mechanisms relate to different type of contracts and therefore to a different division of activities, responsibilities and authorities. The level of collaboration and the division of roles (and positions) of actors is therefore also dependent on coordination. Therefore, coordination mechanism is an important variable. Within the construction industry, price is the most important coordination mechanism. Contracts are mostly formed for short periods (for example the duration of a project). These classical market contracts lead to weak coordination and short-term collaboration agreements. This

type of contract involves low coordination costs (more information about contracts can be found in paragraph 3.1.3.3). If the contractor decides to outsource the purchasing of installations and materials to a secondary contractor, he can also outsource the coordination of the activities on the building site (Dubois & Gadde, 2000). Because of this substantial variation in the roles of actors, an individual actor tends to be broad oriented, including design, production and distribution in various combinations. Therefore, some actors are partnered with others. Most transactions within the construction industry are contractual and not relational. There is a heavy reliance on tendering procedures. This procedure guarantees that actor constellations (networks) change all the time, making it difficult to utilise experience gained in previous projects. Each project in the construction industry is regarded to be unique. However, it should be noted that this uniqueness is partly caused by the purchasing behaviour of the contractor (Dubois & Gadde, 2000). When the focus is more on longer-term collaboration agreements, the type of coordination mechanism used will change. Since coordination is a task during a building process, coordination mechanism is an indicator of changes in roles (tasks) of actors.

In the construction industry, the coordination of projects is emphasized while coordination among firms is left to transactional exchange. The resources of a firm are simultaneously activated in a number of projects. Therefore, coordination is indispensable. Four levels (which should be coordinated) can be identified within construction projects: (1) individual projects, (2) coordination of individual projects within an organization (actor), (3) coordination of activities and resources within an organization (not project based) and (4) coordination between actors (Dubois & Gadde, 2000). Within this project, the focus is on the coordination between actors.

### ***3.4.2. Adaptation***

Exchanges in (social) relationships can be viewed as interaction processes ‘where the interaction is any set of observable behaviour on the part of at least two individuals when there is a reason to believe that some parts of these individuals are responding to each other’ (Hallén, Johanson & Seyed-Mohamed, 1991). Within this definition, actors involved are simultaneously affected by each other. This is an adaptation process. If the interaction between individuals is over more than short periods, they are going to adapt to each others needs. Furthermore, the environment in which the exchange is carried out can also be a reason why the exchanging parties are exposed to changing business conditions. Relationships

between organizations are mostly based on some sort of match between the involved organizations and therefore adaptation is important (Hallén et. al., 1991).

Based on the previous, adaptations can be defined as ‘relationship-induced changes in the make-up of an organization’ (Möller & Wilson, 1995: 27). These adaptations require investments that can be relation specific, because such adaptations can be very important to evaluate the relative interdependency of actors and their commitment to the relationship. These investments may be of critical importance to maintain a certain relationship. If an adaptation is relation specific, then actors can become tied together (and reach longer-term collaboration agreements). Adaptation is therefore important to evaluate the division of power and authority between actors in a network. The level and type of adaptation provides information about the duration of collaboration agreements.

Interfirm adaptation can be conducted in three ways: (1) product adaptation, (2) process adaptation and (3) procedure adaptation. The most frequent used case of interfirm adaptation is customization of products. The supplier adapts the product to the wishes of the customer. For example by adapting the materials used or improve the quality of the product. It is also possible that the production process is adapted (for example new equipment can be bought). Finally, adaptations to the procedures can be made. This can be for example changes in planning procedures or quality control (Hallén, 1991). The different types of adaptation have different levels of impact on the involved organizations. A product adaptation has most of the times lower consequences for an organization then a process adaptation.

Exchange and adaptation are closely related processes (at least in a dynamic setting) (Hallén, 1991). Therefore, the social exchange theory of Blau (1964) and Emerson (1962) provide two mechanisms which can be used to explain adaptations: trust and power. Within social exchange processes, trust is crucial. The involved actors can demonstrate their trustworthiness by committing themselves to an exchange relationship. And commitment can be shown by adapting to the other involved actor. To summarize, adaptations in an inter-organizational (exchange) relationship are elements of a trust-forming (social) exchange process.

As mentioned before, the control of resources is one of the situations in which power is involved. Each actor exists within a network of other actors with resources. Network structure determines the existence and number of resource sources an actor has (Burke, 1997). An actor can derive power from having resources that somebody else needs and from controlling the alternative sources of the resources. A resource dependence model, developed by Pfeffer and

Salancik (1978) suggests that organizations respond to the demands of other organizations, if those organizations control critical resources. Based on this can be stated, that firms within an inter-organizational business relationship can be expected to adapt to each other to the degree that they are dependent on each other's resources (Hallén, 1991). Therefore it can be stated that if the level of dependency between organizations is high, longer-term collaboration agreements are likely, because actors adapt to a larger extent to others.

To summarize, the adaptation of organizations to others is important because they give an indication on the division of power (positions) and authority (roles) between actors. Longer-term collaboration between actors is more likely when the level of adaptation to other actors is high. Therefore, the type and level of adaptation is also important to determine future roles and positions of actors in the construction industry. Relations between actors in the current Dutch construction industry are mostly considered to be short term (arms-length type) rather than being long-term orientated. Because of the competitive tendering (based on price) the focus remains on short-term relationships. Therefore, adaptations are rarely applied to actors within a relationship, they rely on standardized solutions. Standardised products and systems have developed over time, mainly because of the rules and norms which are laid down by the government. Certain 'collective' adaptations have therefore been developed by the entire construction industry. From this 'collective' adaptation follows, that there is great similarity between the products which are offered in the construction industry. However, a slow trend towards more customisation and specific adaptations can be observed. This is illustrated by the fact that there is a growing interest among actors in the industry in longer-term relationships with other actors.

### ***3.4.3. Safeguarding***

Uncertainty, combined with some form of interdependence between organizations, affects the governance of exchange considerably. However, uncertainty itself is not necessarily problematic. If this uncertainty involves some level of critical organizational interdependence, than problems can arise. Therefore, relationship-specific adaptations (and longer-term collaboration agreements) need safeguarding within the exchange process. Furthermore, transactional uncertainty can create information problems within the exchange process. The cause of this uncertainty can be internal (task ambiguity<sup>12</sup>) or external (market dynamics<sup>13</sup>)

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<sup>12</sup> The difficulty of obtaining or understanding information regarding an other actor's tasks or functions (Cannon et.al. 2000)

<sup>13</sup> The degree of variability in firm's market (Cannon et.al. 2000)

(Cannon, Achrol & Gundlach, 2000). In a study of Cannon, Achrol and Gundlach (2000), transactional uncertainty and relationship-specific adaptations are therefore used to measure the context of exchanges and to predict the effectiveness of alternative forms of governance. The context of exchanges also involves the safeguards of the transaction. Exchanges should be safeguarded against the hazards of opportunism. Both legal safeguards (contracts) and social safeguards (relational norms) are useful mechanisms to prevent opportunism within a relationship.

Within the study of Cannon, Achrol and Gundlach (2000) the focus is on combining the two types of safeguards. One of the focuses within the study is the extent to which legal safeguards formally incorporate the expectations and obligations (= responsibilities) of parties in an exchange relationship. They use the term 'legal bonds' which refers 'to the extent to which detailed and binding contractual agreements are used to specify the roles and obligations of the parties'. These legal bonds are therefore important for the determination of the roles of actors in a network. Relational (social) norms refer to shared expectations regarding behaviour, which actors have in the process of working together to achieve mutual and individual goals. Examples of relational norms are trust, shared values, reputation and collective sanctions. Collective sanctions define the parameters of acceptable behaviour by demonstrating the consequences of unacceptable behaviour. Actors in a network can collectively punish a member of a network when the boundaries of acceptable behaviour are crossed. However, collective sanctions reduce behavioural uncertainty by increasing the costs of opportunism and decreasing the costs of monitoring (Cannon et.al. 2000). However, these two types of safeguards are not often used exclusively. Most of the times, a combination of the two types is used.

To conclude, safeguards make sure that actors within a (contractual) relationship keep their obligations and know their responsibilities. Therefore, safeguards are useful to determine the roles (tasks and responsibilities) of actors. The tasks and responsibilities of actors within a relationship are written down in contracts (sometimes used together with relational norms). Characteristic for the current situation of the construction industry is the strong reliance on contracts. Most standard forms of contracts do not encourage collaborative behaviour (Dubois & Gadde, 2000). The involvement of relational norms between actors in the construction industry is currently low. Especially in projects which are one-off, actors do not care much about their reputation and trustworthiness. An example is the fact that changes in the project specification can lead to opportunistic pricing by the designer, contractor or supplier (Voordijk, de Haan & Joosten, 2000). Furthermore, during the pre-contract phase,

opportunistic behaviour of actors is low, but during the post-contract negotiations opportunistic behaviour is high. The constituent can choose from (many) different suppliers, contractors and architects, but after the contract is signed the situation changes.

The type of contract which is used (between a constituent and a main contractor) leads to a different division of responsibilities and authorities between actors. Currently, there are four types of contracts which are commonly used in the construction industry: (1) turn-key contract, (2) design and build, (3) building team, and (4) general contracting (tendering). Alliances and partnering are also used more and more. In the situation of a turn-key contract, the constituent establishes a program of demands. After this program of demand, a contract is set up with a chosen contractor, based on a fixed price and the program of demands. The main contractor takes care of the entire building process. When a design and build contract is used, the constituent formulates a program of demands and a provisional design. The contractor completes the detailed and final design and after the approval of the constituent, he can proceed with the construction. When 'building team' is used as contract, the constituent is the designer and prepares the entire project. The contractor is involved in the building process, based on the final design and his task is to bring his knowledge about the execution of the project into the bill of materials (in Dutch: bestek) and execution. General contracting includes a final design, made by the constituent (and an architect) and the execution of this design by the contractor, which is selected after the design is finished. Because of these different contents of contracts, the role of an actor differs when different types of contracts are used. Therefore, the type of contracts actors use is also an indicator for the level of collaboration between actors. Building team contracts indicate a more intense collaboration between actors than a situation in which, for example, a design and build contract is used. Furthermore, if relational norms become more important in the future, this could have influence on the division of responsibilities and authorities of actors in the construction industry. If contractual agreements are replaced by relational agreements, it is expected that the duration of the relationship will increase. Within longer term arrangements, joint responsibilities of certain tasks are more common.

To conclude, the role of actors in the construction process differs, depending on the project. The contractual form chosen for the project is an important determinant of the roles which actors will take during the process. However, this contract is often not used to coordinate activities, but to seek strict liability and attach blame to events as they occur (Dubois & Gadde, 2000).

To summarize, the following table provides an overview of the variables which followed from the third dimension and the values which belong to a variable.

Table 3.3 Overview variables dimension 3

<b>Factor</b>	<b>Variable(s)</b>	<b>Values</b>	<b>Indicator of:</b>
Coordination	Type of coordination mechanism	Coordination by standardization of processes, coordination by a central actor, coordination by mutual adjustment or ad hoc coordination	Roles (tasks)
Adaptation	Type and level of adaptation	Type: product, process or procedure Level: relation- or project specific	Positions and roles (authorities)
Safeguarding	Type of contracts and importance of relational norms	Type of contracts: design and build, general contract, turn key contract or building team contract. Relational norms: low – medium – high importance	Roles (tasks and responsibilities)

### 3.5. Summary

To summarize, all the previous mentioned factors and variables, found in network theory, the following table is presented. This table was used within the next chapter to create a draft measurement instrument.

Table 3.4 Overview variables

<b>Factor</b>	<b>Variable(s)</b>	<b>Values</b>	<b>Indicator of:</b>
Actors	Type of strategy	Horizontal and vertical integration, market and product diversification, specialization.	Roles (tasks)
Cooperative environment	Level and type of collaboration	Level: low – medium – high Type: short or long-term	Positions
Network density	Frequency of interaction and importance of actors	Frequency of direct contact with other actors (never – sometimes – often - always) and importance of other actors (low – medium – high)	Positions and roles (authorities)
Exchange of resources	Type and amount of resources	Type: scarce and/or critical Amount: none – little – a lot	Roles (tasks) and positions
Exchange of information	Amount and type of information exchange	Type: critical or not critical Amount: none – little – a lot	Positions
Exchange of influence	Relative division of power between actors	Rank five groups of actors from lowest power (1) till highest power (5)	Positions and roles (authorities)
Coordination	Type of coordination mechanism	Coordination by standardization of processes, coordination by a central actor, coordination by mutual adjustment or ad hoc coordination	Roles (tasks)
Adaptation	Type and level of adaptation	Type: product, process or procedure Level: relation- or project specific	Positions and roles (authorities)
Safeguarding	Type of contracts and importance of relational norms	Type of contracts: design and build, general contract, turn key or building team. Relational norms: low – medium – high importance	Roles (tasks and responsibilities)

## **Chapter 4. Methodology**

Within this chapter, the chosen research instrument will be described and the methodology of this research project will follow. This information and the variables from the previous chapter have been used to create a draft instrument which is expected to be measuring perceptions of actors about developments in roles and positions in the Dutch construction industry.

### **4.1. Research strategies**

To measure perspectives of actors in the Dutch construction industry about the development of roles and positions, practice oriented research has to be carried out. To do that, literature provides five possible research strategies: a survey, an experiment, a case study, grounded theory approach and desk research (Verschuren & Doorewaard, 1999). A description of these five strategies can be found in appendix 2. Because the purpose of the research project is to create an instrument, which can measure the overall perspectives of actors in the Dutch construction industry with respect to the development of their roles and positions, a survey is the most appropriate research strategy. As Verschuren and Doorwaard (1999) have stated: ‘a survey is carried out if the researcher wants to gain an overall picture of a phenomenon spread over a period of time or space’. Within this research project, an instrument has to be developed which can provide an overall picture of the Dutch construction industry when it comes to developments in roles and positions of actors. Therefore, a survey is most appropriate. The characteristics of a survey are a large number of research units, labour extensive data generation, more breadth than depth research, a random sample, quantitative data and analysis, and preferably remote, closed data generation (Verschuren & Doorewaard, 1999). The design of a survey will be further elaborated below.

### **4.2. Survey design**

Designing a survey is usually done by seven steps (Hunt, Sparkman & Wilcox, 1982):

1. Specify what information will be sought;
2. Select the type of questionnaire and method of administration;
3. Determine the content of individual questions;
4. Choose the form of response to each question;
5. Determine the number of questions and sequence of each question;
6. Re-examine steps one to five and revise if necessary;
7. Pre-test the questionnaire and revise if necessary.

The first step in conducting a survey is to define precisely which information is desired. Within this research project, the information which is needed are the perspectives of actors in the Dutch construction industry on the development of their roles and positions.

When the first step was clearly defined, the type of questionnaire and method of administration were selected. Mail, e-mail or telephone surveys will all be designed differently. Therefore, the type of questionnaire and the method of administration had to be determined before the content of lay-out of the survey is selected (Frery, 2001). The survey which is designed in this project will be carried out by mail or e-mail, because this is least labour intensive. Furthermore, the sample size is expected to be large, because all five groups of actors in the residential and non-residential building sector have to be represented properly (more information about sample size can be found in appendix 5). Therefore, carrying out a survey by telephone is not an option.

The content of the individual questions was determined, when the previous two steps were complete. This step consisted of brainstorming and writing down every possible question the researcher could think of. Within this research project, the basis for this brainstorm were the factors which were found in network theory. The variables, which followed from the factors, need to be translated into questions. All variables were divided into two (ranges of) questions: one about the current situation of an organization with respect to that variable and one about the future expectations (middle long term: five years) regarding that variable. A respondent was asked about the current and future situation of his own organization with respect to that variable and about the current and future situation of other actors in the Dutch construction industry. After this, the number of questions had to be narrowed down, by applying the following criteria: (1) necessity/relevancy, (2) ability to answer the question by the respondent and (3) willingness of the respondent to answer this question (privacy issues for example). When the questions were compared with these three criteria, it turned out that it will be hard for a respondent to answer questions about other actors. During the pre-test of a survey, which is the focus of this research project, a number of potential respondents was interviewed. It was decided to ask those respondents questions about the situation of other actors, now and in the future, to receive as much information as possible. After the pre-test it will be clear to what extent respondents were able to answer questions about other actors. Based on that information, the draft survey was adapted.

When the content of the questions was selected, the structure of each of the questions was made (the form of response, step 4). A distinction can be made between open-ended and

closed questions. Both options have advantages and disadvantages. Open-ended questions require a respondent to come up with an answer by himself. Therefore, insightful data can be collected and biased answers can be avoided. However, respondents may not know what to answer to a question or are not willing to answer these types of questions. Furthermore, analysing the answers to open-ended questions is a time consuming task (Frary, 2001). Closed questions provide the respondent with a limited set of answer possibilities. The analysis and interpretation of the answers to these questions is much easier. However, the answers may be biased, because the respondents have to make a choice between different answers they might not have thought of by themselves (Frary, 2001). Besides this main distinction between open and closed questions, other type of questions can be used. An overview of the possible type of questions and the situation in which they best can be used is given in table 4.1.

Table 4.1 Type and use of questions (Waddington, 2000)

<b>Type of question</b>	<b>Best used when:</b>
Open-ended	The researcher does not know all the possible answers and/or if the researcher wants to make the chance for bias as small as possible
Closed-ended	The researcher knows all the possible answers and to make the analysis of quantitative data easier
Likert-scale	The researcher wants to assess the respondents feelings about a statement (level of agreement with the statement)
Multiple choice	The researcher has a known finite number of answer possibilities.
Ordinal	To rate items in relation to each other (ranking answer possibilities)
Categorical	The respondents have to make a choice in which category they fall
Numerical	Real numbers are asked, like age.

Within the draft survey, it was decided to ask (mainly) open questions. The pre-test was carried out through personal interviews, in which broad information about the variables will be gathered. Furthermore, answer possibilities are too broad to make a practical finite number of answer possibilities. Therefore, open questions were often the best solution. Based on the information gathered in the pre-test, answer possibilities have been found and questions in the survey were adapted. Most open questions have been replaced by other types of questions. Since the final survey will be a written questionnaire, a long list of open-ended questions should be avoided, because otherwise the number of respondents will decrease considerably.

In the process of developing the questions, the development of defective questions should be prevented. Five types of faulty questions can be distinguished (Hunt et.al. 1982):

1. Loaded questions (bias the responses through their wording);
2. Double questions (two questions to which the respondent can give one answer);
3. Ambiguous questions (questions with two or more interpretations);
4. Inappropriate vocabulary (using terms with which the respondent is not familiar);
5. Missing alternatives (some possible answers are missing).

This information will be used to design the questions for the draft survey adequately.

#### ***4.2.1. Pre-testing***

The final stage of survey design is about pre-testing. Pre-testing can be defined as ‘the use of a questionnaire in a small pilot study to ascertain how well the questionnaire works’ (Hunt et.al. 1982). Pre-testing a survey is necessary, because there is no better way to find out if the instrument works than to test it on the people which it is meant for. If the questionnaire is pre-tested, three items are important: (1) items about the questionnaire itself, (2) items about specific questions and (3) items about data analysis. The first item, about the questionnaire itself, can be for example about the length of the questionnaire, the lay-out and the sequence of the questions. Items about specific questions have more to do with the content of the questionnaire. Finally, the pre-test is useful to pre-test the data analysis procedures and to complete the research design. Furthermore, the answers to (open ended) questions can be used to derive new hypotheses, which can be tested. However, the most important question, which will be answered by the pre-test, is: ‘Will the instrument provide data of sufficient quality and quantity to satisfy the objectives of the research project?’ (Hunt et.al. 1982).

A pre-test can be carried out by several methods, but there are three methods which are often mentioned: personal interviews, telephone interviews and mail self-report. As mentioned before, a personal interview has the advantage that the researcher is present when the respondent answers the questions and because of that, the researcher can observe the respondent and find out personally where the respondent struggles and what the reason therefore is (Hunt et.al. 1982).

Within this research project, the choice is therefore made to carry out personal interviews with people from all five involved groups of actors: constituents, architects, main contractors, subcontractors and suppliers. From every group of actors, two or three organizations have been interviewed, based on the variables which were extracted from the theoretical review and some additional open questions. These additional questions were about the design of the

survey, left space for other suggestions from the interviewees and were useful to receive more in depth information, which could be helpful to improve the questions in the survey. When it comes to the size of the pre-test sample, the opinions of different researchers differ. The range of the sample size varies between 12 and 30 and depends on the sample size and variation (Hunt et.al. 1982). Therefore, more than 12 interviews have been carried out.

The nature of the respondents is also of importance. Respondents should be as similar as possible to the target group. Furthermore, 'a heterogeneous sample with extreme cases is indispensable' (Hunt et.al. 1982). The target group of the final survey consists of all constituents, architects, main contractors, subcontractors and suppliers within the residential and non-residential building sector. The sample for this research project is heterogeneous, because from each of the five groups, actors were selected. This selection was based on size, because it is likely that medium sized to big enterprises have a better overview of the sector and because these type of organizations deal with strategy issues much more.

Within this research project, an individual from two or three organizations, from each of the five actor groups, has been interviewed. This individual should have influence and/or insight on the strategic decisions and direction of the organization, but should also insight and/or influence on the daily business. This is necessary, because the questions in the survey are about the daily business with other organizations, as well as the strategic issue of roles and positions in the network. Therefore, one individual from the management team of each organization has been interviewed. The latter should also be considered when conducting the final survey.

While the interviews were conducted, evaluations were carried out during the process to revise the survey immediately. Revising the survey during the process will contribute to the quality of the final survey, because the improvements that can be made to the survey, based on the interviews which are already conducted, can be tested immediately in the next interviews.

#### ***4.2.2. Draft survey***

The previous information was used to design a draft version of the survey, which has been used during the pre-test. Below an overview will be given of the factors and the variables, followed by the questions which are asked to measure that variable. A distinction is made between the own situation of a respondent, the situation of other actors in the construction

industry (from the perception of a respondent) and between the current and future (five years from now) situation. The focus is on developments in roles and positions and therefore, on the future situation.

### **Factor 1. Actors (variable: type of strategy)**

The type of strategy of an organization can be measured by the following question:

*Which (long-term) strategy does your organisation follow?*

Answer possibilities which are given in the survey are: horizontal or vertical integration, product or market diversification, or specialization. Another question is:

*Could you give a short explanation about the type of strategy your organization follows?*

This question is added to receive more in-depth information during the pre-test about the strategic choice of an organization.

To find out how actors think about strategic choices of other actors, the following question is added:

*Which strategic developments do you see regarding other actors in the Dutch construction sector?*

Within this question, there is no distinction made between the current and future situation (five years from now), because strategy is already about longer-term plans.

### **Factor 2. Cooperative environment (variables: level and type of collaboration)**

The level of collaboration between actors can be measured by the following question: *With which actors is your organization collaborating? During this collaboration with another actor: is the level of collaboration low, medium or high<sup>14</sup> with that actor?*

To measure the type of collaboration (short- or long-term) the following question is added:

*If your organization collaborates with other actors, is this collaboration short-term or long-term oriented? With which actors?*

The developments which respondents expect for the next five years can be measured by the following question:

*How do you think this situation is within five years? Do you see developments on the area of collaboration (type and level) between certain actors?*

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<sup>14</sup> Within this research project, a low level of collaboration means that the collaboration partners do not operate very closely, where as a high level of collaboration means that actors collaborate very close together.

**Factor 3. Network density (variables: frequency of interaction and importance of other actors)**

To measure the frequency of interaction with other actors, the following question is added to the questionnaire:

*Do you have direct contact with the following actors (constituent, architect, main contractor, subcontractor, supplier) and if so, how often?*

The following answer possibilities are given: no contact at all, sometimes, often, or always. It is decided not to include a question about the current contact between other actors, because it is expected that this question is too specific and therefore too hard to answer for respondents.

To find out how respondents think about the future situation regarding frequency of interaction between actors, the following questions are designed:

*Do you think the frequency of interaction between you and other actors will increase within the next five years?*

*Do you think the frequency of interaction between certain actors will increase or decrease?*

Within this question it was decided to ask respondents about their own future situation and the future situation of other actors. The latter question can be asked, because this question is less specific as the question about the current situation would have been, because it is only asked whether or not the respondents expect an increase or decrease in certain contacts between other actors.

When it comes to the importance of actors to each other, questions are added to measure the current and future situation of the respondent himself and his expectations about other actors. Therefore, the following questions were designed:

*Which actors are more (or less) important to your organization?*

*Which actors do you think will become (more) important to your organisation in the future? If a relationship is important to your organisation, how can this be noticed?*

*How do you expect the relative importance of actors towards each other is now and will develop the next five years?*

**Factor 4. Exchange of resources (variables: amount and type of resources)**

To measure the amount and type of resources which are exchanged, the following questions were asked to the respondents. The first question is about the current situation, the second question about the future situation.

*Which resources are in your opinion scarce and/or critical and what do you think are the consequences of that within the construction process? With which actors do you exchange resources and in which amount (none, little, a lot)?*

*How do you think this situation will develop within the next five years?*

*Which actors will exchange resources with each other and in which amount, and which actors will possess critical or scarce resources?*

*Will actors start to collaborate more to receive resources or will they start to explore resources themselves?*

The answers to these questions provide an overview of scarce and/or critical resources in the Dutch construction industry and of actors which exchange resources with each other (in which amount). Furthermore, a question is added to ask whether or not actors are thinking about exploring resources which are scarce and/or critical themselves, because this could have influence on their positions (power) and tasks.

#### **Factor 5. Exchange of information (variables: amount and type of information)**

The amount and type of information exchange can be measured by the following questions:

*From which actors (constituent, architect, main contractor, subcontractor, supplier) do you receive information and in which amount (none, little, a lot)? Is this information critical?*

Respondents are not asked about the amount and type of information exchange between other actors, because it is expected that this information is too specific and that actors will not know this about each other.

However, actors can say something about broad developments regarding this subject which they notice in the entire sector. Therefore the following questions are added to get an indication of the amount and type of information exchange in the future:

*How do you expect the exchange of information will develop the up-next five years? Which actor will own the most critical information?*

*Do you expect that the amount of information which is exchanged between actors will increase the next five years? Between which actors?*

#### **Factor 6. Exchange of influence (variable: relative division of power)**

To measure the relative division of power between actors, every respondent is asked to rank the involved five groups of actors from most power (1) to least power (5), now and in the future. Furthermore, a distinction is made between design and execution phase of a building

process, because it is expected that the relative division of power will strongly differ between those two stages. Therefore, the following question is added:

*Which actor does in your opinion have most power within a building process (now and in the future)? (make a distinction between design and execution stage)*

To receive some more in-depth information, the following question is added.

*Why do you expect these developments in the relative division of power?*

### **Factor 7: Coordination (variable: type of coordination mechanism)**

The variable coordination mechanism is about the entire building process. Therefore, no distinction has to be made between the own situation of a respondent and the situation of other actors. To measure this variable, the following question is added:

*How do you think a current building process is coordinated?*

Answer possibilities are: coordination by standardization of processes, coordination by one central actor, ad hoc coordination or another form (after which a respondent is asked: what other form?). When a respondent answers that coordination is done by one central actor, another question is asked: which actor?

To ask respondents about the future situation, the following question is added:

*How do you think building processes will be coordinated within five years?*

For this question, the same answer possibilities will be used as for the previous question about the current situation.

### **Factor 8. Adaptation (variables: type and level of adaptation)**

To measure the type of adaptation between actors, the following question is added:

*Has your organization ever adapted to another actor to improve collaboration? If so, which type of adaption (product, process or procedure)? How do you think your organization will deal with adaptations for other actors in the future?*

Respondents are only asked about their own situation, because it is expected that they do not know adaptations other actors do for each other. However, both the current as well as the future situation are included.

Furthermore, a question about the level of adaptation will be asked:

*Where those adaptations relation-specific or project-specific? Do you expect more relation-specific adaptations between actors?*

Respondents will answer this question for the current as well as the future situation to make clear whether or not there is a difference.

However, to receive some information about how respondents perceive the situation of other actors to each other, the following (broad oriented) question is asked:

*How do you think actors will deal with adaptations the next five years? Become certain adaptations between certain actors more common?*

Because this question is not very specific about type or level of adaptation, it is more likely that respondents can answer this question.

### **Factor 9. Safeguarding (variables: type of contracts and importance of relational norms)**

To measure the variable contractual forms, differences in types of contracts will be used. Therefore, the following question is added to the survey:

*Which type of contract is, in your opinion, mostly used to formalize relations between contractors and constituents?*

Answer possibilities which are given are: general contract (tendering procedure), turn key contract, design and build, building team and other (after which a respondent is asked: which type? Only the type of contract between contractor and constituent will be asked, because this contract determines to a large extent the roles of actors during a building process.

To find out which type of contract will be most used in the future, the following question is added:

*Which types of contracts do you expect will be more important within the next five years? According to you, is there a trend towards a certain type of contract?*

The importance of relational norms can be measured by the following questions. The first question is about the current situation, the latter about the future situation.

*Are relational norms important to your organization when a deal is closed? Do you notice that relational norms are more or less important to other actors?*

*How do you think this situation will change the next five years? Will relational norms become more important to your organization and/or to other actors?*

**Final questions**

To evaluate the questionnaire, the following questions were asked after the survey was completed:

*Are there any subjects you missed during this interview?*

*Related to the questionnaire itself, are there any aspects which could be improved? (length, order of questions, content of questions)*

This draft survey was used during the pre-test, results of which will be presented in chapter 5.

## **Chapter 5. Pre-test Results and Analysis**

From the interviews in the pre-test, which were carried out with constituents, architects, contractors, subcontractors and suppliers, the following (pre-test) results can be presented. These results followed from the pre-test of the draft survey and lead to the design of the final survey. This final survey will be carried out within a larger sample of the Dutch construction industry to quantify the results found in the pre-test. However, the latter will be outside the scope of this research project.

The pre-test results are ordered per factor, which were found in the theoretical review. The following factors will be mentioned: actors, cooperative environment, network density, exchange of resources, exchange of information, exchange of influence, coordination, adaptation and safeguarding. Per factor, the results of the pre-test are mentioned after which an analysis will follow. Furthermore, a distinction will be made between the own situation of an actor and the situation of other actors, from the perspective of a respondent. Not all actors answered every question, sometimes due to time limitations or because they did not have an opinion about the subject. Summaries of the interviews which are carried out can be found in appendix 4. Furthermore, a list of interviewees can be found in appendix 3. The organizations from which an individual was interviewed are mentioned in the tables below as well. To cluster these organizations clearly in groups of actors, colours are added. The following distinction can be made: **constituents**, **architects**, **contractors**, **subcontractors**, **trade organizations** and producers<sup>15</sup>. After presenting the pre-test results and analysis, preliminary conclusions will be given about developments in roles and positions of actors. The final survey, which follows from the analysis, can be found in chapter 6.

### **5.1. Actors**

In the table below, the results are presented which followed from the factor: actors. This factor was measured by the variable: type of strategy.

<b>Actor</b>	<b>Perception of actors about factor: actors</b>
<b><u>Const 1</u></b>	<u>Own situation</u> : More towards commercial project development (market diversification), renovation and brown field projects.

<sup>15</sup> It was decided during the pre-test to divide the group suppliers into trade organizations and producers, because answers were given separately for these two groups of actors.

	<p><u>Situation other actors</u>: House construction corporations move more towards commercial project development. More mergers between house construction corporations.</p>
<a href="#">Const 2</a>	<p><u>Own situation</u>: Climate neutral buildings are a focus for the future.</p> <p><u>Situation other actors</u>: Specialization of small architectural firms (on design or supervision on building site). Role installation companies is increasing. Trend towards sustainability and climate neutral buildings.</p>
<a href="#">Const 3</a>	<p><u>Own situation</u>: They are no trendsetter with respect to climate neutral buildings. They are trendsetter on other areas. They have a partnership with a contractor to develop projects, they specialize on concept development.</p> <p><u>Situation other actors</u>: Stabilization of commercial development projects of house construction corporations. More climate neutral buildings.</p>
<a href="#">Arch 1</a>	<p><u>Own situation</u>: Strategy is product and service diversification: offering a total package.</p> <p><u>Situation other actors</u>: Trend towards specialization of small architectural firms. Therefore, influence of architects in building process decreases. Large architectural firms will diversify. Medium sized architectural firms have to make a clear choice the next years.</p>
<a href="#">Arch 2</a>	<p><u>Own situation</u>: Diversification strategy: offering a total package from design up to and including supervision on a building site.</p> <p><u>Situation other actors</u>: Small architectural firms are specializing, large architectural firms are diversifying (in services/products).</p>
<a href="#">Arch 3</a>	<p><u>Own situation</u>: Focus on care, wellness and culture market, offering a total package (diversification).</p> <p><u>Situation other actors</u>: Smaller and medium sized architectural firms have to make a choice whether they want to specialize or offering a total package. The number of climate advisors is increasing. Trend towards sustainability. Governmental constituents are trendsetters when it comes to climate neutral buildings.</p>
<a href="#">Contrac 1</a>	<p><u>Own situation</u>: Specialization strategy towards markets as well as products.</p> <p><u>Situation other actors</u>: Small contractors will execute smaller projects and remain working on a traditional way. Entire supply chain will specialize, even though the current trend is towards diversification.</p>
<a href="#">Trade org 1</a>	<p><u>Own situation</u>: Focus shift from residential building more towards non-residential building. Diversification of product assortment. However, specializing on certain product markets.</p> <p><u>Situation other actors</u>: Assemblage finishing of a building shift from subcontractors towards trade organizations.</p>
<a href="#">Trade org 2</a>	<p><u>Own situation</u>: Product and service diversification</p> <p><u>Situation other actors</u>: Trade organizations should deliver added value by product and service (knowledge). Separation between unique and serial projects will increase. Trend towards sustainability.</p>
<a href="#">Prod 1</a>	<p><u>Own situation</u>: Diversification of markets and products</p> <p><u>Situation other actors</u>: Small contractors will work more as subcontractors. Horizontal and vertical integration in executing part of supply chain. Assemblage masonry shift towards producers, assemblage finishing of building towards trade organizations.</p>
<a href="#">Prod 2</a>	<p><u>Own situation</u>: Expand their current business, only new products when they add something to</p>

	<p>the existing products.</p> <p><u>Situation other actors:</u> House construction corporations more towards commercial project development. Number of residential projects stabilizing. Trend towards sustainability and climate neutral buildings.</p>
<u>Subcon 1</u>	<p><u>Own situation:</u> Offering total package (diversification)</p> <p><u>Situation other actors:</u> Trend towards climate neutral buildings will develop, but not within the next five years (for residential buildings). Final user wants luxurious products.</p>
<u>Subcon 2</u>	<p><u>Own situation:</u> Specializing on products and services.</p> <p><u>Situation other actors:</u> More climate neutral buildings in residential projects. Contractors specialize on coordination of building processes, even small contractors. Installation companies are diversifying.</p>

### 5.1.1. Analysis

From the results of the pre-test, it turned out that very broad information was gathered, regarding the factor ‘actors’. All actors could answer the questions and had an opinion (perception) about the strategy of other actors. Furthermore, it became clear that the perceptions of actors with respect to the strategy of other actors in their group and about the strategy of other groups of actors differ. However, there were also some subjects about which actors agreed. The most interesting similarities and differences in perceptions of actors are mentioned below:

- Whether or not house construction corporations will continue expanding commercial development projects: further market diversification or not? And if they expand commercial development, how will they do that: themselves or by partnering with contractors? This choice is of influence on the position and tasks of constituents in the future.
- The difference between professional and non-professional constituents with respect to the role of an architect during a building process: to what extent will an architect be involved in a building process in the future? This involvement is of influence to the position and task of an architect in the future.
- Which actor will become supervisor on building sites: building management office, architect, constituent or contractor? Being supervisor on a building site means a task and power (influence on position) for an actor.
- The separation between design and execution phase of a building project: will this separation increase or decrease? The chosen strategy of architects is therefore of importance. Some actors state that this separation will increase, because architects get a narrower task during a building process. This could also affect the position of an architect.

- Specialization or diversification strategy: is this choice related to size of an organization? Will small organizations specialize where as larger organizations will diversify, thereby increasing the separation between actors in smaller and larger projects? When size of an organization is related to the type of strategy they choose, there could be a clear distinction between the positions and tasks of actors by size.
- During the execution stage of a building process (subcontractors and suppliers), a trend can be viewed towards horizontal as well as vertical integration. The question remains however: who will assemblage materials on the building site: subcontractors, trade organizations or producers? And is there a difference between the masonry stage of a building project and the finishing stage? An integration strategy of several groups of actors could lead to the situation where actors who carry out the same tasks and want the same position.
- All interviewed actors seem to agree about the fact that contractors will develop towards coordinators of building processes (and less executors). However, it is the question to what extent smaller contractors will follow this development. A contractor who executes a building project has another position and carries out other tasks than contractors who are coordinator of a process.
- Climate neutral buildings will become more important in the future, but some actors state that within residential building, this development will not pull through the next five years, because final users of those buildings want luxurious products (which are often not well for the environment). Is there a difference in development between residential and non-residential building? If the latter is true, some actors in that sectors will have different positions and tasks (for example installation organizations).

Within the draft survey, the factor ‘actors’ was measured by the variable strategy, which consisted of four questions. The first question is a closed question about the strategy of an organization. This question will remain the same within the final questionnaire: *Which (long-term) strategy does your organisation follow?*

Because most interesting information was gathered by the question ‘*Could you give a short explanation about the type of strategy your organization follow?*’ this (open) question will remain in the final survey. For example, if respondents say they are following a vertical integration strategy, what activities are they integrating?

The latter two open questions in the draft survey will be replaced by statements, based on the differences in perspectives mentioned above. This choice is made, because a lot of open

questions in a written questionnaire should be avoided (decreasing response rates) and this choice is possible without compromising to the quality of the gathered information. The statements can be found in chapter 6 (design final survey).

## 5.2. Cooperative environment

In the table below, the results are presented which followed from the factor: cooperative environment. This factor was measured by the variables: level and type of collaboration.

Actor	Perception of actors about factor: cooperative environment
<a href="#">Const 1</a>	<u>Own situation:</u> More collaboration with other corporations and project developers. <u>Situation other actors:</u> Collaboration between house construction corporations is increasing. This is also true for collaboration between corporations and project developers.
<a href="#">Const 2</a>	<u>Situation other actors:</u> A higher level of collaboration between actors will not be reached to next years. Collaboration is still seen as a threat instead of an opportunity. The discovery of the large scale fraud in 2002 was just the top of the iceberg and therefore, some actors still do not want to open up to each other and collaborate closer.
<a href="#">Const 3</a>	<u>Own situation:</u> Longer-term collaboration between this constituent and contractors. Work as much as possible with the same group of architects. <u>Situation other actors:</u> A higher level of collaboration will pull through the next years between contractors and constituents. Furthermore, constituents work more with the same architects and suppliers. Collaboration between corporations is also increasing.
<a href="#">Arch 1</a>	<u>Own situation:</u> More longer-term relationships with suppliers. <u>Situation other actors:</u> Actors are more open to a higher level of collaboration, but in practice still nothing changes. Enlargement of actors (mergers) makes collaboration easier. However, legislation regarding tendering procedures makes longer-term collaboration more difficult.
<a href="#">Arch 2</a>	<u>Own situation:</u> They do not want to collaborate exclusively with one other actor (per group). <u>Situation other actors:</u> Future more towards a higher level of collaboration.
<a href="#">Arch 3</a>	<u>Own situation:</u> They work a lot with governmental constituents, who have to use tendering procedures, therefore longer-term relationships are harder to develop. <u>Situation other actors:</u> Less longer-term collaboration between actors, because of increasing legislation regarding tendering procedures.
<a href="#">Contra 1</a>	<u>Own situation:</u> They work with the same constituents several times, longer-term relationships. <u>Situation other actors:</u> Changes in attitude of actors is only superficial, when it comes to action nothing changes. Collaboration on a higher level (transparent and open) is a development for the longer-term.
<a href="#">Trade org 1</a>	<u>Own situation:</u> Longer-term relationships with suppliers and subcontractors. Sometimes also with contractors. <u>Situation other actors:</u> Changes in attitude of construction industry is only superficial.
<a href="#">Prod 1</a>	<u>Situation other actors:</u> Collaboration on a higher level is increasing, because of globalization. More trust between actors and more longer-term contracts between suppliers and

	subcontractors.
<u>Prod 2</u>	<u>Own situation:</u> They work with a select fixed group of subcontractors with who they reach a high level of collaboration. <u>Situation other actors:</u> Actors who already see the advantages of a higher level of collaboration will continue working that way, but there will always be actors who remain working traditionally. However, more 'teams' are formed.
<u>Subcon 1</u>	<u>Own situation:</u> Work together with other installation organizations and often with the same contractors. <u>Situation other actors:</u> Installation organizations collaborate more and more, because there is work enough for all of them.
<u>Subcon 2</u>	<u>Own situation:</u> They work with the same group of contractors and suppliers if possible. <u>Situation other actors:</u> Installation organizations work together more and more (higher level of collaboration).

### 5.2.1. Analysis

Since collaboration and supply chain integration are part of the context of this research project, cooperative environment is an important factor. During the pre-test it became clear that perceptions of actors differ about the question whether or not the Dutch construction industry is developing towards a higher level of collaboration between actors. For example, subcontractors and suppliers seem to develop towards longer-term collaboration, where as architects and contractors still have shorter-term relationships most of the time. Therefore, within the final survey a (closed) question<sup>16</sup> is added: *With which actors do you have longer-term relationships and with who do you expect longer-term relationships in the future?*

The answers to this question will provide an overview about which actors are having longer-term relationships (with each other) and how this situation will develop in the future. Since longer-term collaboration (type of collaboration) and a high level of collaboration turned out to be related to each other during the pre-test<sup>17</sup>, the two questions about this subject will be replaced by one question about the type of collaboration in the final survey.

Finally, some statements (based on Likert-scale) are added to get some information about external factors which influence collaboration in the Dutch construction industry. From the results of the pre-test, it became clear that opinions differ about whether or not tendering procedures should be obliged and the influence this development has on longer-term collaboration. Furthermore, globalization seems to have influence on the level of

<sup>16</sup> Answer possibilities are given in appendix 5: final survey.

<sup>17</sup> When respondents answered those questions, it turned out that a higher level of collaboration means a longer-term relationship (and the other way around).

collaboration between actors. Whether or not actors collaborate on a higher level has influence on their positions. Therefore, this will be asked by statements, which can be found in the final survey (chapter 6).

### 5.3. Network density

In the table below, the results are presented which followed from the factor: network density. This factor was measured by the variables: frequency of interaction and importance of other actors.

Actor	Perception of actors about factor: network density
<a href="#">Const 1</a>	<u>Own situation:</u> Always direct contact with architects and contractors. Also direct contact with suppliers in early stage of building process to select materials themselves. Sometimes building management offices are involved in their building processes. They only want to work with small to medium sized contractors. Architects are more important to them than contractors. <u>Situation of other actors:</u> More actors necessary in building process (more advisors)
<a href="#">Const 2</a>	<u>Own situation:</u> Always direct contact with final user, architect and contractors.
<a href="#">Const 3</a>	<u>Own situation:</u> Only direct contact with architects and contractors. They send acquisition from suppliers to architect or contractor.
<a href="#">Arch 1</a>	<u>Own situation:</u> More direct contact between architect and suppliers. Suppliers approach architect more. During execution of a project, contact between suppliers and architect through contractor. They sometimes subscribe a certain supplier in a bill of materials. <u>Situation of other actors:</u> Separation between design and execution phase is increasing, because involvement architect in building processes is decreasing. More direct contact between architects and suppliers.
<a href="#">Arch 2</a>	<u>Own situation:</u> Direct contact between architect and suppliers is limited. Architect is more approaching constituents actively. They do not subscribe certain suppliers in a bill of materials. <u>Situation of other actors:</u> Trend of all actors (especially suppliers) to get involved in a building process as early as possible. Run on architects and constituents of other actors.
<a href="#">Arch 3</a>	<u>Own situation:</u> Direct contact with architects, constituents and suppliers. However, they never subscribe suppliers in a bill of materials. <u>Situation of other actors:</u> Architects are more directly approached by contractors, who also develop projects themselves. More building management offices contributed to the fact that architect became less involved in a building process.
<a href="#">Contrac 1</a>	<u>Own situation:</u> Direct contact with constituent, architect and suppliers. <u>Situation of other actors:</u> Trend towards a narrower separation between design and execution.
<a href="#">Trade org 1</a>	<u>Own situation:</u> Direct contact with suppliers and contractors, sometimes with architects. <u>Situation of other actors:</u> More producers and trade organizations seek direct contact with architects and constituents. When this leads to a price offer, producers go to trade organizations, which deliver the products. Thereby, trade organizations become the risk carrying party.

<u>Trade org 2</u>	<p><u>Own situation:</u> Direct contact with producers and contractors. They are not approaching architects and constituents.</p> <p><u>Situation of other actors:</u> Small traditional working producers and contractors will involve trade organizations in the process, where as larger producers and contractors will more and more find each other through direct contact. Furthermore, a distinction can be made between masonry stage of a building process (more direct from producer to contractor) and finishing stage (producer to trade organization to contractor). Trade organizations will become logistic coordinators.</p>
<u>Prod 1</u>	<p><u>Own situation:</u> Always contact with constituent. Also contact with architects, contractors and trade organizations. Relations they have with specific other actors are important to them and relation with contractor, who also develops projects.</p> <p><u>Situation of other actors:</u> Separation between design and execution stage of a building process is decreasing, because of more direct contact between producers and architects (material subscribers). Sometimes, producers are part of a building team. Because trade organizations are no longer always involved, the supply chain will simplify in the future. Trade organizations will become logistic coordinators.</p>
<u>Prod 2</u>	<p><u>Own situation:</u> Direct contact with all other actors.</p> <p><u>Situation of other actors:</u> Suppliers are more and more approaching architect and constituents directly to get involved in a building process as early as possible. Contractor should take care of logistic coordination on building site.</p>
<u>Subcon 1</u>	<p><u>Own situation:</u> Direct contact with contractors and producers/trade organizations. Sometimes, architects prescribe them as installation organization, but most of the time a contractor selects them based on price.</p>
<u>Subcon 2</u>	<p><u>Own situation:</u> Direct contact with contractors and suppliers.</p> <p><u>Situation of other actors:</u> Pyramid structure in building process becomes more common: contractor, level of subcontractors, another level of subcontractors, suppliers.</p>

### 5.3.1. Analysis

From the results of the pre-test mentioned above, it turned out that answers given on the questions about the factor network density were very diverse and broad information was gathered. Within the survey, network density can be used to measure positions and authorities of actors in a network. Furthermore, a higher level of network density indicates a higher level of collaboration in a network.

In the draft survey, network density consists of two variables: importance of other actors and frequency of interaction. During the pre-test it turned out that most interesting information was gathered through the variable 'frequency of interaction'. Furthermore, answering questions about the variable 'importance of other actors' turned out to be hard for respondents and delivered few new information. Therefore, within the final survey, network density will

only be measured by the variable 'frequency of interaction'. Within the draft survey, the variable 'frequency of interaction' consists of two questions, one of those questions is closed<sup>18</sup>: *Does your organization have direct contact with the following actors (in an average building process) and to what extent?* This question will remain the same within the final survey. The second question is open ended and will be replaced by statements. The reason why a choice is made for statements (based on Likert-scale) is the same as for the factor strategy: too broad information was gathered to create answer possibilities for closed or multiple choice questions. Furthermore, it is interesting to quantify the results of the pre-test and statements can be used to measure differences and similarities in perceptions of actors. The following differences and similarities in perspectives are found during the pre-test:

- Producers and trade organizations try to get involved in a building process as early as possible to become prescribed in a bill of materials, where as architects indicate that they do not prescribe suppliers in a bill of materials. The question is therefore whether or not direct contact between suppliers and architects is useful? However, more direct contact between actors in a network would lead to a higher level of network density. This has influence on positions of actors.
- Some trade organizations have direct contact with all involved actors, where as other trade organizations only have contact with contractors and suppliers. To what extent are trade organizations seeking more contact with other actors? Whether or not trade organizations have contact with other actors in the industry has influence on their positions.
- Producers indicate that they have more direct contact with constituents, where as constituents indicate that there is little to no contact with producers. Producers try to strengthen their position by seeking more direct contact with constituents (and architects). The question is if this is useful, since constituents indicate that this contact is little and not always wanted.
- Some actors make a distinction between small and large organizations: large organizations seem to work more integral as small organizations. If a distinction can be made between the size of an organization and network density, some conclusions can be drawn about positions of larger organizations relatively to smaller organizations.
- The role of trade organizations is under pressure: according to some producers they are directly trading with contractors and architects. However, trade organizations think differently. The question remains what the task and position of a trade organization should be in the future? It is said that a distinction can be made between masonry and finishing of a building, when it comes to the position of a trade organization.

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<sup>18</sup> Answer possibilities can be found in chapter 6.

- Some actors indicate that the supply chain will simplify in the future (because trade organizations are no longer involved), where as other actors state that the supply chain will become more complex, because a second level of subcontractors will be introduced (pyramid structure). Simplifying or making a supply chain more complex leads to a re-division of roles and positions.

To quantify these differences in perspectives, they were translated into statements (based on Likert-scale), which can be found in the final survey in chapter 6.

#### 5.4. Exchange of resources

In the table, the results are presented which followed from the factor: exchange of resources. This factor was measured by the variables: type and amount of resources.

Actor	Perceptions of actors about factor: exchange of resources
<a href="#">Const 1</a>	<u>Situation of other actors:</u> Shortage of staff, labour is critical. However, this has no big influence on the construction industry and this situation will improve the next years.
<a href="#">Const 2</a>	<u>Situation of other actors:</u> Especially technical staff is hard to find (for a contractor), shortage of labour. No relation between economical situation and shortage or abundance of labour.
<a href="#">Arch 1</a>	<u>Own situation:</u> Shortage of technical staff <u>Situation of other actors:</u> Shortage of staff has influence on construction industry and strategy of actors.
<a href="#">Arch 2</a>	<u>Own situation:</u> Shortage of technical staff
<a href="#">Contra 1</a>	<u>Own situation:</u> They adapt their strategy to the shortage of staff, by hiring more and more subcontractors to carry out the job. <u>Situation of other actors:</u> Shortage of staff in construction industry does not have longer-term consequences.
<a href="#">Trade org 1</a>	<u>Own situation:</u> Shortage of staff (commercial and technical). <u>Situation of other actors:</u> To solve the problem which is created by shortage of staff, work conditions on building sites should be improved.
<a href="#">Trade org 2</a>	<u>Own situation:</u> They have not much problems finding new staff. <u>Situation of other actors:</u> Shortage of staff leads to the fact that knowledge becomes more important.
<a href="#">Prod 1</a>	<u>Situation of other actors:</u> Shortage of staff. To solve this problem, prefab is used more and work conditions should be improved. However, this shortage of staff will decrease in the future.
<a href="#">Prod 2</a>	<u>Own situation:</u> They had a little shortage of staff, but lately they do not have problems anymore finding new staff. <u>Situation of other actors:</u> Shortage of technical staff leads to a lower quality of buildings.
<a href="#">Subcon 1</a>	<u>Own situation:</u> Because of shortage of staff in installation branche, there is work enough and therefore, they have a strong position at the moment. Staff is a restrictive condition for

	expanding their business. <u>Situation of other actors:</u> Number of sole traders on building sites is increasing. They organize themselves in network organizations.
<u>Subcon 2</u>	<u>Own situation:</u> They use sole traders more and more as subcontractors to carry out their jobs. <u>Situation of other actors:</u> More sole traders, who organize themselves in network organizations. Shortage of staff seems to be temporarily. Prefab is not a solution to the problems which shortage of staff causes.

#### **5.4.1. Analysis**

From the results of the pre-test, it turned out that the opinions of interviewed actors about critical and scarce resources are the same: labour is a scarce and critical resource at the moment. However, perceptions of actors differ about the consequences of this shortage. Therefore, within the final survey the focus will be on the latter subject, because whether or not this shortage of staff has influence on future developments in the construction industry partly determines positions and roles of actors.

Both questions in the draft survey were open-ended. The first question (which resources are scarce and/or critical?) will be replaced, because all actors answered the same on this question. Therefore, the answer to this question (labour is scarce in the Dutch construction industry) will be considered as given. However, it will be tested if other actors agree with this development. Within the final survey, the focus will be on the consequences of this shortage of labour on the construction industry. Opinions differ about that subject: some actors state that this shortage is temporary and will have no consequences on the future construction industry where as other actors state that this shortage will exist and/or become worse the next years. Furthermore, one other development can be viewed: the number of sole traders on building sites seems to be increasing and these sole traders organize themselves in network organizations, according to some actors. This could give those sole traders (subcontractors) a stronger position in the future and therefore, statements about this subject are also included. To measure those differences in perspectives of actors, statements will be created about the previous mentioned subjects and included in the final survey (chapter 6).

#### **5.5. Exchange of information**

In the table on the next page, the results are presented which followed from the factor: exchange of information. This factor was measured by the variables: type and amount of information.

<b>Actor</b>	<b>Perceptions of actors about factor: exchange of information</b>
<a href="#"><u>Const 1</u></a>	<u>Own situation:</u> They take a central position during a building process and therefore, has no problems with information exchange. All information is critical.
<a href="#"><u>Const 2</u></a>	<u>Own situation:</u> Use share points and internet to share information. <u>Situation of other actors:</u> Trend to share information through internet or share points. Coordination of information is however still necessary and most problems arise there. A contractor should take care of that.
<a href="#"><u>Const 3</u></a>	<u>Own situation:</u> Because of their partnership with a contractor, they have not much to do with information exchange, except with contractors. However, the latter is not a problem. <u>Situation of other actors:</u> Information exchange remains work which has to be done by actors themselves. Information systems are nice, but do not solve the problems.
<a href="#"><u>Arch 1</u></a>	<u>Own situation:</u> Exchange information with contractors, suppliers and constituents. Information always important. <u>Situation of other actors:</u> Building management offices should play a bigger role with respect to information exchange in the future.
<a href="#"><u>Arch 2</u></a>	<u>Own situation:</u> Exchange information with contractors, suppliers and constituents. <u>Situation of other actors:</u> Building information management (BIM) is more and more applied.
<a href="#"><u>Arch 3</u></a>	<u>Own situation:</u> Exchange information by mail and e-mail. <u>Situation of other actors:</u> Moment of transferring information from design to execution stage of a process is a source of risks, but not the cause of problems with information exchange. Share points should be used more in the future.
<a href="#"><u>Contrac 1</u></a>	<u>Situation of other actors:</u> The level of information exchange between actors is increasing. Actors become more open to each other. Information is critical.
<a href="#"><u>Trade org 1</u></a>	<u>Own situation:</u> Information exchange is a problem. Often problems arise during the preparation of a project by the contractor.
<a href="#"><u>Trade org 2</u></a>	<u>Own situation:</u> Often receive to little information from contractors to do their part of the job properly. More problems with small contractors than with large contractors.
<a href="#"><u>Prod 1</u></a>	<u>Situation of other actors:</u> The level of information exchange between actors is increasing. More direct contact between actors at the front and at the end of the supply chain. This leads to a higher level of trust between actors.
<a href="#"><u>Prod 2</u></a>	<u>Situation of other actors:</u> Source of problems during building processes is often work pressure (of contractors).
<a href="#"><u>Subcon 1</u></a>	<u>Own situation:</u> Exchanging information with contractors is good, no problems arise there. However, changes in designs are a source of problems and delay.
<a href="#"><u>Subcon 2</u></a>	<u>Own situation:</u> Exchanging information is not a problem.

### 5.5.1. Analysis

During the pre-test, questions about information exchange turned out to be rather hard to answer for respondents. The concept of information exchange is very broad interpretable. Which information is critical to actors is mostly answered by: 'all information'. The actors

from which respondents received information, turned out to be the same actors with who they have direct contact. To receive useful information about this factor, a lot of questions should be asked. This would lead however to a very extended questionnaire. Therefore, the choice is made to delete this factor from the final questionnaire. Developments in the process of information exchange provides information about tasks and positions. However, this information can also be received by measuring other factors, like strategy and exchange of resources and these latter factors are easier to measure. The results of the pre-test about the factor exchange of information should, however, be kept in mind when analyzing the results of the final survey.

### 5.6. Exchange of influence

In the table, the results are presented which followed from the factor: exchange of influence. This factor was measured by the variable: relative division of power.

Actor	Perceptions of actors about factor: exchange of influence
<a href="#">Const 1</a>	<u>Situation of other actors:</u> Contractors should never be the actor who determines everything on a building site, always an independent actor who is the supervisor on a building site. Because of more brown fields, house construction corporations get more influence (preferred partner of local governments).
<a href="#">Const 2</a>	<u>Situation of other actors:</u> Subcontractors have (relatively) the weakest position. For smaller projects, architects have more chance to be supervisor on a building site. For larger projects, an independent other party will carry out this task, thereby decreasing the influence of architects in a building process. Producers are not getting more influence in the next years.
<a href="#">Const 3</a>	<u>Own situation:</u> Architect takes care of esthetical supervision on building sites. For other aspects, a contractor is supervisor. <u>Situation of other actors:</u> Battle of power during a building process between constituent, architect and contractor. Installation companies get more influence in the future. Contractors should take all responsibility during a building process and therefore have more influence.
<a href="#">Arch 1</a>	<u>Situation of other actors:</u> Subcontractors have power, because labour is scarce. The division of power during a building process depends largely on chosen type of contract. Depends on a contractor to what extent an architect is involved in a process, tendency towards participation up to and including bill of materials. Installation organizations get more influence. Final user gets less influence.
<a href="#">Arch 2</a>	<u>Own situation:</u> Influence architects should increase in the future, because of more brown fields. <u>Situation of other actors:</u> Contractors, who also develop projects themselves, have most influence and power. Task and thereby influence of an architect is decreasing. In design stage, power is developing towards constituents. Within execution stage, contractors have and will remain having most power. Producers do not receive more influence, because of standardization and unique solutions.

<a href="#">Arch 3</a>	<u>Situation of other actors:</u> Installation organizations are more and more earlier involved in a building process, thereby receiving more influence. Building management offices take over supervision on building sites from architects (decreasing influence architects). However, this development seems to be turning around now and the next years. Constituents should have most influence during a building process.
<a href="#">Contrac 1</a>	<u>Situation of other actors:</u> Subcontractors have relatively the weakest position in the supply chain. Influence architect will decrease, because supervision on a building site becomes a task of contractors. Furthermore, producers get more influence, because of ongoing standardization. Some suppliers are sometimes part of building teams.
<a href="#">Trade org 1</a>	<u>Situation of other actors:</u> Relatively, subcontractors have the weakest position. Because of shortage of staff at the moment they have however influence on the progress of a project. Professional constituents <sup>19</sup> get more influence, by doing their own supervision board on a building site. For non-professional constituents, building management offices or architects carry out that task.
<a href="#">Trade org 2</a>	<u>Situation of other actors:</u> Contractors, who also develop projects themselves have most power during an entire building process. However, contractors, who do not develop their own projects, seem to have less freedom to deviate from the bill of materials. During design stage, constituents have most influence. During execution stage, contractors are most powerful, but seem to get less influence.
<a href="#">Prod 1</a>	<u>Situation of other actors:</u> Subcontractors have relatively the weakest position and least influence during a building process. Architects have lost a lot of their influence the past years, contractors are more and more doing supervision on a building site themselves. Contractors, who also develop projects themselves have the strongest position now and in the future. However, the influence of producers is increasing, because of earlier involvement in a process and more direct contact with constituents.
<a href="#">Prod 2</a>	<u>Situation of other actors:</u> Contractors, who also develop projects themselves have most influence, now and in the future. The division of power of an architect differs with the sector they operate in. Within non-residential building, an architect has in general more influence than within residential building.
<a href="#">Subcon 1</a>	<u>Own situation:</u> They are dependent on contractors as well as suppliers. Therefore, not much influence on building processes. However, because labour is scarce at the moment, they are less dependent on contractors. <u>Situation of other actors:</u> Within design phase, constituents have most influence. During the execution phase of a project, contractors have most influence. The final user gets more influence within residential building.
<a href="#">Subcon 2</a>	<u>Situation of other actors:</u> Final users get more influence on residential building projects. Contractors, who also develops projects themselves have most influence during a building process.

<sup>19</sup> A professional constituent is a constituent who has carried out several building projects, a non-professional constituent has carried out just one building project.

### 5.6.1. Analysis

During the pre-test, it turns out that perceptions of actors about this factor largely differ. Distinctions seem to be made between the relative division of power within residential and non-residential building, between the perception of different groups of actors, the stage of a building process and between size of organizations. The most interesting differences and similarities in perceptions are mentioned below:

- Opinions differ whether or not producers get more influence during a building process, because of ongoing standardization and working with unique solutions. Some actors (mainly suppliers) think that influence of producers within a building process is increasing, because of the increasing level of direct contact with architects and constituents. Architects and constituents themselves do not think that the influence of producers on a building process is increasing.
- Another question is whether or not installation organizations get more influence during a building process. The latter happens, according to some actors, because installations become a larger part of the contract amount of a construction project. However, not everybody agrees on this. Whether or not this is true has influence on the position of installation organizations.
- All interviewed actors agree that contractors, who also develop projects themselves, have the strongest position within the supply chain and they will keep that position the upcoming years. However, the question remains what the influence of this development is for the role of an architect, since some actors indicate that this does reduce the role of an architect to the provisional and final design.
- Furthermore, a distinction seems to be made by some actors, regarding the role of an architect and the sector in which they operate. Within residential building projects, an architect seems to get less influence as in non-residential building projects in the future. Less influence of an architect, could mean a weaker position of that actor.
- Opinions also differ about the fact whether or not contractors, who work for professional constituents, get less freedom to deviate from a bill of materials. This could be of influence on the amount of power a contractor has.

Within the draft survey, this factor was measured by three questions. The first question is closed and will remain the same: *Which actor does in your opinion has most power within a building process?* From that question, information will be gathered about the perceived

current and future division of power. Respondents will be asked to rate the six<sup>20</sup> groups of actors from most influence (1) to least influence (ordinal scale). Thereby, an overview is created of the future division of power between actors (since power is only there when perceived by other actors). After this closed question, two open questions followed in the draft survey. These open questions will be replaced by statements (on Likert scale), based on the most interesting differences in perspectives mentioned above. These statements can be found in chapter 6.

### 5.7. Coordination

In the table, the results are presented which followed from the factor: coordination. This factor was measured by the variable: coordination mechanism. This variable was used to measure overall coordination during a building process. Therefore, no distinction is made between the own situation of a respondent and the situation of other actors.

Actor	Perceptions of actors about factor: coordination
<a href="#">Const 1</a>	Contractors should coordinate the building site, but the overall coordination should be done by another actor (architect or constituent). Contractors should also remain executing a building process.
<a href="#">Const 2</a>	The quality of coordination of building processes by contractors is decreasing. A contractor hires several subcontractors to carry out a project and some contractors that is coordinating a project. However, there is more involved. Coordination is therefore becoming an increasing problem.
<a href="#">Const 3</a>	Contractors should coordinate a building process and take full responsibility. Medium sized and large contractors can handle that responsibility.
<a href="#">Arch 1</a>	Contractors become more and more coordinators of a building process instead of executors.
<a href="#">Arch 2</a>	Coordination is a problem in the Dutch construction industry. Contractors are having problems coordinating a building process or do not make enough effort. A model should be set up in which one actor is the overall coordinator (building management office or architect) of a building process and there should another coordinator per stage of a building project. Currently, the level of coordination of a contractor is decreasing.
<a href="#">Contrac 1</a>	Contractors are developing towards becoming coordinators of a process instead of executors. Execution of a building project is shifting towards subcontractors, suppliers are moving towards the tasks of subcontractors. Producers are not shifting towards the tasks of contractors yet.
<a href="#">Trade org 1</a>	Contractors become more and more coordinators of a building process instead of executors. However, when an architect is supervisor on a building site, coordination of a process is often

<sup>20</sup> During the pre-test it became clear that a distinction should be made within the group suppliers. Suppliers should be divided in trade organizations and producers. Therefore, the total number of groups is six (and not five anymore as in the pre-test).

	better arranged than in the situation that a contractor is in charge.
<a href="#">Trade org 2</a>	Contractors become more coordinators of a process and less executors. In the future, contractors should coordinate a building process. Small contractors remain coordinating ad-hoc.
<a href="#">Prod 1</a>	Logistic coordination becomes more important in the future. This could be a task for a building management office. An architect should be the overall coordinator of a building process. Contractors become more coordinators on a building site than executors. However, contractors should take the lead more when it comes to coordination. Large sized contractors are increasing the level of coordination in their processes, but small contractors remain working ad-hoc.
<a href="#">Subcon 1</a>	Contractors become more coordinators of a building process instead of executors. This development will continue the next five years. Small contractors remain working as executors and coordinate a building process ad-hoc. Some subcontractors take part of the coordination task of a contractor.

### 5.7.1. Analysis

From the results from the pre-test mentioned above, it turned out that the questions about coordination deliver interesting information about coordination during a building process. However, coordination is included in this questionnaire to measure tasks and responsibilities of actors in a network. Looking at the pre-test results from that point of view, it only seems an interesting question whether a contractor or another actor should coordinate building processes and whether or not they are capable to do that. Furthermore, an option was given by an actor to design a model for coordination during a building process. Therefore, only these latter two subjects will be included in the final survey and translated into statements. Within the draft survey, the first question about coordination mechanisms turned out to be too hard to answer. Therefore, this question will be deleted from the questionnaire and will be replaced by the previous mentioned statements. These statements are based on a Likert-scale and are set up based on the results of the pre-test, within the context of coordination as a task for an actor during a building process. The focus of this factor will shift from how the process is coordinated to who will coordinate building processes in the future.

### 5.8. Adaptation

In the table on the next page, the results are presented which followed from the factor: adaptation. This factor was measured by the variables: type and level of adaptation.

<b>Actor</b>	<b>Perceptions of actors about factor: adaptation</b>
<a href="#">Const 2</a>	<u>Own situation</u> : it is not easy to get something adapted to their wishes by other actors.
<a href="#">Const 3</a>	<u>Own situation</u> : Adaptations are done unconsciously during longer-term relationships. Collaboration between actors leads to adaptations on the long term on both sides.

<a href="#">Arch 1</a>	<u>Own situation</u> : Only project-specific adaptations for other actors are done. Some of these adaptations become standards (product and process adaptations).
<a href="#">Contrac 1</a>	<u>Own situation</u> : Suppliers do product adaptations if they ask them to. Process and procedure adaptations are also done, if necessary (by suppliers).
<a href="#">Trade org 1</a>	<u>Own situation</u> : Relationship-specific adaptations are done for constituents and to a certain degree for contractors.
<a href="#">Trade org 2</a>	<u>Own situation</u> : They do adaptations for contractors, but have to do that in collaboration with their suppliers, since they do not produce products themselves.
<a href="#">Prod 1</a>	<u>Own situation</u> : Adaptations to products are done in collaboration with contractors and other actors.
<a href="#">Prod 2</a>	<u>Own situation</u> : Relationship-specific adaptations are done for constituents and to a lower degree for contractors.
<a href="#">Subcon 1</a>	<u>Own situation</u> : Adaptations for contractors are done, but contractors have to pay for that. Only project-specific adaptations (re-design of products).
<a href="#">Subcon 2</a>	<u>Own situation</u> : Adaptations are done for contractors or constituents, but only re-design of existing products.

### 5.8.1. Analysis

From the results of the pre-test becomes clear that little information was gathered through the factor adaptation. As adaptation is an indicator of authorities and positions, information about these subjects can also be gathered by other factors, which deliver more useful information. Therefore, this factor will be deleted from the final survey.

### 5.9. Safeguarding

In the table on the next page, the results are presented which followed from the factor: safeguarding. This factor was measured by the variables: type of contracts and importance of relational norms.

<b>Actor</b>	<b>Perceptions of actors about factor: safeguarding</b>
<a href="#">Const 1</a>	<p><u>Own situation</u>: Experimenting with turn key contracts. However, often tendering procedures and general contracts are used (for contractors). Work with same architect every time if possible.</p> <p><u>Situation of other actors</u>: Trend of house construction corporations who work with the same architect(s) in all their projects. Price is not always the most important selection criterion anymore during a tendering procedure.</p>
<a href="#">Const 2</a>	<p><u>Own situation</u>: They work with tendering procedures (general contracting) and design and build contracts. They do not favour building team constructions.</p> <p><u>Situation of other actors</u>: Contractors favour design and build and building team constructions,</p>

	architect want building team contracts and general contracts. It is hard to say which form will be used most often in the future, although a trend can be viewed towards design and build contracts. However, rules concerning tendering procedures become tighter. Reputation becomes more important in the future.
<a href="#">Const 3</a>	<u>Own situation:</u> They experiment with different type of contracts: turn key, design and build, building team constructions. They favour turn key contracts, because all the risk and responsibility is thereby for a contractor. <u>Situation of other actors:</u> Risk management is an important item the next years. Constituents want to put responsibility more and more completely by a contractor. Therefore, a contractor should become involved in a process early.
<a href="#">Arch 1</a>	<u>Situation of other actors:</u> Type of contract which is used is strongly related to state of economy. Price offers low > tendering procedures, price offer high > integrated contracts. Tendering procedures are more and more used, because of increased norms. Architects are also more and more selected through tendering procedures (and for smaller projects). Design and build and building team contracts become more important in the future. Trust between actors in the construction industry is increasing.
<a href="#">Arch 2</a>	<u>Own situation:</u> They favour building team constructions or tendering procedures. <u>Situation of other actors:</u> Design and build and building team contracts are the contracts for the future. Preference contractor for design and build and preference architect for building team. Architects are more and more selected through tendering procedures. Reputation and trust are and will remain important.
<a href="#">Arch 3</a>	<u>Situation of other actors:</u> Building team contracts could work effectively, if they are used right. The latter is still a problem. In the past, time, money and quality were most thought of, nowadays risks are the most important concern during a building process. Thereby increasing the importance of contracts. Constituents want more and more total solutions: turn key contracts. Distinction between constituents becomes larger: one group who says 'I take full responsibility' and another group who says 'I take no responsibility at all.
<a href="#">Contrac 1</a>	<u>Situation of other actors:</u> Design and build and building team contracts will become more important in the future. Used type of contracts are related to the state of economy. When prices are low, tendering procedures are more used; when prices are high, integrated contracts are more used.
<a href="#">Trade org 1</a>	<u>Situation of other actors:</u> No overview of type of contracts which are used most. Reputation becomes more important, building trust is hard because relationships are often short-term.
<a href="#">Trade org 2</a>	<u>Situation of other actors:</u> No overview on type of contracts which are used between constituents and contractors. Contractors are more and more trying to move responsibilities during and after a building process towards suppliers. Because the number of sole traders on a building site is increasing, the question who has which responsibility becomes more unclear.
<a href="#">Prod 1</a>	<u>Situation of other actors:</u> No insight in type of contracts between constituents and contractors. Contractors try to move responsibility more and more towards producers and trade organizations. It is expected that responsibilities during a building process will be divided between contractor and producers in the future. Because of more sole traders on the building site, it is hard to know who is responsible for what.

<u>Prod 2</u>	<u>Situation of other actors:</u> No insight in type of contracts between constituent and contractor. Building team constructions do not always work out, this could have something to do with actors who do not want to take a different role in a building process. Tendering procedures should not be obliged, it would be better if the market could act freely. More longer-term contracts between suppliers and subcontractors and small architectural firms and contractors. Contractors try more and more to move responsibilities towards suppliers.
<u>Subcon 1</u>	<u>Own situation:</u> They were asked to participate in some building team constructions, but they are not doing that anymore without a guarantee that they get to carry out the job as well. Price remains the most important selection criterion for a contractor. <u>Situation of other actors:</u> No shift in responsibilities on a building site. After the discovery of the large scale fraud in 2002, there are still price agreements between certain actors. This delays openness and transparency between actors. Reputation becomes more important.
<u>Subcon 2</u>	<u>Own situation:</u> They only do building team construction with contractors they have good experiences with. They do not want to give advice and then be replaced by another installation company who offers a slightly lower price. <u>Situation of other actors:</u> Trust and reputation becomes more important, but price remains most important as a selection criterion.

### 5.9.1. Analysis

From the results of the pre-test it becomes clear that very broad information can be gathered from this factor. Within the draft survey, two items are related to the factor safeguarding: types of contracts and importance of relational norms. From both variables, the most interesting differences and similarities in perspectives of actors are:

- Some actors state that the contractual form which is mostly used depends on state of economy. In times of shortage, more integrated contracts are used; in times of abundance, tendering procedures are more common. When is the case, roles (tasks and responsibilities) of actors also differ with the state of economy.
- Opinions also differ about the involvement of constituents in a building process: some constituents will take full responsibility for a building process in the future, where as other constituents seem to take no responsibility at all. The latter group is experimenting with turn key contracts. Whether or not constituents take responsibility during a building process has influence on the roles of actors.
- Several actors indicate that risk management will become more important than time, money and quality the next years. Therefore, a shift in risks and responsibilities can be expected. However, the question is whether or not this counts for all actors.
- Most actors agree on the fact that a contractor is the actor who should coordinate a building process. However, are contractors capable to do that and do they want to take that role?

- Suppliers and subcontractors indicate that contractors try to shift responsibilities towards them. However, not all actors view this development like this. Therefore, it is asked who will take responsibility during the execution phase of a project in the future.
- The procedures regarding tendering seems to become tighter and tighter. The question whether governmental constituents have the choice to choose their own type of contract during a building process in the future is asked. When tendering becomes obliged, constituents have less freedom to use integrated contracts. This development has influence on future roles and positions of actors.
- Some actors state that the discovery of the large scale fraud in 2002 was just the top of the iceberg. There are still agreements about price between certain actors. This could have influence on the development of transparency, trust and other relational norms between actors.
- All actors agree on the fact that reputation is important. However, opinions differ when it comes to trust and transparency between actors. Some actors state, the level of trust is increasing, where as other actors say that there is a long way to go before this is reached.

These differences and similarities in perspectives will be used as a basis on which statements will be created. These statements (on Likert-scale) will replace the open question of the draft survey about relational norms and used types of contracts in the future. The question: *Which type of contract is, in your opinion, mostly used to formalize relations between contractors and constituents?* will remain the same in the final survey. Only the type of question will be changed from multiple choice to ordinal scale (ranking answer possibilities). This choice is made to find out how likely it is that certain type of contract will be used in the future. However, one comment should be made: this question could only be answered by contractors and constituents and sometimes by architects. Therefore, within the final survey, this question will only be asked to that actors. Furthermore, the type of question will be changed to ordinal scale (rate items in relation to each other). This choice is made, because that way an overview is created of type of contracts and likeliness that they will be used.

#### **5.10. Other information regarding final survey**

Within, the final survey, general questions have to be asked to the respondents as well to find out to which groups of actors they belong (constituents, architects, contractors, subcontractors, trade organizations and producers) and the size of an organization. The latter

is important, because during the pre-test it became clear that the distinction between small, medium sized and large companies will most likely increase. Furthermore, smaller companies are likely to think differently about certain factors as large sized organizations. Therefore, the size of an organization could be an interesting measure as well, when it comes to the analysis of the results of the final survey. The choice is made to ask general questions at the beginning of the questionnaire, because answers to other questions are of now use when those questions are not answered. If those general questions were asked at the end of the questionnaire, respondents who stop filling in the questionnaire somewhere in the middle of the list do not answer these questions. Therefore, it is a better solution to ask those questions at front.

Furthermore, the questions regarding the content and lay-out of the questionnaire are deleted in the final survey, because no adaptation to the survey will be done anymore. Therefore, information about the questionnaire itself does not longer contribute to this research project.

### **5.11. Preliminary conclusions about developments in roles and positions**

From the pre-test results, preliminary conclusions can be drawn about developments of roles and positions in the Dutch construction industry. It should be noted that these conclusions are only preliminary and have to be quantified through the final survey. When it comes to developments in roles of actors, three subjects have to be distinguished: tasks, responsibilities and authorities. Furthermore, conclusions about developments in positions of actors will be mentioned.

#### ***5.11.1. Developments in tasks***

Developments in tasks of actors can be measured by the factors: actors, exchange of resources, coordination and safeguarding. Based on the results of these factors, the following can be concluded.

House construction corporations are broadening their tasks towards commercial project development and a higher level of maintenance and renovation. However, they are also narrowing their tasks during a building process towards only the developing of programs of demands. They want less involvement during a building process and are more and more looking for a complete solution by other actors. About the tasks of other types of constituents, nothing can be said based on the results of the pre-test.

When it comes to architects, their tasks seem to be to a large extent dependent on their size. Small architectural firms seem to be specializing, thereby narrowing down their tasks to only the provisional and final design or towards supervision on a building site. Larger architectural firms are offering a total package, from design up to and including supervision on a building site, thereby increasing their amount of tasks during building processes. However, not all constituents and contractors want that involvement of an architect during a building process. Therefore, the question remains to what extent this total package satisfies the needs of the clients of an architect.

Contractors are specializing towards becoming the (overall) coordinator of a building process. Execution of building processes is more and more becoming the task of subcontractors and even suppliers. However, this development could be related to size. Small contractors are not all developing towards coordinators (losing their task as an executor on building sites) and therefore, it could be that small contractors develop towards subcontractors in the future.

Some subcontractors are specializing, where as others are diversifying. Therefore, it is hard to conclude anything at this moment about the task of this actor in the future. However, looking at developments in the tasks of other actors, subcontractors seem to be moving towards a task as sub-coordinator (hired by contractors) and executor of building processes.

The task of trade organizations during a building process is questioned by several actors. Producers are more and more seeking direct contact with constituents, architects and contractors, thereby declining the task of a trade organization to zero. However, not all producers are able to do that. Some do not have enough storage capacity or do not want to carry the risk involved (direct responsibility when things go wrong on a building site with their products). Those producers will remain working with trade organizations. Furthermore, a task of logistic coordinator on building sites could also become part of the tasks of a trade organization. Therefore, the tasks of trade organizations will not decrease, only the number of trade organizations is likely to decrease.

The tasks of producers are increasing, because more and more producers are taking over part of the job of subcontractors on building sites (assemblage of their products). However, some producers are not able to do that themselves and are hiring subcontractors to do that for them. When the latter is the case, producers take over a part of the coordination task of a contractor.

### ***5.11.2. Developments in responsibilities***

When it comes to responsibilities, the following can be concluded.

Constituents will make a clear choice the next years: one group will take all responsibilities during a building process (thereby increasing their influence on a process) and another group will take no responsibilities at all during building process. The latter group is experimenting with turn key contracts. Which choice will be made by which amount of constituents is hard to say, based on these results.

Architects are only taking responsibilities during the design stage of a project and this is not likely to change in the future. However, a clear conclusion about this subject can only be made when the results of the survey are quantified, because it is unclear which types of contracts will mostly be used in the future. Opinions differ too much about the latter subject and this is of large influence on the division of responsibilities (and tasks) during a building process.

Contractors should take all responsibilities during a building process. They are also willing to do that, with one precondition: they want to be involved in a building process as early as possible. However, contractors are moving responsibilities towards subcontractors and suppliers. More and more claims from contractors are sent to those actors. Therefore, taking full responsibility of a contractor during a building process only seems to be superficial.

When it comes to trade organizations and producers, no changes in the division of responsibility can be viewed, other than the above mentioned shift of responsibilities from a contractor.

### ***5.11.3. Developments in authorities and positions***

Since authorities (positional power) and positions are related, conclusions about those two subjects will be made at once. When it comes to authorities and positions, the following can be concluded.

Constituents derive more power, because their influence during the design stage of a building process is increasing. However, there is a difference between professional and non-professional constituents. Professional constituents get more influence during the entire

building process. This is strengthening their position. Non-professional constituents however have less influence during a building process and less direct contact with all other actors (often only architects and/or contractors), thereby their position becomes weaker (moves towards an isolate).

Architects are losing influence on a building process. This development is going on for several years now. However, a tendency can be viewed towards a higher level of influence (and participation) of an architect in a building process. If this tendency pulls through, the position of an architect will become stronger again. Looking at the current position of an architect, it has to be concluded that this position is relatively weak, compared to some other actors. The position of gatekeeper, which an architect possessed several years ago is currently lost for that actor.

Contractors, who also develop projects themselves, currently have the highest level of influence on a building process. During the execution stage of a building process, a contractor is always the actor with relatively most power. During the design stage, it differs with whether or not a contractor is also the constituent of a project or not. Within the construction industry, contractors are functioning as gatekeepers (and/or stars) between the actors in design stage and execution stage of building processes (now and in the future).

Subcontractors have relatively least influence in the construction industry. However, because labour is currently scarce, they have more power (authority). However, when this situation of shortage of staff changes in the future, they will lose this power again.

Trade organizations have not much influence on building processes. Within the construction industry, they function as bridge between producers and contractors. However, this position is threatened, because more and more producers are having direct contact with contractors.

Producers think their influence on building processes is increasing, because of a higher level of standardization and unique solutions. However, other actors state that the amount of influence of producers on building processes is remaining the same. Therefore, it is hard to draw a conclusion about this subject before the results of the pre-test are quantified through the final survey.

## **Chapter 6. Design of final survey**

Within this chapter, the final survey will be presented, which is designed based on the results and analysis of the pre-test of the draft survey. The questions will be mentioned per factor. To conclude this chapter, some discussion points and limitations of this research project will be mentioned.

### **6.1. Final survey**

First of all, general questions will be asked. It is necessary to know what type of actor is answering the questions and, based on the results of the pre-test, it turned out that a distinction based on size could also be useful during the analysis. Therefore, the question is included how many employees an organization has.

#### **General questions**

Within the Dutch construction industry, my organization operates as (several answers might be possible, but please indicate what is your core business):

- Constituent
- Architectural firm
- Contractor
- Subcontractor
- Trade organization
- Producer

My organization has:

- 1-10 employees
- 10-50 employees
- Over 50 employees

#### **1. Actors**

As mentioned during the analysis, this factor will be measured by questions regarding the type of strategy and by statements, which are based on the main differences and similarities in perspectives of actors, which were found during the pre-test. Therefore, the following questions are designed. Furthermore, a short introduction is added to the question for respondents (the latter is done for all the following factors as well).

Strategy is also something to consider when inter-organizational relationships are started.

*Which (long-term) strategy does your organisation follow?*

- Strategy in which activities are developed which complement existing activities (horizontal integration)
- Strategy in which activities in front of behind the current activities in the supply chain are integrated (vertical integration)
- Strategy in which your organisation explores new markets (market diversification)
- Strategy in which your organisation broadens their assortment with new products (product diversification)
- Strategy in which the organisation specializes on a certain area (specialization)
- Other, namely.....

*Could you give a short explanation on your strategy? For example, which activities are you integrating? Or to what market are you diversifying?*

.....

*Below, some statements regarding strategy are given. Please indicate to what extent you agree with those statements. If you answer is 'partly agree', please indicate the reason for that choice below.*

<b>Statement</b>	Disagree	Partly agree	Agree	Neutral/ No opinion
1. House construction corporations will continue expanding commercial development projects more and more.				
2. House construction corporations will expand their commercial development by partnering with contractors.				
3. Professional constituents want less involvement of an architect during a building process				
4. Non-professional constituents want more involvement of an architect during a building process (up to and including supervision on the building site)				
5. Building management offices are going to take the task of overall coordination and supervisor on the building site.				
6. Small architectural firms are specializing on provisional and final design.				
7. Large architectural firms are diversifying towards offering a total package to the market: from provisional design up to and including supervision on a building site.				

8. Medium sized architectural firms are enlarging and diversifying.				
9. Small contractors will remain executors on building sites.				
10. Medium sized and large contractors will stop working as executives on building sites and move towards a task of coordinator of a building process.				
11. Small subcontractors will specialize.				
12. Producers are moving towards the task of assemblage on the building site, with respect to masonry (vertical integration)				
13. Trade organizations are moving towards the task of assemblage on the building site, with respect to the finishing of a building.				
14. Trade organizations are more and more partnering with subcontractors.				
15. Trade organizations are diversifying their product assortment.				
16. Producers are globalising and specializing on certain products.				
17. Climate neutral building are not wanted within residential building the next five years.				
18. Final users of buildings want a higher level of quality and luxurious products. This is more important to them than energy and climate.				

*Explanation of statements which were assessed with ‘partly agree’. Please indicate the number of the statement which your comment is about.*

.....

When respondents partly agree with a statement, an explanation is asked, because the explanation will provide useful information about the reason for that choice.

**2. Cooperative environment**

As mentioned during the analysis of the results of the pre-test, the level and type of collaboration were related and therefore it is decided to only ask a question about the type of collaboration. The following question is added to get an overview of longer-term relationships (and collaboration) between actors, now and in the future. Furthermore, statements are added about the most interesting differences in perspectives, found in the pre-test.

The level of cooperation between actors partly depends on the environment in which actors operate. *With which actors do you have longer-term relationships and with who do you expect longer-term relationships in the future? (more answers possible). Please make a distinction between the current and future situation.*

	Current	Future
Constituents		
Architects		
Contractors		
Subcontractors		
Trade organizations		
Producers		

*Below, some statements regarding the cooperative environment within the construction industry is given. Please indicate to what extent you agree with those statements. If you answer is 'partly agree', please indicate the reason for that choice below the table.*

Statement	Disagree	Partly agree	Agree	Neutral/ No opinion
1. Longer-term relationships between actors in the Dutch construction industry are thwarted by increasing legislation regarding tendering procedures.				
2. A positive change of attitude towards more collaboration is superficial: when it comes to action nothing changes the next 5 years.				
3. The globalization of the last years makes collaboration between actors more likely.				

*Explanation of statements which were assessed with 'partly agree'. Please indicate the number of the statement which your comment is about.*

.....

### 3. Network density

As mentioned during the analysis of the pre-test, the question about the number of direct contacts between actors in the draft survey, remains the same in the final survey. Furthermore, the most interesting differences in perspectives of actors are used to create statements, which are mentioned below, after the first question.

To contribute to a building process, contact with other actors is indispensable. *Does your organization have direct contact with the following actors (in an average building process)*

*and to what extent? Please give your answer for the current situation and your expectations for the future.*

	Current				Future			
	Never	Sometimes	Often	Always	Never	Sometimes	Often	Always
Constituent								
Architect								
Contractor								
Subcontractor								
Trade organization								
Producer								

*Please indicate to what extent you agree with the statements below: Agree, Partly agree, Disagree or Neutral/No opinion. If your answer is 'partly agree', please indicate the reason for that choice below the table.*

Statement	Disagree	Partly agree	Agree	Neutral/ No opinion
1. Producers are reaching for and having more direct contact with architects and constituents.				
2. Small and medium sized producers remain working with trade organizations to get their products on the market.				
3. Large producers will start to work directly with contractors, without the involvement of trade organizations in the future.				
3. Trade organizations are reaching for, and having more direct contact with architects and constituents.				
4. The position of trade organizations is threatened, because producers have more direct contact with architect and contractors.				
5. Building materials which are needed to construct the masonry of a building will in the future be delivered by producers directly to contractors.				
6. Building materials which are needed to finish a building will in the future still be delivered by trade organizations to contractors.				
7. Architects prescribe certain producers in the bill of quantities. Therefore, it is useful for producers to approach architects in an early stage of a building process.				
8. The separation of the design phase and execution phase of a building process will become smaller.				

9. A contractor hires a few subcontractors who hires sub-subcontractors on his turn. A pyramid structure becomes visible.				
10. The construction supply chain will simplify in the future (less actors involved in a process).				

*Explanation of statements which were assessed with 'partly agree'. Please indicate the number of the statement which your comment is about.*

.....

**4. Exchange of resources**

As mentioned during the analysis of the pre-test, the exchange of resources will be measured by statements. All actors agreed on the fact that labour is scarce and critical in the Dutch construction industry and therefore only statements will be included which measures the impact of this shortage in the future. Below the statements are presented.

Interaction with other actors is necessary to exchange resources. A resource which is currently scarce in the Dutch construction industry is labour. *Below, some statements are given about this subject. Please indicate to what extent you agree with those statements. If you answer is 'partly agree', please indicate the reason for that choice below the table.*

<b>Statement</b>	Disagree	Partly agree	Agree	Neutral/ No opinion
1. The shortage of staff is temporary and will not affect future developments in the construction industry.				
2. The shortage of staff is a source of concern and therefore, smarter solutions on the building site are necessary, now and in the future.				
3. Subcontractors and suppliers start to take over some jobs (specific drawings) from a contractor.				
4. Because of the current shortage of labour, subcontractors have more influence on a building process than within a situation with enough labour capacity.				
5. The number of sole traders on building sites increases.				
6. Sole traders are organizing themselves in network organizations.				

*Explanation of statements which were assessed with 'partly agree'. Please indicate the number of the statement which your comment is about.*

.....

## 5. Exchange of influence

As mentioned during the analysis, the first question of the draft survey about the factor exchange of influence will remain the same. The open questions about the future situation of other actors will be asked through statements.

During a building process, actors influence each others behaviour. This influence is related to the relative power of an actor towards other actors. *Which actor does in your opinion has most power within a building process? Please rate the actors from 1 to 6, highest influence (number 1) to lowest influence (number 6) and make a distinction between design (up to and including bill of materials) and execution stage of a building process and between current and future situation.*

	Current		Future	
	Design stage	Execution stage	Design stage	Execution stage
Constituent				
Architect				
Contractor				
Subcontractor				
Trade organization				
Producer				

*Below, some statements regarding the process of exchange of influence during a building process are given. Please indicate to what extent you agree with those statements. If your answer is 'partly agree', please indicate the reason for that choice below the table.*

Statement	Disagree	Partly agree	Agree	Neutral/ No opinion
1. Installation companies get more influence during the execution of a building process.				
2. Within residential building, an architect has less influence as within non-residential building projects.				
3. Contractors have less freedom to deviate from a bill of quantities as in previous years.				
4. Subcontractors are largely dependent on producers and contractors.				

*Explanation of statements which were assessed with 'partly agree'. Please indicate the number of the statement which your comment is about.*

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**6. Coordination**

As mentioned in the analysis of the pre-test, all actors agreed on the coordination mechanism which will be used in the future: one actor should form one central coordination unit. Therefore, statements are included about who should coordinate the process, whether or not they are capable and about some external factors which have influence. These statements are mentioned below.

Inter-organizational relationships between actors in the industry have to be coordinated. Below, statements regarding coordination during a building process are given. Please indicate to what extent you agree with those statements. If your answer is 'partly agree', please indicate the reason for that choice below the table.

Statement	Disagree	Partly agree	Agree	Neutral/ No opinion
1. Contractors are more and more becoming coordinator of building processes.				
2. Contractors are capable of coordinating a building process properly.				
3. Small contractors remain to work ad-hoc during a process.				
4. Standardization of a building process will continue developing. Therefore, coordination becomes less complex.				
5. During a building process, there should be one overall coordinator.				
6. Brown field ask for a higher level of coordination on the building site, especially when it comes to logistics. A contractor will take care of that task.				
7. Small, traditional, building projects can be coordinated ad-hoc without problems.				
8. There should be a coordinator for every stage of a building process separately. For example, an architect during the design stage.				

*Explanation of statements which were assessed with 'partly agree'. Please indicate the number of the statement which your comment is about.*

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## 7. Safeguarding

As mentioned in the analysis of the pre-test, the first question about which type of contract is used delivers useful information, but could only be answered by constituents, architects and contractors. This question will remain in the final survey, but only for these types of actors. The statements mentioned below can be answered by all actors and are based on the differences in perspectives of actors, found in the pre-test.

Relationships and collaboration agreements between actors ask for some sort of insurance. This insurance can be achieved in different ways: through legal forms, like a written contract, or by relational norms. *Which type of contract is, in your opinion, mostly used to formalize relations between contractors and constituents? Please rate your answers from most used (1) to least used (4) and answer the question for the current situation and the future situation (only for constituents, architects and contractors).*

Type of contract	Current	Future
Tendering procedure (general contract)		
Turn key contract		
Design and build		
Building team		

### For all actors:

*Below, some statements regarding contractual forms during a building process are given. Please indicate to what extent you agree with those statements. If your answer is 'partly agree', please indicate the reason for that choice below.*

Statement	Disagree	Partly agree	Agree	Neutral/ No opinion
1. The contractual form which is mostly used depends primarily on state of economy. In times of shortage, more integrated contracts are used; in times of abundance, tendering procedures are more common.				
2. Constituents are experimenting with turn-key contracts.				
3. Risk management is an important item for the next years, more important than time and quality.				
4. The responsibility for an entire building process will in the future belong to one actor: a contractor.				
5. Contractors try to move responsibilities during the execution of a building process more and more towards subcontractors and suppliers.				

6. Contractors send more claims to trade organizations and producers, regarding problems with their products.				
7. Constituents will make a clear choice the next years: take full responsibility during a building process or take no responsibility at all.				
8. For governmental constituents, tendering becomes obliged for all projects in the future.				
9. Price will remain the most important selection criterion for a contractor to select other actors.				
10. The discovery of the large scale fraud in 2004 was just the top of the iceberg. There are still agreements about price between certain actors.				
11. Trust and reputation are important in the construction industry. However, price will remain more important.				
12. Reputation is more important for small companies than for large companies.				

*Explanation of statements which were assessed with ‘partly agree’. Please indicate the number of the statement which your comment is about.*

.....

**6.2. Discussion**

Within this paragraph, an indication will be given about the points of discussion which are left and the limitations of this research project.

Within the empirical part of this research project, actors were interviewed. The chapter about methodology mentions that two to three actors from each group will be interviewed. However, for the group ‘contractor’, this number has not been reached. Only one contractor is interviewed. The purpose of the empirical part of this research project was to pre-test the survey. Therefore, several groups of actors had to be interviewed to make the sample heterogeneous, which is a precondition when a pre-test is carried out. With only one contractor in the sample, the sample is still heterogeneous. However, because the results of the pre-test were also used to create statements, which will be tested in the final survey, information from all five groups of actors to the same extent is needed. Since only one contractor is interviewed, information from that group of actors might be less represented in the final survey. However, because contractors are positioned in the middle of the ‘traditional supply chain’ and have contact with almost all other actors, much information is gathered

from other actors about contractors. Therefore, this risk will be minimized by analyzing this 'secondary' information. That way, contractors are represented to the same extent as other actors in the final survey.

Within the empirical part of this research project, the survey has been pre-tested. During this pre-test, three items could be tested: items about the questionnaire itself, items about specific questions and items about data analysis. The latter item is however not been tested. Due to time-limitations, it was not possible to analyze the results from the pre-test within SPSS. However, since almost all questions in the final survey are closed, multiple choice or based on a Likert-scale, data analysis should not be a problem.

This research project is limited towards developments in roles and positions of the five main actors (constituents, architects, contractors, subcontractors and suppliers) within the next five years. However, there are other actors who influence these developments (like governmental institutions). These actors have not been taken into account during this research project. The five groups of actors which are included are considered to be the most important actors during a building process and therefore, the choice is made to include those five groups. Furthermore, only 'residential and non-residential building' have been included in this research project. Therefore, conclusions of this research project can only be generalized (after carrying out the final survey) for this sector. The sector 'civil engineering' has not been taking into account. The sectors 'civil engineering' and 'residential and non-residential building' differ a lot (for example on the area of involved actors during a project) and therefore, the choice is made to exclude the sector 'civil engineering' from this research project.

## **Chapter 7. Conclusion and recommendations**

Within this chapter, the conclusion of this research project will be presented, followed by the recommendations.

### **7.1. Conclusion**

This research project has been conducted to reach the following research objective: *To design an instrument, which will measure the perspectives of actors in the Dutch construction industry on the development of roles and positions, by analyzing the configuration of the Dutch construction industry, identifying factors that influence the roles and positions of actors based on network theory, designing a draft instrument and pre-testing this instrument in the Dutch construction industry.*

To reach this research objective, this research project was divided into five research questions. The first research question was about presenting an overview of the Dutch construction industry. From this overview could be concluded that the main problems in this industry are related to interdependency and a solution to these problems has to be found in (system) integration. To reach (system) integration, the Dutch construction industry has to change and therefore, changes in roles and positions of actors are necessary.

This information was then used to answer the second research question, which consisted of the question about which factors (variables) can measure developments in roles and positions of actors. By analyzing network theory, the conclusion could be drawn that the following factors (and variables) can be used to measure developments in roles and positions of actors:

- Actors (type of strategy)
- Cooperative environment (type and level of collaboration)
- Network density (frequency of interaction and importance of other actors)
- Exchange of resources (type and amount of resources)
- Exchange of information (type and amount of information)
- Exchange of influence (relative division of power)
- Coordination (type of coordination mechanism)
- Adaptation (type and level of adaptation)
- Safeguarding (type of contracts and importance of relational norms)

The third and fourth research question were set up to find out which type of research instrument was suitable to measure developments in roles and positions and how this instrument should be designed. From the answers to these questions turned out, that a survey is the most appropriate research instrument to measure developments in roles and positions of actors in the Dutch construction industry. This survey had to be pre-tested before it was used and therefore, a draft survey was designed, based on the variables found in research question 2. This draft survey had to consist of mainly open questions, to receive as broad information as possible.

The fifth research question (which improvements can be made to the survey) could be answered after the pre-test of the draft survey. From this pre-test several differences and similarities in perceptions of actors became visible. The (main) differences and similarities in perceptions of actors are:

- All interviewed actors agree on the fact that labour is a scarce and critical resource. However, perceptions of actors differ about whether or not this has influence on future developments in the construction industry.
- The coordination mechanism, which will be used in the future is, according to all interviewed actors, coordination by one central authority: a contractor. However, perceptions differ about whether or not all contractors will follow that development and if they are able to do that.
- Which type of contract will be most used in the future: design and build contracts, building team contracts or general contracts? This choice has, however, a large influence on the division of tasks and responsibilities of actors in the future.
- The role of an architect in the future: will this actor only be a designer or an actor who is supervisor on a building site as well? Perceptions differ about this subject.
- The position of trade organizations in the future: will they keep the task they currently have or not? Actors do not agree about this subject.
- The responsibilities of a contractor: will this actor take all responsibility for a construction process in the future or not? However, all actors agree on the fact that a contractor, who also develops projects themselves, has most influence during a building process.
- The role of a constituent in the future: will this actor become the designer of the program of demands or will he have other tasks as well during a building process? Actors do not agree about this subject.
- The position and authority of producers: are they becoming more important (getting more influence) on building processes in the future? Perceptions of actors largely differ.

Since the above mentioned points are based on the results of the pre-test, only preliminary conclusions about the developments of roles and positions in the Dutch construction industry can be drawn, because the sample was too small and perceptions of actors differ too much to get a clear overview already. Furthermore, perspectives of actors about developments in the Dutch construction industry differ so much, that it can already be said that this could have influence on the question why the Dutch construction industry is not changing. Because perceptions of actors differ a lot, organizations in the industry are not likely to develop into the same direction and reach a fundamental change in the entire industry. After conducting the final survey, the previous mentioned results can be quantified and generalized. The following preliminary conclusions can be made:

It turned out that the position of architects and trade organizations is most threatened. Contractors (who also develop projects themselves) have the strongest position (as a gatekeeper and a star).

Tasks of actors are related to size of an organization. Furthermore, in the execution stage of a project tasks are shifting from one actor to another: suppliers take over the tasks of subcontractors, whereas subcontractors take part of the coordination task of a contractor.

When it comes to developments in responsibilities, contractors should take all responsibilities during a building process. However, contractors are moving these responsibilities towards subcontractors and suppliers. To receive a final conclusion about developments in roles and positions of actors in the Dutch construction industry, the final survey has to be carried out to quantify the current results.

Furthermore, the final survey could be designed, based on the pre-test. The factors exchange of information and adaptation were deleted from the final survey, because only little useful information was gathered by adding these factors to the survey. The open questions in the draft survey were replaced by closed questions and statements, based on differences and similarities in perceptions of actors, because too many open questions in a written survey lead to lower response rates.

To conclude, the final survey consists of statements and (almost only) closed questions about the factors actors, cooperative environment, network density, exchange of resources and

influence, coordination and safeguarding. This instrument is capable of measuring developments in roles and positions of actors in the Dutch construction industry.

## **7.2. Recommendations**

When it comes to recommendations about the execution of the final survey, several recommendations have been given during this research project and can be found in the previous chapters (especially in chapter 4, methodology). However, some recommendations can be added:

The final survey has become an extended questionnaire. There is a risk that this extended questionnaire will lead to lower response rates. If needed, the factors cooperative environment and coordination can be removed from the questionnaire. When these variables are removed, it is still possible to measure developments in roles and positions of actors in the Dutch construction industry. However, less broad information will be gathered about these developments and therefore, the choice is made by the researcher to include those factors in the final survey.

One of the starting points of this research project was that the Dutch construction industry is developing towards a higher level of collaboration and (system) integration. Furthermore, characteristics of the current construction industry have been used to design the survey. Therefore, it is recommended to carry out the survey ultimately six months from now. The latter is advised, because otherwise, the characteristics of the Dutch construction industry could be changed and the survey could become outdated.

It is recommended to do further research about the development of roles and positions of actors within the sector 'Civil engineering' as well, because it is interesting to find out if there are differences in developments of roles and positions between the sector 'residential and non-residential building' and 'civil engineering' within the Dutch construction industry. Furthermore, it could be useful to do an investigation about perceptions of other stakeholders in the Dutch construction industry about likely developments in roles and positions of the five main actors. Those 'outside' perspectives can also provide useful information about possible developments.

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## **Appendix 1: Glossary of terms**

### Actors:

All those parties who have an active involvement in the identification, preparation and/or implementation of a project. As such 'actors' are a special type of stakeholder, although the terms are sometimes used interchangeably.

Within the Dutch construction industry, five main actors can be distinguished: the constituent, the architect, the main contractor, subcontractor and suppliers. Distinctions can also be made within these five main categories.

### Architects:

Architects are the companies who design the building. Only companies which are medium sized (10 to 100 workers) or big enterprises (over 100 workers) will be involved in this research project, because small enterprises (less than ten workers) are less occupied with strategic issues.

### Construction industry:

The Dutch construction industry can be divided into residential and non residential building (in Dutch: Burgerlijke & Utiliteitsbouw), civil engineering (in Dutch: Grond- Weg,- en Waterbouw) and building services (in Dutch: installatietechniek). The focus within this project will be on residential and non residential building; 'Civil engineering' and 'building services' will be disregarded from this research project. The residential and non residential sector consists of building, maintenance and renovation of houses and offices. Within the sector residential and non residential building, the focus will be on the building of new houses. Projects which involve maintenance and/or renovation of houses do not always need all actors in the network and therefore, these two types of projects are disregarded from this research. The building of houses can also be divided into two categories: one-off projects, which means that one or more of the actors in the network only is involved once in the construction of one building; and serial building, which means that all the actors in the network are involved during a project, which consists of several buildings (and can be built at several occasions). This distinction is made, because some actors in a network which is one-

off<sup>21</sup> can not make statements about the development of roles and positions in a network. Furthermore, within this research project, the construction industry will be viewed from a network perspective. Therefore, longer term relationships are necessary and those can not be found within one-off projects. To summarize, the construction industry within this research project consists of the serial building of (new) houses within the B&U sector.

#### Constituents:

Constituents can be the government, companies, private individuals, house construction corporations, main contractors and other constituents, like construction companies which develop building projects themselves. Because only serial building will be taken into account, private individuals and companies will be left out of this research project. Those constituents are most of the time just involved in one building project and therefore can not give statements about the development of the roles and positions in their networks.

#### (Main) contractors:

Main contractors are companies which carry out jobs, directly for the constituent. Main contractors can be small enterprises (less than ten workers), medium sized enterprises (10 to 100 workers) and big enterprises (over 100 workers) (CBS, 2007a). Within this research project, only the medium sized and big enterprises are involved, because the small enterprises are less occupied with strategic issues.

#### Network:

A group of interrelated organizations, which work together to reach a certain goal.

#### Positions:

The place which the different actors in the network possess with respect to each other. 'A company's position in a network is an aggregation of its individual and separate direct and indirect interfaces with the other companies that form part of the network surrounding it' (Möller & Wilson, 1995: 337).

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<sup>21</sup> One-off means that for example the constituent is only involved once in a building project and therefore, this actor can not make statements about developments in the construction industry. Serial building means that every actor in the network is involved in a project which consists of several buildings.

Roles:

Within this research project, roles are the set of responsibilities, activities and authorizations of an actor in the network. Actors can have multiple roles.

Subcontractors:

Subcontractors are companies, which are hired by the main contractor to carry out a job and can be for example painters, plumbers or masons. The nature of the subcontractor is not a selection criterion for this research project. However, the size of the company is important. Only middle sized and big enterprises will be interviewed, for the same reason as for main contractors: only these enterprises are mostly occupied with strategic issues.

Suppliers:

Suppliers are the organizations which deliver resources to the main- of subcontractor. The selection criterion for suppliers within this research project is the same as for main- and subcontractors.

## **Appendix 2: Overview research strategies**

While conducting a practice oriented research project, sooner or later the choice has to be made about how the empirical part of the project will be carried out. The literature provides five possible research strategies: a survey, an experiment, a case study, grounded theory approach and desk research (Verschuren & Doorewaard, 1999). In the following paragraphs, each of the five strategies will be shortly described.

### Survey

A survey is carried out if the researcher wants to gain an overall picture of a phenomenon spread over a period of time or space. The characteristics of a survey are a large number of research units, labour extensive data generation, more breadth than depth research, a random sample, quantitative data and analysis, and preferably remote, closed data generation (Verschuren & Doorewaard, 1999).

### Experiment

When the researcher wants to gain experience with newly created situations or processes, an experiment is the most suitable research strategy. An experiment is characterised by:

- The formation of (at least) two groups, an experimental group and a control group;
- A random assignment of perceptions or research object to either group (randomising);
- The researcher determines which group is subjected to the intervention and what happens further within the groups;
- The researcher makes sure that there are few outside influences as possible;
- An ex-ante measurement is carried out before the intervention takes place (Verschuren & Doorewaard, 1999).

### Case study

A profound insight into one or several cases, which can be objects or processes, can be gained by carrying out a case study. The following characteristics can be attributed to a case study: a small number of research units, labour intensive data generation, more depth than breadth, a selective (strategic) sample, qualitative data and research methods and an open observation on site (Verschuren & Doorewaard, 1999).

### Grounded theory approach

The grounded theory approach can be described as a method that may be used to gain theoretical insights with only a minimum of prior knowledge and through continuously correlating the phenomena. This strategy can be characterised by ‘an inquisitive attitude from the researcher, a continuous process of comparing empirical data and theoretical concepts and a careful and consistent use of the procedures and techniques, for example coding’ (Verschuren & Doorewaard, 1999).

### Desk research

When this strategy is used, the researcher uses material produced by others. This is also the most important characteristic of this strategy. Furthermore, desk research is characterised by the absence of direct contact with the research object and looking at the material being used, from a different perspective than at the time of its production (Verschuren & Doorewaard, 1999).

**Appendix 3: List of interviewed organizations**

Below, an overview is given of the organizations which are interviewed, the group of actors they belong to and the function of the interviewed person of an organization.

<b>Organization</b>	<b>Type of actor</b>	<b>Function interviewed person</b>
House construction corporation	Constituent 1	Member of executive board
Building management office	Constituent 2	Senior construction manager
House construction corporation	Constituent 3	Member of executive board
Architectural firm	Architect 1	Bureau manager and project leader
Architectural firm	Architect 2	Architect and bureau coordinator
Architectural firm	Architect 3	Architect
Contractor	Contractor 1	Member of executive board
Trade organization	Trade organization 1	Member of executive board
Trade organization	Trade organization 2	Head of sales department
Producer	Producer 1	Member of executive board
Producer (who also trades)	Producer 2	Head of sales department
Installation company	Subcontractor 1	Head of plumbing department
Installation company	Subcontractor 2	Member of executive board

**Appendix 4: Summaries interviews**

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**Summary 1: Interview Constituent 1** (medium sized house construction corporation)**Actors: type of strategy**

This constituent wants to focus on sustainability and quality. Furthermore, maintenance becomes a larger part of their tasks. A trend is visible towards the integration of living, care and wellness within one building. Small house construction corporations can not carry the risk which is involved in these large projects and therefore, they are merging. Furthermore, house construction corporations are developing more towards commercial development projects, often in combination with social projects. Contractors are also developing towards project development and therefore, project developers could get a hard job surviving in the future. Furthermore, the number of brown fields is increasing: more replacement of buildings within a village of city. House construction corporations are thereby often preferred partner of local governments.

**Cooperative environment: type and level of collaboration**

Collaboration between house construction corporations becomes more common. Large corporations work together, that is not an issue anymore. Small corporations do not work together very often, they do not want that. Medium sized corporations will move towards more collaboration. Furthermore, collaboration with project developers happens more often. Project developers need corporations more often, because of their experiences with social building projects and their contact with local governments.

**Network density: frequency of interaction**

As a constituent, this actor determine the program of demands. After that, they select an architect. When the design is approved by governmental institutions, a contractor is selected by tendering procedures (often on invitation). When a contractor is selected, this constituent still has a distance declaration. During a building process, this constituent wants to be involved from the beginning to the end of the process. They want to be in charge during the entire process. Therefore, they only work with contractors who execute a building process (as well). If this constituent has a lot of projects at the same time, they ask an architect (or sometimes a building management office) to become supervisor on the building site. A contractor is never the one who is totally in charge on the building site. Furthermore, this constituent has a standard bill of materials, which they work with. Because of that, their influence on a building project becomes larger.

This constituent often works with the same architectural office (if possible). Trust is part of the relationship they have with this firm. Sometimes, an architect even does the construction license procedure for them. They see a development of other corporations to work with one or a select group of architectural firms as well. When it comes to contractors, they do not work with the same contractor all the time. Contractors often do one to three projects for them. This actor has a select group of contractors which they ask to participate in their tendering procedures. Contractors are selected based on price and quality: composition of a company, continuity, previous projects of a contractor and this constituent visits a current building site of contractors to find out how things go there. If everything looks all right, they invite that contractor to participate in a tendering procedure.

This constituent only works with small to medium sized contractors. Large contractors want a large involvement during a building process as well, this constituent does not want that. A development towards more quality can be viewed. This constituent started with this a couple of years ago and now final users are asking for a higher level of quality.

This constituent has good experiences with building management offices. Therefore, in the future it could be that this constituent will use more building management offices during building processes. The relation between them and the person on the building site who is in charge is crucial.

A couple of years ago, they merged with another house construction corporation. More corporations are enlarging. Furthermore, the number of advisors within a building process is increasing, especially when it comes to installations. A trend which can be viewed is an increase in the number of organizations which are necessary to complete a building process (especially advisors).

This constituent has contact with some producers and trade organizations. They prescribe certain labels in a bill of materials. Therefore, this constituent visits producers and trade organizations in an early stage of a building process. They select products and prescribe them. Later on in the process, these products are ordered directly from producers. Thereby, trade organizations are not involved anymore. For this constituent, this is cheaper, because no margin for trade organizations is involved. When it comes to maintenance projects, this constituent has a small showroom themselves.

**Network density: importance of other actors**

An architectural firm is important to them, because they have longer-term relationships with certain architects. When it comes to contractors, they have a larger group to choose from and therefore, those relationships are a little bit less important. Furthermore, with governments and brokers, they have more longer-term relationships. With care institutions, they get more longer-term relationships as well, because more and more house construction corporations become the owner of a care institute. Care institutions then hire the building from the house construction corporation.

This constituent only carries out a project if they are the owner of the land. This discussion becomes more important (with local governments), because they want to own the land as well.

The last couple of years, a contractor became more important. In the past, you just choose a contractor when you needed one. Nowadays, contractors are selected earlier in a process. More agreements about quality. House construction corporations do receive more freedom when it comes to determining what they will build and where from local governments. Only broad rules are set, this constituent may interpret those rules themselves.

**Exchange of resources: type and amount of resources**

Labour is scarce at the moment. This constituent has trouble to find enough qualified people, but till now, they manage to fulfil their jobs. Smaller contractors are not reacting to this development. They will wait till this shortage is over.

**Exchange of information: type and amount of information**

This constituent remains in charge during a building process and therefore, they have no trouble with getting the information they need. Information from subcontractors are received through contractors. Information from architects is received directly. The separation between design and execution stage of a project is there, but not a problem for them. Only when they have problems working together with a contractor, information exchange becomes a problem.

**Coordination: type of coordination mechanism**

A contractor should just coordinate the building site and execute the project. Coordination of the entire building process is a job for this constituent themselves or for an architectural firm or building management office.

**Safeguarding: types of contracts**

This constituent is experimenting with turn key contracts (for smaller project). A discussion about whether or not a building management office should be involved is still going on. Turn key contracts could increase the progress of a project. However, turn key constructions are only possible when a contractor is trustworthy and delivers quality.

Price remains very important for this constituent. They want to talk to contractors directly and use tendering procedures on invitation. However, European tendering procedures become more important, thereby decreasing the possibilities of selecting a contractor without a public tendering procedure.

**Summary 2: Interview Constituent 2** (building management office)**Actors: type of strategy**

A trend can be viewed towards more brown fields and climate neutral buildings. Installation advisors should become energy advisors. Installation companies should start to think in energy and comfort instead of more and more installations. Integrate work becomes indispensable. Especially, actors in the execution stage of a project are not ready for that.

The role of an architect during a building process differs with size of a project and type of constituent. Smaller architectural firms will specialize (towards designing or supervision on the building site); large architectural firms will diversify.

**Cooperative environment: type and level of collaboration**

Because of obliged tendering procedures, they can not work with the same actors all the time. However, within the selection procedures, previous experiences are very important. Small architectural firms can not also participate in tendering procedures. Therefore, often the same firms are participating within tendering procedures. With smaller projects, they work with smaller organizations; with larger projects, they work with larger organizations.

It is hard to say whether or not actors will collaborate more. Integration of tasks within one organization happens more often. Approaching collaboration as a win-win situation is not common yet. However, within tendering procedures, this constituent can demand certain things with respect to collaboration. Sometimes, companies have to prescribe on tendering procedures together to comply to the demands from a constituent. However, mostly this collaboration is only on paper and when it comes to action, collaboration does not exist between those actors. Transparency is a big barrier. Their position will improve by collaboration, but instead of that, actors often think it will weaken them. Since the discovery of the large scale fraud in 2002, transparency is still a problem and therefore, this constituent thinks that this discovery reviewed not all price agreements. Between certain actors in the industry, price agreements still exist.

**Network density: frequency of interaction**

This constituent is a building management office for governmental constituents. They are delegated constituents towards all other actors in the supply chain. Within a building process, they are involved from initiative up to and including the transfer of the building to the final user. They coordinate the building process, select architect and contractors (through tendering procedures). Contractual forms are designed by them. However, the final user (constituent)

has to sign these. Executive board and supervision on the building site are not part of their task, this job is done by contractor or other (independent) party (sometimes also an architect for smaller projects). Architects are not used as supervisor when it comes to larger projects, because they noticed that things start to become complicated during a project (changes in design during the execution stage of a project for example).

Because of governmental legislation, they are obliged to use tendering procedures for almost every construction project they do (select constructors, installation advisors, architects, contractors et cetera). Projects which they participate in differ from offices, schools, gyms to monuments.

Mostly, they offer the final user (constituent) two choices. The first choice is to use traditional tendering procedures: select architect, make design, select contractor. Other option is design and build: select contractor by tendering procedure and let this actor coordinate the process further. However, when it comes to the selection of an architect, a contractor has to choose three architects and this constituent than chooses the one who will get the job. Furthermore, they want to be involved in the design phase of a building. This constituent does not have contact directly with subcontractors and suppliers. A contractor selects those actors, is not part of their job.

#### **Exchange of resources: type and amount of resources**

There is a shortage of staff. This constituent notices that, when working with contractors. Quality of work is sometimes lower, because of high work pressure. Seems to be a development which will be there for the next years as well. Relation between state of economy and shortage of staff is not clear to them: at the moment there are more projects (more complex) so more staff is necessary.

#### **Exchange of information: type and amount of information**

A trend is visible towards more share points on the internet. Designing and executing actors are sharing drawings and other information through these share points more and more. However, coordination is necessary to make sure the right information is used by the right actor. Furthermore, integrating certain drawings remains hard and that problem is not solved by share points. One actor should be responsible for this coordination (should be main contractor). A proper overview of all tasks and materials and integrate all those separate parts is a task which is deemed necessary, but is not done properly yet. This is a point of attention for especially contractors.

**Exchange of influence: relative division of power**

Producers do not get more influence during a building process. Product development is encouraged by architects and therefore, they have more influence with respect to this subject. Innovation comes from architects and producers. If contractors coordinate a building process well, they can receive influence and power from that.

All actors depend on each other. Constituents depends on architect to get a good design, architect depends on contractor to execute the design. Subcontractors have relatively the weakest position within the supply chain. More alliances between subcontractors and suppliers are not likely. Number of suppliers is increasing, which is important for competition. A trend can be viewed towards more integrated solution, which need more collaboration between actors. However, this collaboration does not necessarily has to be on a longer-term.

**Coordination: type of coordination mechanism**

For this constituent, contractual forms and coordination are most important items during a building process. Contractors should coordinate building processes, but if they can not deal with that, this constituent hires an independent third party to do that. Within a building process, three components can be distinguished: constructions, installations and architectural (in Dutch: bouwkundig). This constituent selects one contractor to do all these job or three different contractors. When the latter is the case, the architectural contractor has to coordinate the work. The interpretation of contractors about what should be coordinated differs a lot. Therefore, some contractors think that coordination of a job is just saying when things go wrong. However, there is more to it.

**Adaptations: type and level of adaptation**

It is hard to get something done a little bit different from normal standards. Trust and transparency is a problem as well when it comes to adaptations.

**Safeguarding: types of contracts**

Tendering procedures are open selections, not based on invitation. This constituent asks questions about previous projects and references. They try to get a certain level quality this way. The selection is partly based on price, but they try to select on quality and experience as well. Quality becomes more important during a selection procedure. Furthermore, previous experiences with organizations are also important. They try to not work anymore with actors with whom they had a bad experience in the past. This constituent works with tendering procedures and design and build contracts. Sometimes, building team is also used, but this is

only when it is necessary (for example very complex project). This constituent does not prefer building teams contracts, because price competition is gone within an early stage of a project. Within a building team construction, this constituent, architect, contractor and advisors are included (not producers). Within a building team, there is a distance statement: if they want they can get rid of a contractor later, but this does not happen often, because both actors have invested in the project already. Architects do not like design and build contracts, they prefer building team contracts or tendering procedures. From a contractors perspective, design and build contracts are very attractive. A trend is visible towards design and build contracts. Governmental constituents, which consist of people who have little knowledge about building procedures, design and build constructions are often used. This actor wants to be hired by those constituents and select other actors by tendering procedures.

**Safeguarding: importance of relational norms**

Reputation is very important for this actor, is part of their selection criteria and becomes more important.

**Summary 3: interview Constituent 3** (house construction corporation)**Cooperative environment: type and level of collaboration**

Longer-term collaboration agreements between constituents and contractors will increase: win-win situation. However, it should be noted that tendering procedures sometimes thwart this development. With architects, they work as much as possible with a select group. This constituent does not (often) collaborate with suppliers and subcontractors directly. Acquisition from suppliers is sent to contractors (by this constituent). Collaboration between house construction corporations becomes more common. Collaboration of house construction corporations with other actors is not very common yet.

**Network density: frequency of interaction**

This constituent wants to specialize in the development of concepts and program of demands. The execution of a building process should not be their responsibility. The program of demand is their focus. Recently, they started, together with a contractor, the 'new combination'. This new combination is a partnership between this constituent and a contractor and means that this constituent is responsible for the program of demands and selection of the architect and then the contractor takes over. This constituent controls the architect, negotiate with local governments, select advisors and decide which type of contract will be used. This constituent tries to pull back from a building process as soon as possible. Within some smaller projects, this actor develops the project themselves. However, they try to do that as little as possible.

The selection of the architect is important to this constituent. They are always involved in that process and ask certain architects to take part within tendering procedures. Tendering procedures are however not always used by house construction corporations. Not all actors agree whether they are obliged to use tendering procedures or not. Therefore, it is not commonly used. An architect is selected based on quality and design, price is not the most important criterion.

House construction corporations are involved in commercial building processes more and more. However, this development already reached his top and will not increase anymore. Small house construction corporations will merge to deliver quality and survive in the market. Corporations should not become to big, because a balance should be reached between flexibility and efficiency.

This constituent works mostly with medium sized architectural firms, sometimes with large sized firms. Depends on the project how far an architect is involved in the process. Supervision on the building site is mostly organized through the 'new combination'. Architects are however involved in the execution process for esthetical and quality measures. This constituent has no contact with suppliers and subcontractors.

#### **Exchange of information: type and amount of information**

If things go wrong during a building process, it is on this subject. There are beautiful new information systems, but it remains work, which humans have to take care of. Through the 'new combination', they are not involved in the process of information exchange as much as they used to be. They receive information from their partner (contractor), when necessary.

#### **Exchange of influence: relative division of power**

Contractor has power and should have power, but they should also take responsibility. The discussion who's responsibility it is when problems arise should no longer be there: contractor is responsible. Contractors should therefore also be involved earlier in the process.

#### **Coordination: type of coordination mechanism**

Contractors should coordinate the building process. Medium sized and large contractors can handle this coordination. This constituent does not work with standardized constructions often.

#### **Adaptation: type and level of adaptation**

Contractors make adaptations for them (longer-term relationships). This just happens unconsciously : refining collaboration agreements.

Risk management becomes more important the next years. Which actor takes which risk and how do they arrange that? In the past, money, time and quality were the most important concepts. This constituent expects that this will change towards risk management. It will depend on the situation which actors take responsibility during a building process. Most contractors do not mind taking responsibility, when they are compensated.

**Safeguarding: types of contracts**

This constituent experiments with integrated contracts, especially turn key. Furthermore, they collaborate with contractors, who also develop projects themselves and close development building team contracts with that actor. This constituent is, within this construction, however still responsible and carries risk, because they possess the area on which is build. Therefore, they experiment with turn key contracts in which they offer a program of demand towards a contractor (developer) and have further no involvement during the building process. When the project is finished, they pay and on that moment, the risk and responsibility moves from the contractor towards them. Work remains the same, only responsibilities and risks are divided differently. They want this type of contract constructions with a select group of contractors.

This constituent thinks climate neutral buildings will come up in next years. However, they do not intend to be trendsetter on that area. They will follow when this trend pulls through. They are trendsetter on other areas.

Installation advisors become earlier involved in a process, become more important. Therefore, this constituent wants to be more involved in the selection of that actor.

## Summary 4: Interview Architect 1

### Actors: type of strategy

This architect has a broad orientation to the market, offers provisional design till supervision on the building site. However, they see a trend towards specialization (of other architects). Core business is provisional and final design. This architect wants to play a dominant role during a building process and think that offering supervision on the building site is added value towards the constituent. They also work mostly with constituents who appreciate that (like foundations or other non-professional constituents). When a trend towards specialization set through, the separation of design and execution during a building process will not become smaller. The involvement of architects on the building site is therefore important.

Contractors are broadening their responsibilities (towards developing). They take for example also responsibility during the design stage of a project. Government also wants that. They want design and build contracts to put responsibility of a building process completely on a contractor (or developer). To give the architect all responsibility during a building process is not possible. Contractors merge, that is also a trend. Possibilities to offer a broader package of services become larger because of that. Suppliers also become larger enterprises, but they focus more on diversification (product assortment). Within Europe, there are some big suppliers who take over other (smaller) companies and deliver almost anything.

A tendency when it comes to contracting is to board the masonry to subcontractors. These subcontractors take care of purchasing and assemblage. Subcontractors have the weakest position within the supply chain. Pressure from contractors and suppliers and because of that, they will most likely start to specialize and try to deliver added value.

### Cooperative environment: type and level of collaboration

This architect thinks that actors want to collaborate, but in reality everybody sticks to the old habits. Longer term relationships were already present; perhaps these types of relationships will become less, because of the regulation by the government (more obliged tendering procedures). Longer term relationships with subcontractors and suppliers are increasing. Suppliers seek more and more contact with architects to get involved in a project as early as possible. That is trend: suppliers seek more contact with architects, where in the past they sought contact with contractors. Suppliers realise more and more that architects possess a certain power.

**Network density: frequency of interaction**

Most frequent interaction is with constituents and contractors. Contact with subcontractors and suppliers are less frequent. It depends on the type of constituent (government, foundations or developers) what the involvement of this architect in a building process is. Provisional and final design are always made by an architect, when it comes to the bill of materials it differs. However, there is a tendency towards a bill of materials which is made by the architect. Contractors want that so they can select subcontractors in an early stage. Within the execution stage, this architect offers also an executive board and supervision on the building site. However, the responsibility on the building site remains for the contractor. When this architect makes the bill of materials, they have contact with subcontractors and suppliers and sometimes, they prescribe certain parties within the bill of materials. Therefore, this architect has a select group of subcontractors and suppliers which they work with often. However, when this architect is designing the bill of materials, there is no guarantee for subcontractors or suppliers that they will get the job. Still they are willing to cooperate, based on their longer-term relationship with this architect. When it comes to the selection of subcontractors and suppliers it happens often that the contractor selects the prescribed products and actors. Price remains an important criterion, but the cooperation in the design phase is also important during the final selection. Longer-term relationships between an architect and subcontractors and suppliers are common. Suppliers and subcontractors also approach an architect when they have new products, innovations often come from suppliers. Trade organizations often visit architects with lists of products.

**Exchange of resources: type and amount of resources**

Labour is scarce, especially technical trained personnel. Therefore, this architect started to lower their requirements for new staff and also hires employees on MBO-level. However, they notice that this is not a solution, because these employees can not do the job most of the times. They do not think this situation will change soon. This architect notices that there are architects which focus on making provisional and final designs and stop with designing bills of materials. Specialization of (small) architects is enhanced by scarcity of personnel.

**Exchange of information: type and amount of information**

This architect encourages openness and transparency during a building process. They think that this is necessary. Most of the times, the beginning of a building process is the hardest, trust has to grow during a process (or relationship). An important organization when it comes to sharing information during a building process is a building management office. These offices make, together with the constituent, a program of demands, then they select an

architect, lead the tendering procedure and have supervision on the building site. This actor also coordinates the building process on behalf of the constituent. The last couple of years, the number of building management offices decreased, mostly due to the fact that not every construction management office really was an independent third party. However, for complicated projects with a non-professional constituent, these building management offices will be used. Since they take care of coordination activities during a building process, they work on the area of contractors (which focus more on coordination than execution). Therefore, these types of contractors could get more difficulty to survive. To provide this problem, contractors will try to get to the constituent as early as possible during the process.

#### **Exchange of influence: relative division of power**

Constituent has most influence and is leading during the process. When it comes to the development in types of contracts which are used: design and build contract, then a final user less power, and a constituent has less power as a contractor. Division of power depends strongly on type of contract which is used. When a contractor is chosen, this actor has power over suppliers and subcontractors. Although, it could be that an architect prescribed some subcontractors and/or suppliers. In that case, part of the power belongs to the architect. Different kinds of power belong to different actors.

#### **Adaptation: type and level of adaptation**

This architect does adaptations to products and procedures to reach a better collaboration with other actors (final design + for example) or changes in submitting building licenses. This architect does adaptations for the constituent if they think it is justified. Suppliers also adapt to the wishes of others, if several other actors ask for it (no relation specific adaptations). This architect only does project specific adaptations, although some project specific adaptations were asked for several times, thereby becoming normal within every project.

#### **Safeguarding: types of contracts**

The type of contract that is used depends strongly on the economy. When prices are low, tendering becomes more important. If prices are high, building team is more used. Experience and knowledge become more important. Turn key and PPS contracts are not used very often in residential and non-residential building. Design and build contracts and building team contracts will become more important. More and more actors want to be involved early in the building process. An architect preferably wants to have contact with the final user. However, within a design and build construction, this is not always possible, depends on the contractor. Within a building team construction, the chance of little contact with the final user is smaller.

Although, sometimes the term building team is used but when it comes to actions, there is sign a working in a building team. One advantage of a building team contracts is the distance declaration (in Dutch: afstandsverklaring). If they can not work with a contractor, they have the chance to choose another contractor, later in the process. Within design and build constructions, this is not possible. This architects prefers a constituent who comes directly to them, without involvement of other actors. The division of power during a building process depends to a large extent on the type of contract: which actor is earlier involved in the building process? Therefore, this architect prefers building team contracts. When a constituent chooses an architect, 25% is based on price, 35% on presentation and vision, 15% on process accompaniment and 15% on 'click'. When a contractor selects an architect, price is most of the times crucial. A tendering procedure to select an architect is used more and more (trend).

**Safeguarding: importance of relational norms**

The reputation of the construction sector and trust in that sector, seen from the society, is not very good. That is not likely to change in the near future. However, between actors in the sector, this will probably change on a short to middle term.

## Summary 5: Interview Architect 2

### **Actors: type of strategy**

Final users get more influence and speak up more for themselves. However, too much freedom to choose for final users is not wanted. A certain level of standardisation within which people can choose for certain options is a trend. Larger architectural firms should offer a total package and operate as integral as possible. Small architectural firms get a hard job surviving and have to make a choice: specialize on a certain aspect. Tendering procedures are more and more used, within smaller projects. This is a trend.

### **Cooperative environment: type and level of collaboration**

This architect expects more longer-term collaboration between actors. They do not want to work with one actor exclusively, but with a select group of actors. They do not often prescribe certain suppliers within a bill of materials.

### **Network density: frequency of interaction**

During a building process, this architect has direct contact with constituents and advisors. They operate regularly in building team constructions and when this is the case, they also have a lot of contact with a contractor. Direct contact with subcontractors and suppliers is limited to esthetical control of their work during the execution of the project. When a project is very complex, they have (sometimes) more contact with producers.

It happens sometimes that they get to arrange the entire process for a constituent. When that is the case, they select the contractor, advisors and other involved actors and carry responsibilities during a building process (only for non-professional constituents). Whether or not the number of contractors, who also develop projects themselves is increasing, is hard to say. Contractors have interests to coordinate a process, constituents want to be coordinator more and more and architects also want to take that role. This architect also wants to be the coordinator of a building process. Because of more brown field projects (in Dutch: herstructurering), projects become more complex and an increasing role for an architect is necessary.

### **Exchange of resources: type and amount of resources**

There is a shortage of staff, they also notices that (especially technical staff). This also counts for contractors.

**Exchange of information: type and amount of information**

Building information management (BIM) applications are more and more used. This applications says that everyone should work with the same information system, but this is not something that is done easily and will happen the next years. A contractor should coordinate the process of information exchange during a building process. However, it seems like this is done less. A contractor takes the job and then hires several subcontractors to carry out the job. Then a contractor sometimes thinks their job is finished. Furthermore, the staff of a contractor is often less technical educated and this also leads to problems. Whether or not there is a trend towards a coordination task of a contractor (no more executor) is hard to say. It is feared by this architect, that this is the case.

**Exchange of influence: relative division of power**

Traditionally, an architect has most influence during a building process. However, this changed decades ago. Nowadays, contractors and project developers get more and more influence. That is one of the reasons, the quality of a project is currently under pressure sometimes. From a research project by KOW turned out, that contractors also think that an architect should be leading during a design stage.

The position (power) of a contractor will decrease the next years, because of technical and social developments. More power belongs to constituents and advisors. However, during the execution stage of a project, a contractor will remain having most influence. Division of power goes between constituents, architects and contractors. Producers do not receive more power, because of standardized and unique solutions and products.

**Coordination: type of coordination mechanism**

It could be good when there is one overall coordinator of a building process and a coordinator during every stage of a building process. For example, during initiative stage, a constituent; during a design stage an architect and so on. An overall coordinator could be an architect or building management office.

**Safeguarding: types of contracts**

This architect notices that they get earlier involved in a building process as a contractor more and more. However, they also notice that some contractors want to be the overall coordinator of a building process and make the role of an architect as small as possible (only design). Whether or not design and building contracts work well depends on the contractor. Some contractors still show an open attitude for suggestions of an architect, where as others just

want a drawing of their wishes. Prefab is not something they prefer. Building team constructions are favoured by them, if all actors involved are open for it.

Contracts which will be most used in the future: they expect design and build contracts and building team constructions.

**Safeguarding: importance of relational norms**

Trust and reputation become more important, a building management office should be leading in that development. Actors should work towards one mutual goal.

## Summary 6: Interview Architect 3

### **Actors: type of strategy**

Sustainability becomes more important the next years within building processes. Some constituents already asks for sustainable buildings, other constituents are not interested in sustainability (yet). However, currently a trend is visible that more actors focus on sustainability.

This architect focuses on the 'care market'. This has always been this way. However, they do want market diversification. This architect thinks that standard market classifications (care, wellness, educations, residential building) will disappear and that another classification, like types of contracts and types of sustainability.

Architectural firms have to make a clear choice the next years: offer a total package (from design up to and including supervision on a building site) or specialize on a certain aspect.

### **Cooperative environment: type and level of collaboration**

The market is shifting towards less longer-term collaboration agreements, partly because of increasing legislation regarding tendering procedures. Since this architect often works with governmental constituents, they are often obliged to use tendering procedures. This has one advantage that they get into the relationship with an open attitude. If they have not worked with an actor before, they can not have a bad experience with that actor. However, also not a good experience.

During a tendering procedure, price becomes less important. Experience and references become more important. The demand of constituents for more references leads to more collaboration between architectural firms to subscribe on a building process together. However, when the latter is done, agreement has to be reached between those two firms about who has which responsibility and task before the process is started. Otherwise, often problems arise.

### **Network density: frequency of interaction**

It differs till how far this architect is involved in a building process per constituent. There is a range from only design up to and including supervision on a building site. When a building management office is involved, the involvement of an architect is often decreasing. They

receive more jobs by contractors (who also develop projects themselves). However, they also participate in tendering procedures. It happens more often that this architect enters a building project, because they are asked to by a contractor who also develops the project themselves. However, it also happens more often that an architect is not supervisor on a building site anymore. Building management offices have contributed to that development. Whether or not an architect is supervisor on a building site has no influence on the responsibilities they take during a process. A contractor is most of the time responsible.

This architect never prescribes certain suppliers within a bill of materials. They receive information from suppliers during the design stage, but that is the only contact they have with suppliers. However, they do notice that suppliers seek more direct contact with architects and constituents.

#### **Exchange of resources: type and amount of resources**

The number of sole traders on a building site is increasing. Those sole traders are organizing themselves in network organizations. Sharing knowledge is not a problem anymore in that environment. This 'network thinking' could develop more, when legislation regarding tendering procedures (in Europe) make that possible. Between subcontractors and suppliers, a certain developments towards networks can already be viewed.

#### **Exchange of information: type and amount of information**

The transfer of information from design to execution stage of a building process is not a source of problems, but it is a source of danger during the exchange of information. Agreements about who receives which design, who is responsible for what and when a drawing is up-dated, who coordinates that?

#### **Exchange of influence: relative division of power**

A constituent of building management office has most influence during the design stage of a project. When an architect and a contractor disagree, the actor which is most trusted by a constituent mostly has most influence.

Influence of producers during a building process is not increasing (because of standardization and unique solutions). Executing task of a contractor is shifting towards subcontractors, contractors are becoming coordinators of building processes. Large contractors are developing towards network organizations. Architects receive less influence, because they develop towards becoming a designer and loose their influence as supervisor on building sites.

**Safeguarding: types of contracts**

Currently, tendering procedures are most used. Sometimes, they work with building team constructions. In the opinion of this architect, this is a good way of working. However, it depends on all the actors involved whether or not this construction works properly. Installation organizations are also more often earlier involved in a project and because of that, also in building team constructions. Because climate neutral building become more important, installation organizations also become more important in a building. However, there are also new firms who offer climate advise during building processes.

Constituents are more and more looking for a total solution. Turn key contracts are more used. Working with turn key contracts and total solutions makes it necessary to collaborate closer. Furthermore, risk management becomes more important. Who carries what risk? Who is responsible and to what extent? A distinction between two types of constituents becomes clear: one group of constituents says: 'I build, so I take full responsibility' and another group of constituents says: 'I do not want to take any responsibility at all'.

## Summary 7: Interview Contractor 1

### **Actors: type of strategy**

This contractor has a specialization strategy, as well on market as on product level. However, within the chain, they offer a wide range of services: from engineering to service after the delivery of the building (by subcontracting). Because they are a medium sized to big contractor, they can make the choice to only coordinate the building process and take a smaller part of the execution. Contractors should make the choice for a specialization strategy; this is more profitable on the long term. The amount of contractors is narrowing down, amount of subcontractors is growing. Contractors are going to take care of coordination during a building process and focus less on execution. Execution becomes more and more task of subcontractors; suppliers are also developing partly to subcontracting. This is, however, not a new development. To this contractor, suppliers are more important than subcontractors (deliver only capacity). They work with standardized solutions and therefore, it is less easy to change suppliers all the time.

### **Cooperative environment: type and level of collaboration**

To really work in a building team contract, actors must want to collaborate. A first change which should happen is on the attitude of actors towards collaboration. Starting point of collaboration should be common interests. Furthermore, uncertainty of actors, when they are involved in a building process but not (yet) with a contract, is an obstacle. The construction industry says that they are changing, but when it comes to actions, they still work on the traditional way, like they have always done.

### **Network density: frequency of interaction**

Frequency of interaction with constituents is high. This contractor is not involved in projects, which involve tendering procedures. They want to be involved in the building process as early as possible. This contractor takes the role as director of the building process: the constituent picks them to carry out the job and then they take care of the entire process. However, subcontractors are important for this contractor, because they do not do the executive work themselves. On the building site, this contractor is (most of the times) only the coordinator of the process. These subcontractors have contact with suppliers. However, this contractor has long-term relationships with certain suppliers and works with these suppliers as often as possible. When it comes to products which are a large part of the contract amount, this contractor is involved in the process of selecting suppliers. Contact with architect is also

necessary. This contractor works with a fixed selection of architects. Those architects design the building; this contractor takes care of the engineering. Contact with the final user of a building also becomes more important. The government has set a rule for non-residential building: there has to be a known final user, before a building can be build. Furthermore, service after finishing the building is also part of the tasks of this contractor. Therefore, contact with the final user of non-residential buildings happens more often. The way this contractor is working right now is preceded by a complete change in the organization (culture and structure). Therefore, it is not likely that other contractors are going to work this way on a short term. Furthermore, it is not likely that small sized enterprises can make this change. Relations with constituents and suppliers are most important to this contractor.

#### **Exchange of resources: type and amount of resources**

At this moment, labour is scarce within the Dutch construction industry, but this will change again some day. This development is temporary. Speed, laws, efficiency and effectiveness are going to lead to more specialization in stead of integration (which is some organizations in the industry focus on). If one resource becomes scarce, actors have the intention to 'do the activity involved with that resource themselves'. However, before an organization has put that intention into reality, the resource is often not scarce anymore. Therefore, this does not have that much impact on trends in the industry. When the economy is going well, subcontractors have a hard job to survive.

#### **Exchange of information: type and amount of information**

Openness and transparency is very important when it comes to the exchange of information. However, this is one of the other obstacles to let other contractors work on the way they do it right now. This is a barrier which the building sector has to take. They still feel weaker while sharing information, while contra dictionary it can strengthen their position. Regular meetings with architect, contractor and constituent are necessary to carry out a building process. However, in a traditional building process, the separation between the design phase and executive phase is still large. An architect often shows a cynical attitude when it comes to trusting a contractor. Architects as well as contractors often want to be supervisor on the building site. Since the responsibility for the executive part of the process is for the contractor, this contractor wants to take the lead on the building site. Architects are not always happy with that. These contra dictionary interests between these two actors do not encourage trust and transparency. Furthermore, within a traditional process a contractor likes it when things are not according to plan. Declaring extra costs is where the contractor makes its profit (also enhanced by the focus on price in the tendering procedure). However, a slow trend towards a

change and a better connection between design and execution can be viewed. A higher level of information exchange and more collaboration between actors can therefore be expected. This contractor wants to work transparent; contract amount is higher as the offer of other contractors. However, during the building process, there are less extra costs to declare. This contractor notices that this is appreciated by constituents. Often they work with the same constituents several times.

#### **Exchange of influence: relative division of power**

Constituent has most influence (distinction made between final user and constituent, not always the same). Subcontractors and suppliers have little to none influence on design and execution. Game is played between constituent, architect and contractor. Within the design phase, architects and/or building management offices (in Dutch: bouwmanagementbureaus) have most power. Within other settings, professional constituents have most power in the design stage. Within the execution stage, the contractor has most power. In some cases, power during the execution stage is shifting towards suppliers. Especially in large projects in which the installations are a large part of contract amount, part of the power is shifting towards suppliers. Furthermore, unique solutions contribute to the fact that suppliers strengthen their positions. Big suppliers are more often part of a building team construct. Within the traditional building process, shifts in power are not expected on short or middle term.

#### **Adaptation: type and level of adaptation**

Adaptations happen most of the time naturally between this contractor and other actors. Product, process as well as procedure adaptations happen. Unwritten experiences turn out to be very important

#### **Safeguarding: types of contracts**

This contractor works most of the time with design and build contracts and building team contracts and expects that these two types of contracts will be used most often in the future. It depends on sector, size of buildings and constituents which type of contract will be used most often. In the future, the construction sector will not use more long-term contracts, only longer-term relationships. When some resources are scarce, longer-term contracts can be used, but when the scarcity is over, price becomes more important again and relations with other actors less important. This does not encourage trust between actors.

**Safeguarding: importance of relational norms**

Trust and reputation are very important aspects to this contractor. Transparency and trust have to grow to a higher level, but within five years, this will still not be the case. Perhaps, some more organizations will start to work that way, but a fundamental change is not expected for the entire industry.

**Summary 8: Interview Subcontractor 1** (installation company, only residential building projects)

**Actors: type of strategy**

Norms and legislation are increasing. Climate neutral building will come up the next years. However, there is a huge contradiction between climate neutral buildings and the trend towards more luxurious products. For example, large showers which spoil a lot of water. The next year, this trend towards luxurious products seems to win the battle.

Installation branch is developing towards prefab as well.

The largest part of turnover of this subcontractor comes from plumbing (most people work in plumbing industry within this actor). A lot of installation companies are specializing towards either electra, plumbing or climate control. However, there are also companies who are developing towards delivering a total package.

**Cooperative environment: type and level of collaboration**

Attitude of actors in the Dutch construction industry towards longer-term collaboration agreements is not negative. The discovery of the large scale fraud in 2004 is just the top of the iceberg. Still, price agreements between certain actors within the Dutch construction industry are made.

**Network density: frequency of interaction**

They have direct contact with contractors. Almost always, they get involved in the process when a contractors contacts them and ask for a price. Sometimes, they are asked to participate in a building team construction. However, after some 'free' advice, other subcontractors get to carry out the job sometimes. Therefore, they do not want to work in building teams anymore, except if they get a guarantee to carry out the job as well. Price remains the most important selection criterion from a contractor.

This subcontractor delivers a total package: assemblage of all installations in a project. They receive bill of materials from a contractor and based on that information (including EPC norms), they make sure the right installations will be made and delivered. This subcontractor only accepts products within a region of maximum 50 kilometres away. They have a choice, because there is more than enough work to do for them. This subcontractor does not do active acquisition.

**Exchange of resources: type and amount of resources**

This subcontractor notices a shortage of staff, especially technical staff (mechanics). The number of personnel which they have determines the amount of work they can accept. However, this situation exists already for about fifteen years. They do not work with Bulgarian people or other workers from southern European countries, because language is a problem. Furthermore, they do not know how well-trained they are. The number of sole traders is increasing. They unite in network organizations. Sometimes they work with those network organizations or sole traders directly. Furthermore, collaboration with other installation companies is common (work enough in the market).

Shortage of staff will remain the next years (become worse). Work conditions are not well and that becomes more important. Prefab could be a solution to that, but this is not be used often.

**Exchange of information: type and amount of information**

Information exchange with contractors goes well. They receive all drawings and other information digital. However, one problem is the continuous changes in drawings, which information they receive too late. This costs time, which they can not declare to a contractor.

**Exchange of influence: relative division of power**

Suppliers (trade organizations) are dependent on this subcontractor. If they do not act like this subcontractor want them to, they do not pay the bill. However, since this subcontractor is located between contractors and suppliers, they have a problem themselves as well if this happens. If this subcontractor does not pay the bill of a supplier, this supplier does not deliver their products. Contractors then do not pay them, because they can not carry out the job. Therefore, this subcontractor is really dependent on both actors. Longer-term relationships with those actors are therefore very important to them.

Actor with most influence and power within the supply chain is the contractor. Within the execution stage of a project, contractors have most influence. Within the design stage, constituents have more influence. To constituents, price is not always most important when it comes to selecting a installation company. However, often contractors select those organizations, thereby price is most important.

Final users get more influence during a building process. They unite themselves and speak up more. Sometimes it happens that final users stop a building project temporarily, because they

do not agree with certain things. This leads to problems for the contractor and finally, also problems for the final users themselves.

### **Coordination: type of coordination mechanism**

Contractors become less executors and more coordinators of a building process. The number of subcontractors on the building site is increasing. This does not have to be a problem, if the contractor takes good care of its coordination task. It differs what coordination means to a contractor. Coordinating installation activities is mostly done by the subcontractor who executes that part. This also happens with masonry and finishing of a building.

Most contractors get a hard job, surviving when they are only coordinators of building processes. Large contractors will survive, smaller contractors should remain executors as well (partly). Small contractors who are hired as subcontractors on large building projects is not working properly.

### **Adaptation: type and level of adaptation**

This subcontractor does adaptation to his products or process when a contractor asks that. However, contractors have to pay for that. Furthermore, EPC and EPN norms have to be reached. If the latter is not the case, contractors should sign a contract in which they take full responsibility in case of problems. This subcontractor does not do relation-specific adaptations.

### **Safeguarding: types of contracts**

This subcontractor has no idea of the type of contract which is mostly used between contractors and constituents. If a building is finished, a final user should contact his insurance when a problem arises, before he contacts the contractor. Contractors approach subcontractors and suppliers with that problem. However, this subcontractor does not accept that and returns problems most of the time to the contractor again. The number of claims from contractors is not increasing.

This subcontractor does not notice a shift in the division of responsibilities on the building site. At least not the contractors they work with. They work with the same contractors and suppliers most of the time. They do not work with contractors anymore with who they have a bad experience. They have the possibility, because of shortage of installation companies and staff, to refuse orders from such contractors.

**Safeguarding: importance of relational norms**

Reputation is important. However, a good reputation is hard to get and can be lost easily. The same happens with trust. Price remains however most important. Longer-term relationships with contractors are worth nothing when they get a better price offer from another company. This subcontractor does not have this free choice when it comes to suppliers. Most of the time, a certain label is prescribed in the bill of materials and they have to stick to that.

**Other development**

More brown fields (in Dutch: herstructurering).

**Summary 9: Interview Subcontractor 2** (installation company)**Actors: type of strategy**

Trend towards climate neutral buildings. This actor is dealing with that issue as well. However, they do not intend to be trendsetter, more trend watcher and follower.

Contractors are less executors on a building site and more coordinators. Even small contractors show this behaviour more and more. Shortage of staff enhances this development.

This subcontractor wants to specialize towards climate neutral construction (when it comes to climate control in buildings). Installations become more complex, therefore small installation companies will have trouble follow that development. They are however trend follower, not trend setter. Other installation companies are moving towards diversification (on markets: climate control, plumbing and ventilation). Enlarging companies is hard for the entire market because of shortage of staff.

Contractors are asking total solutions. Therefore, a lot of subcontractors are diversifying. However, this subcontractor accepts such a job from a contractor and hires other subcontractors to do the jobs which they can not do themselves. Therefore, installation organizations do work together (horizontal collaboration). Longer-term relationships between subcontractors and suppliers were already set up. Function of trade organization is to have a total assortment and deliver fast.

**Network density: frequency of interaction**

This subcontractor has direct contact with contractors, subcontractors and suppliers. Normally, a building process starts for them when a contractor asks them to participate. Price is still the most important selection criterion for a contractor to select subcontractors. Sometimes, constituents ask architects to prescribe them in the bill of a materials. This subcontractor does also maintenance jobs for some constituents and therefore, it is possible that those constituents also want new installations from this subcontractor. This does not happen often. They work with a fixed group of contractors. Only projects which are relative close by are accepted. They try to work with fixed suppliers as much as possible.

**Exchange of resources: type and amount of resources**

The number of sole traders is increasing. This actor subcontracts those sole traders to execute jobs for them. Only renovation and maintenance are done by their own staff. Sometimes, sole traders are approached through network organizations, but they prefer direct contact with a

sole trader. They work with the same sole traders mostly. Time and money is most of the times still more important than quality (for sole traders). For renovation and maintenance, they have longer-term contracts with constituents. However, they do not have longer-term contracts with constituents when it comes to new building projects.

Shortage of staff is related to state of economy. If the situation of economy remains the same, the shortage of staff will remain the same. However, it is expected that state of economy will change and shortage of staff will decrease. Furthermore, shortage of staff is also partly caused by the current image of the construction sector.

#### **Exchange of information: type and amount of information**

They do not have problems with exchanging and receiving information during a building process. With small contractors, exchanging information is less frequent as with medium sized or large contractors.

#### **Exchange of influence: relative division of power**

Final users of building speak up more, thereby creating more power. However, contractors still have most power within the construction supply chain. Producers may get bigger influence on a building process, but they do not get more power. To much power belongs to contractors. Sometimes, even constituents do not have much influence on their project (non-professional constituents). Within the design stage, as well as during the execution, contractors have most influence.

Price remains most important to contractors. Price is less important for the selection of an architect (by a constituent).

#### **Coordination: type of coordination mechanism**

Installation companies are located between contractor and supplier within the supply chain. Contractor are asking for total solutions more and more. They want an party who does the installation part of the job for example. Part of the task of coordination a building process is therefore put towards subcontractors. A pyramid structure arises. One main contractor who selects for example three subcontractors who carry out the tasks. These subcontractors select new subcontractors and suppliers. Whether or not a main contractor coordinates a process well depends on their own interests. If they receive payment to coordinate a process from a constituent, then they are not very interested to do much about it. When they are the constituent as well themselves, than the job is done better. Prefab does not seem to become the most important way of constructing a building. It will be used, but on a relative small scale.

**Adaptation: type and level of adaptation**

This subcontractor does adaptations for constituents and contractors. Try to find a solution by themselves and want that turns out to be not possible, they talk to producers about the problem. However, this is only about the re-design of existing products.

**Safeguarding: types of contracts**

For constituents and contractors with who they have a longer-term relationship, they also do installation advice (sometimes in building team constructions). However, they do not prefer building teams because they have no guarantee at all that they get to execute the job as well. Therefore, they only do that with actors who they have a longer-term relationship with. Claims during and after a building process from a contractor are not increasing. Responsibility belongs to contractors. When a problem arises, contractors talk to subcontractors, then the problem goes to suppliers or even producers.

**Safeguarding: importance of relational norms**

Trust and reputation is important, but price is more important. That remains this way.

## **Summary 10: Interview Trade organization 1**

### **Actors: type of strategy**

This trade organization has a strategy towards product diversification: offering a total package. Focus is on residential building, but within non-residential building, architects have more influence. Therefore, this sector is also a point of attention. A trend towards luxurious products and quality can also be viewed.

### **Cooperative environment: type and level of collaboration**

Changes in attitude of actors in the Dutch construction industry are superficial. A lot of initiatives are started in which actors talk with each other, but currently, talking is all there has been done.

### **Network density: frequency of interaction**

Direct contact with contractors and producers. They also have more often direct contact with architects to promote their products as early as possible. Most of the turnover comes however from contact with contractors. When an architect prescribes a certain supplier, contractors mostly follow that advice. Architects do, however, not often prescribe certain suppliers within a bill of materials. Relations with other actors are very important to this trade organization. Unfortunately for architects, but contractors and project developers become more important during a building process (at least, that is what they notice). However, there is a difference between residential and non-residential building. Within residential building, an architect loses influence, where as in non-residential building, an architect is often earlier involved in a building process as a contractor, thereby gaining more influence. The separation between smaller contractors (renovation, maintenance) and larger contractors becomes bigger.

Producers are more and more approaching architects and constituents themselves. Producers think that trade organizations are not doing a proper job when approaching architects and therefore, they are starting to do that themselves. However, when an order is done, most of the times, a trade organization is still involved. Producers often do not have enough storage capacity and do not offer a total package. Therefore, orders are mostly done via a trade organization. However, the margin on this orders (from producers) is often lower than when a contractor approaches a trade organization.

This trade organization focuses on becoming involved in a building process as early as possible. Approaching house construction corporations is therefore also a point of attention.

**Exchange of resources: type and amount of resources**

There is a shortage of staff. This trade organization notices that especially when it comes to technical commercial staff. Contractors and architects also have trouble finding enough qualified personnel. This trade organization has noticed this trend several years ago and reacted to that by creating a prefab department. The size of this department is now increasing considerably. Assemblage of their products is also something they have been arranging for several years now, when a contractor or constituents asks for that. Therefore, they try to maintain longer-term relationships with subcontractors. They also have framework contracts with network organizations of sole traders. However, the members of these network organizations are not always reliable.

**Exchange of information: type and amount of information**

The problem, when it comes to information exchange, often arises during the execution stage, when a contractor is involved. When you need information from a contractor, you really have to work hard to receive this information in time.

**Exchange of influence: relative division of power**

Constituents have most influence during the design stage of a building process, especially when a contractor, who also develops projects themselves, is the constituents as well as the contractor in a process. Within non-residential building, an architect also has considerable influence. When a building management office is involved, the influence of this actor depends on the constituent.

Because of shortage of staff, subcontractors currently have relatively more influence than in situations in which labour is not scarce.

**Coordination: type of coordination mechanism**

Coordination of activities on a building site is often done by a contractor. However, when an architect is supervisor on a building site, things are often better arranged.

**Adaptation: type and level of adaptation**

New product developments are often done by producers. When a constituent or contractor says that they want a certain product, they will always try to deliver that. However, this has to

be done in collaboration with producers. Sometimes, also architects are asking what is possible.

**Safeguarding: types of contracts**

This trade organization has no good overview of which types of contracts are mostly used between constituents and contractors.

The division of responsibilities is changing. Contractors try to move responsibilities more and more towards subcontractors and suppliers. More claims are sent from a contractor towards suppliers.

**Safeguarding: importance of relational norms**

Trust and reputation should become more important in the Dutch construction industry. This will happen in the near future. Because of a high rotation of staff, it is hard to build up trust. A relationship is build up between persons and not between organizations.

## Summary 11: Interview Trade organization 2

### Actors: type of strategy

A trend towards more choices for final users is visible. Final users speak up for themselves more and ask for more luxurious products. A separation between unique products and serial projects becomes larger. More prefab on one site and on the other site traditional working people. However, they are developing towards using the advantages of serial building within unique products. This trade organization focuses on service and product diversification. Delivering added value through knowledge and assemblage (partnering with subcontractors). Other trade organizations are specializing. Because building sites become brown fields more and more, their market is expanding.

### Network density: frequency of interaction

Direct contact with contractors and suppliers (producers), no contact at all with constituents and architects. Their constituent is a contractor. Whether or not trade organizations are passed by producers who have direct contact with contractors, architects and constituents is hard to say. Depends on the sector in which you operate. This trade organization is specialist with respect to doors. Therefore they are part of the wood industry. Within that sector, this development of producers who pass trade organizations during the process is not visible.

This trade organization focuses on smaller and medium sized contractors (who work mostly on a traditional way). To reach this type of contractor, producers remain working with trade organizations. When it comes to other building products, it could be true that producers reach contractors directly. However, the added value of this actor as trade organization can never be reached by producers themselves.

A development which is going on is that more and more contractors start to develop their own products. These type of contractors order all their building materials through a trade organization. Large sized contractors will start to work more directly with producers for certain products; small and medium sized contractors will remain working with trade organizations. Trade organizations who deliver added value (knowledge, complete assortment, partnerships) will survive in the future. This also counts for small, more specialised, trade organizations.

This trade organization does not agree with the statement that trade organizations who move towards the task of subcontractors (in the finishing stage of a project). However, that also

depends on the market in which they operate. Assemblage of masonry is something producers start to do more and more, most of the times in a partnership with subcontractors.

**Exchange of resources: type and amount of resources**

Labour is scarce within the construction industry. However, they do not have much problems finding new staff. It is hard to say whether or not this shortage of staff will affect future developments. However, it is clear that more contractors develop a role as coordinator of building processes and less as executer. This development is partly, because of shortage of labour. Because a contractor is less present on a building site, trade organizations struggle with the fact to who they should deliver information about their products. They do not have contact with the subcontractors who are carrying out the job.

Import organizations are approaching architects and constituents as well, because they realize they have to deliver added value to the supply chain. If they do not do that, they will not survive in the future.

For contractors, price is the most important selection criterion. However, this depends on the state of economy. In times of shortage, price is more important, where as in times of abundance price becomes less important. In times of abundance, lead time and knowledge becomes more important. Logistics on the building site becomes more important, because number of brown fields increases. This task could also lead to added value for trade organizations.

**Exchange of information: type and amount of information**

Information exchange is still a problem. If a contractor contacts them he needs information from them directly. However, information they receive back is minimal. To deliver the right products in the right amount, this information is crucial. Especially when it comes to finishing a building, contractors do not understand that trade organizations need information. With large sized contractors, this is becoming less of a problem.

**Exchange of influence: relative division of power**

Contractor, who also develops products themselves, have most influence during a building process. However, when a contractor is not the constituent as well it seems like he get less freedom to change the bill of materials during a process. It is hard to say why this is happening, it could be because a contractor is afraid of possible consequences (responsibilities) or becomes final users speak up more frequent.

**Coordination: type of coordination mechanism**

Coordination is mostly ad-hoc. This trade organization does not understand why contractors do not coordinate more during a building process. Large sized contractors start to take this job more seriously, small sized contractors however remain working ad-hoc.

**Adaptation: type and level of adaptation**

Adaptations are always small and project-specific. This trade organization does not produce products themselves, so adaptations are always in consultation with producers.

**Safeguarding: types of contracts and importance of relational norms**

Responsibility on the building site becomes an issue more and more. Contractors try to move responsibility towards subcontractors, trade organizations and producers. Because there are more sole traders who work as subcontractors on building sites, an overview of who did what is often hard to get. Therefore, who is responsible for a problem is hard to determine. Trade organizations are most of the time not responsible when problems arise. Reputation becomes more important to a contractor. During tendering procedures, price remains however the most important criterion.

## Summary 12: Interview Producer 1

### **Actors: type of strategy**

This producer follows a diversification strategy (on markets as well as products). Vertical integration is also present, producers who also trade other products. Or trade organizations that shift towards contractors. Horizontal as well as vertical movements are visible. Producers and subcontractors are working more and more in partnerships, thereby decreasing the number of links in the supply chain. On the building site, contractors remain the most important actor; suppliers do not move that far towards contractors. Within the masonry, assemblage moves more towards the producer. In the finishing stage, assemblage moves towards trade organizations. Vertical integration on several levels. The complex supply chain of the construction industry will simplify the next couple of years. Several links within the supply chain will integrate the next years.

### **Cooperative environment: type and level of collaboration**

The construction industry starts to show a positive attitude towards collaboration. Necessity of working together starts to break through. Within five years, this will be much more visible. Transparency becomes normal, more information exchange and the level of trust will also increase. This producer wants more long-term relationships with contractors who also develop; a lot of attention goes to that relationship.

### **Network density: frequency of interaction**

This producer always has contact with the constituent during a process. They visit architects and developers (and other constituents) to show new products and so on. This producer tries to get involved into a building process at an early stage (unique products). Through trade organizations, this producer put his bulk products on the market. They have direct contact with other actors, earlier in a project. Because of more and more brown fields (in Dutch: herstructuring), building sites become more complicated and therefore, contact with producers in an earlier stage of a building project is wanted. Semi-official, they are sometimes also part of building team constructions. Half of the problems in the execution stage of a project follow from the fact that in the design stage, there was too little contact between actors from both stages. However, the distance between design and execution in the supply chain starts to become smaller. This is also true when it comes to the distance between products prescriber (most of the times architect, sometimes contractor) and producer (most of the time supplier). In the past, contact between those parties was mostly indirect, via trade organizations and

mostly also contractor. This producer wants to strengthen their position by getting involved earlier in the process and by passing the trade organizations and contractor and search contact with product prescribers directly. Tactical purchasing by contractor should be replaced by performance based selection by architect and supplier. This producer expects that responsibility during a building process will be more divided between contractor and supplier. This producer has some alliances with contractors, as well as subcontractors. Together they come up with a complete solution/concept and they put it on the market together. When this solution is used within a building process, a second contractor is introduced on the building site (next to the main contractor) for this concept. The producer is not involved during the execution, the partner contractor is. This contractor and this producer have a long-term contract. This is also a trend: producers who initiate this kind of partnerships. And when this happens, a change in the supply chain is happening: trade organizations are no longer involved. Those trade organizations get a different role: more about coordination and the logistics on the building site. Producers shift towards integrated solutions suppliers instead of product supplier. Innovative contractors and suppliers start to find out each other by initiatives like Topbouw. Since the 'bouwfraude' in 2004, the necessity of change starts to break through. Price becomes less important, process becomes more important. This producer thinks that ultimately, the entire construction industry must make that switch from price oriented towards process oriented.

#### **Exchange of resources: type and amount of resources**

If scarcity of personnel and the state of economy are related is not clear, according to this producer. If scarcity and the importance of price as selection criterion are related is not proven. This producer thinks that this scarcity is just temporary and does not expect that this has any influence on longer-term developments in the construction industry. The shortage of personnel is now solved by getting personnel of other EU countries, like Bulgaria or Portugal. If that development pulls through, producers should look for 'easier and smart constructions' because this personnel is not as well trained. Cradle to cradle, sustainability and energy performance norms are of much more influence to future developments than shortage of resources. The circumstances on the building site should improve and the image of jobs like painter and plumber should improve in order to solve the shortage of personnel. Another development is the arising of more and more sole traders. This development makes the coordination of the building process more complicated and responsibilities within a building process become vaguer. The trend of contractors becoming more a coordinator of a building process instead of executing the project is also related to that. Contractors just hire people

when they need them and that enhances the fact that more and more people start a company themselves.

### **Exchange of information: type and amount of information**

Bottom up in the supply chain, actors want to exchange information, but because of the fragmented supply chain, there are a lot of transfer moments in which information can get lost. However, information exchange between actors is increasing. Producers are more and more communicating with actors at the other end of the chain (developers, architects, constituents). Inter- and intranet are thereby of large importance. With architects and constituents, communication becomes more and more directly. Exchange of information will increase, thereby increasing trust and transparency between actors in the supply chain. However, small contractors will remain working on the traditional way. Traditional (small) organizations will focus on small residential projects. Project- and serial building will be work for the medium sized to large enterprises. Traditional (smaller) contractors will become subcontractors in larger projects. The position of a subcontractor is the weakest in the chain, especially when this subcontractor only delivers capacity (labour). The position of producers will be strengthened, because of standardized and unique solutions.

### **Exchange of influence: relative division of power**

The architect lost a lot of its influence the last ten years and is trying to get that back. If this will work is hard to say. Contractors who also take the role of developers are increasing and they will be the executive on the building site and take supervision there as well. Architects only get this role by non-professional constituents. Another trend is that developers take a lead when it comes to the determination of products and producers. The contractor who is also developer has the strongest position in the supply chain at this moment. This producer thinks that the final user in non-residential building does not get more power.

Smaller organizations will play more and more subordinate roles. Producers have become globalized the past years; this is also true for contractors. That is also a reason why collaboration now begins to work. Within the trade industry, the same thing is happening. In a globalized market, collaboration between actors is much easier. Compared with Germany and Belgium, Holland is doing well. In Holland, a kind of exponential curve has been present: for years change went very slowly and now change starts to go faster and faster.

### **Coordination: type of coordination mechanisms**

Contractors with their own building locations have more power and will coordinate more. The position of traditional contractor will become weaker, that actor will become less important

and shifts towards subcontracting. Most of the time, the contractor coordinates the building process (mostly ad-hoc). A logistic coordinator becomes more important due to brown fields. Most likely, this will be an independent party, perhaps construction management bureaus. Standardization within the construction industry must increase, more prefab. One actor who does the coordination during the entire process would be great, but that is not likely on short term. This producer would like that architects would be this overall coordinator.

**Safeguarding: types of contracts**

This producer does not have a proper view on contractual forms (between constituent and contractor). They become more and more earlier involved in the process, so probably, building team constructions are increasing. Longer-term contracts between certain actors are most likely between producers and executive actors (subcontractors mainly) and architects and contractors who also develop. The contractor is leading in that process and most of the times, smaller architectural firms are involved.

## Summary 13: Interview Producer 2

### Actors: type of strategy

EPC norms and climate neutral buildings become more important in the future. Therefore, the role of installation companies are changing. They have become a client as well for this trade organization. Furthermore, their role during building processes is enlarging.

The strategy of this trade organization is to become market leader for the five type of products they deliver now. Diversification is an option, but only if those products contribute and belongs to the assortment they have already. Their focus is on residential building and partly on non-residential building. For both types of construction projects, they have standardized bill of materials. If someone use this standardized bill of materials as a basis for a design, This trade organization is automatically prescribed in the final bill of materials.

There is a difference between residential and non-residential building. Non-residential building has more specialized projects, where as residential building is more about the relationship between actors.

Contractors, who also develop projects themselves, become more successful. Contractors who only have projects from other constituents have a harder job to survive. The number of building projects is stabilizing. The demand is there, but the shortage of staff becomes a bigger problem. Furthermore, legislation becomes a barrier.

The role of an architect during a building process seems to become smaller. Large sized constituents and governments want a bigger role of an architect during a building process. From this constituents, broad oriented architectural firms get their jobs.

### Cooperative environment: type and level of collaboration

This trade organization is positioned in the supply chain between producer and contractor and has to have good relationships with both these groups of actors.

This trade organization hopes that a higher level of collaboration is reached the next years. Actors that already change their mind about collaboration will continue doing that, but actors which still do not want closer collaboration are not likely to in the future. Perhaps, a distinction can be made based on size of organizations: larger enterprises will collaborate, smaller enterprises are less likely to.

House construction corporations are more developing commercial projects as well as social projects: alone or in partnership with a contractor.

This trade organization has longer-term contracts with subcontractors. With their products, it is a big risk to work with subcontractors they do not know. A contractor orders products from them, and has nothing to do with that subcontractor. If problems arise, this trade organization is responsible. Contractors are also trying to move responsibility to suppliers more and more (more claims). Therefore, longer-term relationships are very important. Because of this increasing number of claims, the level of trust is decreasing.

The government wants responsibility for a building process by a contractor. This could be happening, but a contractor should have a bigger role in the process in that case.

#### **Network density: Frequency of interaction**

This trade organization produces and delivers five type of products to the market. They try to provide information about these products to the entire supply chain and create added value this way. The philosophy of this trade organization is the become prescribed in a bill of materials. Therefore, they try to create added value by material subscribers (architects and constituents). This trade organization also creates added value when working with a contractor by taking over certain tasks from that actor: making specific drawings (in Dutch: uittrekstaten). Taking over this task has two purposes: making it easier for a contractor and this trade organization knows that the drawings are made the right way. They make these drawings for free, if they get a guarantee that they can deliver their products. Their advisors work specifically with one group of actors: constituents/architects, contractors, producers. This change has been recently pulled through in the organization.

This trade organization produces most of the product they sell themselves. However, they try to sell as much as possible their own products, because they know the lead-time and quality of that products better. They have their own research and development department (7-8 persons). Because they have contact with almost all actors in the chain, they have insight in future trends.

This trade organization wants a good partnership with producers to work on future developments together. Try to work with the same producers.

This trade organization notices a request from the market for complete solutions. Therefore, they work together with a select group of subcontractors to assemblage their products as well. They give these subcontractors an internal training after which they know all of the products of this actor. This trade organization thereby partly takes a part of the coordination task of a contractor, create added value. Contractor becomes more and more director of a building process. This trade organization becomes involved in a building process through acquisition or relationships, their digital bill of materials service or advertisements.

**Exchange of resources: type and amount of resources**

Labour is scarce. This also a reason why contractors become more directors of a building process. Furthermore, the quality of a building is decreasing. Contractors who have their tasks arranged properly often work in building team constructions and reach a high level of collaboration with other actors.

Tendering procedures should not be used this often. The lowest prices always count and that should not be the most important selection criterion. Work with their own and select group of partners, that is the right way. The market should act freely.

**Exchange of information: type and amount of information**

Changing drawings during a process are sometimes a problem. Coordination and contact with a contractor is very important, but is still a source of problems

**Exchange of influence: relative division of power**

It can not be viewed already, but there should be more and more involvement of installation companies during a process. Power during a building process should not belong to one actor (contractor), there should be collaboration. Reaching a certain level of quality with a select group of partners.

**Coordination: type of coordination mechanism**

Contractors become more and more coordinators of building processes. This task should include building site logistics as well.

**Adaptation: type and level of adaptation**

Only re-design of products. Often, adaptations are done for constituents and architects, not for contractors (not the decision making party in this matter).

## **Appendix 5: Sample size**

### **Sample**

The survey is carried out in a part of the entire (target) population, because interviewing the entire population would take too much time and involves very high costs. Therefore a sample of the entire population is selected (survey population). 'A sample can be defined as a subset of the population' (Rossi, Wright & Anderson, 1983: 24). However, to make statements about the entire population, this sample should be selected carefully to be representative for this entire population.

The sample process consists of seven stages:

1. Defining population;
2. Specifying sample frame (which includes the elements<sup>22</sup> in the target population which are measurable);
3. Specifying sampling technique
4. Determine the sample size
5. Implement sample plan
6. Sample and data collecting
7. Review sample process

The first step in the sample process is the definition of the target population. This target population is defined based on the objectives of the research project. After that, the sample frame has to be determined. In most cases it is not possible to measure all the elements in the target population. For example, if the target population is all the voters at the next election, it is not possible to know in advance which individuals are part of this population because it is not known which individuals will vote or not. Therefore, not all the individuals in this target population can be measured and a sample frame is created. This sample frame must be a representative of the entire population and this decision has to be made by the researcher (Rossi et. al. 1983).

When the definition of the sample frame is made, the sampling technique has to be chosen. A distinction can be made between probability and non-probability methods. Within probability

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<sup>22</sup> An element is the basic unit that comprises the population. For example, all people in the Netherlands which are 18 years or older.

methods, each element of the target population has a known non-zero probability of being selected. In non-probability samples, elements are selected from the population in some non-random manner (Cochran, 1977). Probability methods, include amongst others random sampling (each element of population has an equal and known chance of being selected) and systematic sampling (every N-th element from the sample frame is selected). Non-probability methods include amongst others convenience sampling (selection of sample based on convenience) and judgement sampling (researcher selects sample based on his/her own judgement (Cochran, 1977). Within the field of sampling techniques, there are three basic main methods to select a sample: (a) stratification, (b) clustering and (c) multistage selection. These three techniques are further elaborated below.

- Stratification: the population is divided into several mutually exclusive and exhaustive subpopulations (strata). Within these strata, separate samples are selected and sample estimates are calculated. These sample estimates are later combined to produce parameter estimates for the entire population (Rossi, Wright & Anderson, 1983: 36). There are three reasons to choose for stratification as the sample strategy: (1) appropriate stratification may lead to lower sampling variance and therefore increased efficiency, (2) explicit strata will lead to the fact that certain key groups will have sufficient sample size and (3) creation of strata permits the use of different sample designs for different parts of the population (Rossi et. al. 1983: 37).
- Clustering: sample cases are selected based on groups or clusters. This technique is used when 'natural' groups exist. From all the groups, a sample is selected randomly. Individuals within the groups should be as heterogeneous as possible, where as homogeneity between clusters means is necessary. Without this clustering technique, it would be necessary to have a complete list of all the individuals in order to select a sample, which is not always possible and involves high costs (Rossi et. al. 1983: 36).

After the selection of the sample method, the sample size has to be determined. To determine the sample size, several formulas are developed of which the Cochran's sample size formula is the most well known. The sample size largely depends on the chosen sample method and is based on the type of data (continues or categorical), estimated return rate and error margins (Bartlett, Kotrlik & Higgins, 2001).

After the determination of the sample size, the sample plan is implemented and the data is collected. When the collection of the data is finished, a review of the sample process should be conducted, especially to find out what the non-responses are. These non-responses can bias the research and therefore, these non-responses should be identified.