



Public-Private Interaction in Infrastructure Networks

Towards Valuable Market Involvement in the Planning
and Management of Public Infrastructure Networks

Wim Leendertse
Jos Arts

// IN //
PLAN //
/ NING

Public-Private Interaction in Infrastructure Networks

Towards Valuable Market Involvement in the Planning
and Management of Public Infrastructure Networks

Wim Leendertse

Jos Arts

The past is always deterministic...

(Nassim Taleb in The Black Swan)

This book discusses a study about infrastructure networks and the parties involved in managing and developing such networks. In particular, we study interested in the interaction between (public) network administrators, such as public infrastructure administrators such as Rijkswaterstaat (Dutch main highways and waterways) and ProRail (Dutch main railways) in the Netherlands, and the relevant market parties for developing and managing such infrastructure networks. The interaction between the market and public administrators should exploit the best of both while delivering maximum public and commercial value. Government cannot manage and develop its infrastructure networks without the involvement of the (construction) market and this market seems not to be able to survive without governmental tenders. Our doubts as to whether both parties maximize and appreciate each other gave rise to our study.

We have chosen to focus our study on the Netherlands because, as a result of a construction fraud at the beginning of this century, a transition of the infrastructure sector has been deliberately initiated by the government and involved market. The developments in Netherlands are comparable with developments in other countries, for example, the UK, Australia and the US. Unique for The Netherlands, however, is that to support this transition a lot has been (and still is) experimented with new models of cooperation between the government and the market, like a living lab for public-private partnering. Therefore, we think that the results of our study are very useful and instructive for international infrastructure managers, market parties involved in infrastructure development, infrastructure planners and project managers.

For many years we are active at the interface of the construction market and government, both in making policy for the Rijkswaterstaat and in concrete implementation of such policy in infrastructure projects. What we see is much friction in interaction and consequently recurrent hope and frustration on both sides. Partnering, i.e. regarding and using each other as complementaries in collaboration, is much discussed but still seems not to be common in the sector. We are convinced that there is a lot to gain when both parties better appreciate and exploit their respective roles and capabilities. In order to be able to do that, we think a good analysis of what is happening in the interaction between the (construction) market and (public) infrastructure network administrators is useful and necessary. This analysis may lead to insight into how the interactive processes work, at least in the perception of the involved parties, and how to make these processes more effective.

The aim of this book is to gain insight into the performance of the transaction between the (public) manager of an infrastructure network and the (commercial) market. We focus at the transaction, the set of relationships that determine the interface between (public) infrastructure network administrators and the (construction) market. Regarding this, the transaction as defined in this study is not similar to a contract, the almost 'magic document',

Copyright © 2020 by Wim Leendertse and Jos Arts

This book is based on a PhD study finished under the supervision of the University of Groningen and the University of Delft in cooperation with the Ministry of Infrastructure and Water Management, Department of Rijkswaterstaat, The Netherlands. The PhD study was originally published in 2015 by the University of Groningen under the title: "Publiek-Private Interactie in Infrastructuurnetwerken. Een zoektocht naar waardevolle marktbetrokkenheid in het beheer en de ontwikkeling van infrastructuurnetwerken".

// IN /
PLAN /
/ NING

Published by InPlanning
Oude Kijk in 't Jatstraat 6, 9712 EG Groningen, The Netherlands

Cover design by InPlanning
Cover Photo: courtesy Beeldbank Rijkswaterstaat
Translation and editing: Ampersand Text & Translation, Groningen, The Netherlands

All rights reserved. No part of this publication may be reproduced, stored in a retrieval database or published in any form or by any means, electronic, mechanical or photocopying, recording or otherwise, without the prior written permission from the authors.

ISBN: 978-90-367-9482-4 (printed book)
ISBN: 978-90-367-9481-7 (e-book)

in which one often wants to compress all these relationships. We see the contract as the formal fallout of only one of the relationships in the transaction. We consider the transaction as the whole set of interacting relationships at the interface between infrastructure network administrators and market parties. This transaction determines the behavior of the government in its role as a client to the market, but also in its role as network infrastructure manager. The same transaction determines the behavior of the market. The transaction is therefore the key to the evolvement of sustainable market operation, but at the same time also the key to generating added value for the (public) client. In our study, we have looked for how this transaction can be shaped, taking the best advantage of what the (construction) market and (public) infrastructure network administrators can offer to each other now and in the future.

Wim Leendertse
Jos Arts

Groningen, The Netherlands
Februari 2020

List of Figures *VII*

List of Tables *VIII*

1. The infrastructure sector in turbulence *1*
 - 1.1 Background *2*
 - 1.2 Problem statement and scope *5*
 - 1.3 Contribution to planning practice *8*
 - 1.4 Research approach *9*
 - 1.5 Structure of this book *12*
2. Conceptualizing the construction sector as a complex adaptive social system *13*
 - 2.1 Complex adaptive social systems *14*
 - 2.2 The construction sector as a complex adaptive social system *18*
 - 2.3 System evolution and system transition *19*
 - 2.4 Evolution of the (Dutch) construction sector *21*
 - 2.5 Summary *23*
3. Actors in the construction sector *25*
 - 3.1 The public infrastructure network manager (Rijkswaterstaat) *26*
 - 3.2 The industrial network manager *29*
 - 3.3 Characterization of the construction sector *31*
 - 3.4 Summary *35*
4. Relationships in the construction sector *37*
 - 4.1 Relationships, transaction and contract *38*
 - 4.2 The construction sector as a 'loosely coupled system' *40*
 - 4.3 Integrating the system *43*
 - 4.4 Tightening relationships through partnering *45*
 - 4.5 Types of partnering *47*
 - 4.6 Summary *49*
5. Conceptualizing sustainable market dynamics and customer value *51*
 - 5.1 Sustainable market dynamics *52*
 - 5.2 Customer value *54*
 - 5.3 Competitive distinction by innovation *56*
 - 5.4 Summary *57*
6. Constructing an analytical framework for the construction sector *59*
 - 6.1 The system of the construction sector *61*
 - 6.2 System evolution *63*
 - 6.3 System ordering by means of tight and less tight relationships *64*
 - 6.4 Sustainable market dynamics *64*

- 7. A network management view on the construction sector 67
 - 7.1 Characterizing the networks 68
 - 7.2 Preserving and increasing network value 73
 - 7.3 Governing the network 74
 - 7.4 Involving the market 76
 - 7.5 Relationships and transaction structures 79
 - 7.6 Resume and findings 82
 - 8. A market view on the construction sector 93
 - 8.1 Current market dynamics 94
 - 8.2 Strategy of (large) construction firms 96
 - 8.3 Actors in the construction sector 99
 - 8.4 Relationships in the construction sector 108
 - 8.5 Resume and findings 112
 - 9. Combining network management and market views 119
 - 9.1 The construction sector does not structurally evolve 120
 - 9.2 System responsibility can only be outsourced if parts can be functionally separated 122
 - 9.3 System responsibility can only be taken on with in-depth knowledge of the system 125
 - 9.4 Partnering is a long-term relationship based on financial and non-financial motivators 126
 - 9.5 Strong goal-oriented governance needs adaptability and cooperation 127
 - 9.6 Clients should value added value to the infrastructure network over project value 128
 - 9.7 Market dynamics is still based on price competition and not on differentiation 129
 - 9.8 In the long term the use of MEAT leads to uniformity 132
 - 9.9 Current policies lead to a decrease of contractors 133
 - 10. Public-private interaction in infrastructure networks 135
 - 10.1 Discussing system evolution 136
 - 10.2 Discussing system ordering by means of tight and less tight relationships 141
 - 10.3 Discussing sustainable market dynamics 145
 - 10.4 Concluding on public-private interaction in infrastructure networks 148
 - 10.5 Towards valuable market involvement in infrastructure networks 150
- Appendices 155
- 1 List of network management interviews 156
 - 2 List of market interviews 157
 - 3 List of focus group participants 159
 - 4 Network management interview questions 160
 - 5 Market interview questions 162
 - 6 Tendering procedures and contract forms 164

Glossary 169

References 175

List of Figures

- Figure 1.1: Strategic groups within the construction sector 11
- Figure 2.1: Basic model of adaptation as a result of variation, selection and retention 16
- Figure 2.2: System evolution as a co-evolution process on three levels 20
- Figure 3.1: Public infrastructure management value chain 27
- Figure 3.2: Wheel of hierarchies and networks 29
- Figure 3.3: The transactions in an industrial production network 30
- Figure 4.1: The construction industry as a loosely coupled system 42
- Figure 5.1: Cycle of sustainable market dynamics based on differentiation 53
- Figure 5.2: Value generation in the public infrastructure network value chain 55
- Figure 6.1: Schematic representation of the construction sector as a system 62
- Figure 6.2: System definition from a project perspective 63
- Figure 6.3: The paradigm of system evolution linked to the construction sector 65
- Figure 7.1: Relative focus on actors and relationships in industrial networks 82
- Figure 7.2: Relative focus on actors and relationships in public networks (Rijkswaterstaat) 83
- Figure 7.3: Pattern of tight and less tight relationships in industrial and public networks 85
- Figure 7.4: Main activities and relationships between industrial network managers and their market 89
- Figure 7.5: Continuation as a result of value creation in the industry 91
- Figure 8.1: Relative focus on actors and relationships in the market interviews 112
- Figure 10.1: From generating project value to generating network value 139
- Figure 10.2: Difference between public and industrial network managers with regard to market involvement 143
- Figure 10.3: The transaction as two connected cycles of relationships 151
- Figure A6-1: European public procurement procedures 165
- Figure A6-2: Design phases 166
- Figure A6-3: Vertical and horizontal integration 167

List of Tables

- Table 4.1: Key non-financial incentives in the construction industry 46
- Table 4.2: Forms of partnering according to Barringer and Harrison 48
- Table 7.1: Main differences between industrial networks and public infrastructure networks 69
- Table 7.2: Differences in network policy and management of ProRail and Rijkswaterstaat 70
- Table 7.3: The transaction for service provision and supplying in industrial network management 80
- Table 7.4: Differences between engineer & construct, design & construct, and two-stage tendering 81
- Table 7.5: Motivators used in the transaction with the market by industrial network managers 85
- Table 7.6: Motivators used in the transaction with the market by Rijkswaterstaat 86
- Table 9.1: Hierarchy and characterization of infrastructure network systems 121



The infrastructure sector in turbulence

1.1 Background

“Many of the recent problems and losses suffered by the construction industry can be attributed to low tenders they have been forced to submit for projects as a result of economic developments. This has led to a hunger for work. By pricing below cost, construction firms can recover part of their overhead. However, sometimes it turns out there is a price to pay afterwards. Especially when there are setbacks, or when risks have not been sufficiently factored in” (Taco van Hoek, managing director of the Economic Institute for the Dutch Construction Industry (EIB), 6 October 2014). How right mister Van Hoek was about ‘the price to pay afterwards’ is shown through the following quotation taken from Cobouw1 in July 2019: “The legacy from the past is affecting many infrastructure projects. In addition to the problems at Zuidasdok, IJmuiden and Hoevelaken, a record number of projects seem to be struggling with delays and difficulties. De Ring Groningen A7 is also faced with a three-year delay, the tender for the Twentekanalen is being repeated and Rijkswaterstaat is also looking for a new contractor for the Juliana Canal. With current tenders, fewer and fewer tenderers are registering or builders are withdrawing from ongoing procedures. The fight contracts have been replaced by a withdrawal movement. A movement that will erode the construction market in the long term and create a structural problem for competition”.

The (Dutch) construction sector has been experiencing turbulent times as is the case in many other western countries such as the United Kingdom, Spain, the United States and Australia. Market parties’ values have been fluctuating. Companies are reorganizing. Occasionally, cases of fraud have been made public. There are many take-overs, especially among small to medium-sized enterprises. The practice of market involvement by public infrastructure administrators like ProRail and Rijkswaterstaat2 in The Netherlands is continuously under dispute. Large infrastructure projects regularly face considerable setbacks, leading to (contractual) tensions between administrators and contractors. The controversial Dutch construction fraud in the construction industry in 2001 marked a turning point in the relationship between government and market (Doreé, 2004; Vulperhorst, 2005; Van den Heuvel, 2005). Dutch politicians especially felt that the relationship between government and market should be formed in such a way, that the market would be able to develop into a sustainable one. Since then, the large public clients in the construction sector have radically altered their market policy. But fifteen years on, has the construction sector really radically evolved into a sustainable sector?

“A cartel of The Netherlands’ largest construction companies has cheated Rijkswaterstaat, as well as other (public) clients, out of hundreds of millions of euros. As a result of illegal price-fixing, clients were charged ten to fifty per cent more than necessary for the construction of fly-overs, tunnels, roads and railways. These practices could be carried out for years, because contractors frequently paid bribes to key officials in the Ministry of

1 See www.cobouw.nl.

2 Rijkswaterstaat is the executive agency of the Dutch Ministry of Infrastructure and Water Management for the main road and waterway networks. ProRail is the executive agency for the main railway network in The Netherlands.

Infrastructure and Water Management and to local councils”. This opening was used by Dutch documentary series Zembla in November 2001 to reveal price-fixing in the Dutch construction industry³. This discovery caused a political outcry and, a year later, led to the creation of the Parliamentary Inquiry Committee on Construction Fraud (Parlementaire Enquêtecommissie Bouwnijverheid, or PEC) for the purpose of investigating the nature and scope of the alleged construction fraud. The PEC found the existence of “structural formation of cartels, based on deep-rooted habits in the culture of the building industry...which could in part survive due to the insufficiently alert and decisive stand taken by the government” (Dutch Government, 2002, p. 11). According to the committee, the construction industry was closely interwoven and closed to outsiders. Competition on lowest price had led to illegal price agreements between market parties. In order to break this pattern, the committee suggested establishing a more businesslike relationship between (public) clients and the contractors, in order to better guarantee the integrity and to implement new ways of working by the public clients, aimed at the creation of design space for the market, combined with evaluating tenders based on quality and performance instead of price only. The second Balkenende administration adopted the committee’s conclusions (Dutch Government, 2003). In 2004, this administration created the Regieraad Bouw (Building Management Board), which consisted of representatives from both the construction market parties and public clients (Regieraad Bouw, 2004)⁴. This Building Management Board was to bring about the process of change in the construction industry and keep it going (a transition). The construction industry was to change from a conservative, internally focused sector into a sustainable sector that was innovative and focused on creating added value for society.

The development as outlined above is not unique to the Netherlands (PSIBouw, 2004; PIANOo, 2005). In the 1990s, the UK saw a political intervention in order to thoroughly renew the construction sector as well. In the UK, the immediate cause was the exceptionally bad economic situation faced by the construction industry in the 1990s. In 1994, the British government appointed Sir Michael Latham to analyze the tendering process used in the construction industry. He found a severe lack of efficiency in the relationship between public clients and market. By way of solution, Latham (1994, p. 62) urged for a reform of this relationship and promoted partnering and collaboration between government and the construction industry: “Partnering includes the concepts of teamwork between supplier and client, and of total continuous improvement. It requires openness between the parties, ready acceptance of new ideas, trust and perceived mutual benefit”. In 1997, the UK cabinet created a Construction Task Force led by Sir John Egan, which was to further analyze the construction industry, specifically from the client’s perspective. The Task Force recommended (Egan, 1998) the increased use of integrated client-contractor project teams for the full duration of projects, contracts based on a life cycle approach, granting contracts

3 Quote from Zembla Dutch television broadcast on 9 November 2001, ‘Sjoemelen met miljoenen’.

4 The national Regieraad Bouw ceased to exist 31 December 2009. As of 1 January 2010, the foundation ‘Vernieuwing Bouw’ (Renewal Building Sector) continued the process of change and renewal in the Dutch construction sector. Since 2015 Vernieuwing Bouw is part of De Bouwcampus (Building Sector Campus), a collaboration of public clients, market companies and knowledge institutes. See for more information: www.debouwcampus.nl.

based on best value rather than lowest price, and the introduction of performance appraisal in order to come to a continued improvement of both process and culture. Comparable to the Building Management Board in The Netherlands, a Strategic Forum for Construction was established in 2001, chaired by John Egan (2002). In 2003, this Forum was replaced by the organization that is still active today: Constructing Excellence⁵.

As is outlined in for example the Global Corruption Report 2005 (Transparency International, 2005), construction industries throughout the world teem with all sorts fraudulent practices. The structure of the industry clearly has a number of features that encourage mala fide practices. The value chain (from the initial conception until operation) is long. A large number of different companies (banks, investors, consultants, general contractors, subcontractors, suppliers, specialists etcetera) are involved, with a variety of interests. And there is a very large number of different transactions. The overall result is that lower quality is provided at a higher price. In this respect the practice of the construction sector in The Netherlands is not different from the practice in other industrialized countries. However, there are some characteristics that make a focus of study on the Dutch practice valuable. Firstly, The Netherlands choose deliberately for a governed transition of the sector, initially based on the UK experience. To support this transition a lot has been (and still is) experimented with innovative models of cooperation between the government and the market. In this respect, the Dutch practice can be seen as a living lab for public-private partnering. Secondly, in the sector two clients, Rijkswaterstaat and ProRail, have a dominant position and therefore a strong influence on the transition of the sector. Rijkswaterstaat is a pure public infrastructure network manager and operator responsible for the main road and waterways networks. ProRail is responsible for the management of the main railroad network. Both clients are continuously reworking their network management and market policies based on the results of the afore mentioned experiments. Moreover, although ProRail can be considered a semi public infrastructure network manager, it has also commercial or industrial characteristics. The comparison between the practices of public infrastructure network managers and commercial or industrial network managers may provide new insights in possibilities to reconstruct the sector. Therefore, the study not only looks at the practice of Rijkswaterstaat and ProRail, but also looks at the common practice of pure industrial network managers like Akzo/Nobel (Delamine), Scania and Chemelot/DSM. Although the study is focussed on the Dutch practice, we think that the results are also very useful and instructive for international infrastructure managers, market parties involved in infrastructure development, infrastructure planners and project managers.

The Dutch Parlementaire Enquêtecommissie Bouwnijverheid (PEC), mentioned before, was one of the main reasons to come to a different market policy for large public clients in the construction sector, such as Rijkswaterstaat and ProRail (Metze, 2010). This effect is made clear in Rijkswaterstaat's first businessplan of 2004 (Rijkswaterstaat, 2004, p. 9): "We are forced to implement radical changes by current circumstances, both internal and external. Rijkswaterstaat is faced with the task to change its way of working, and to provide more

⁵ For further information, see: www.constructingexcellence.org.uk

quality with fewer people". Rijkswaterstaat began working according to the principle of 'market, unless...'⁶. "The executive responsibilities with regard to construction, management and maintenance will be left to the market as much as possible. Rijkswaterstaat will focus on professional and expert commissionerhip and on actively securing public interests...a clear division of roles between us [Rijkswaterstaat] and the market, and will also focus on a relationship that is characterized by professionalism, integrity and a healthy market mechanism" (Rijkswaterstaat, 2004, p. 27).

Interestingly, this development was triggered in The Netherlands by the above mentioned construction fraud, but fits in a wider trend of governmental change from traditional public administration to new public value management based on networked governance (see for example Stoker, 2006). Networked governance is a framing of involving and legitimizing a wide range of participants in the planning and decision making process through networking i.e. building and using relationships. This concerns also the set of relationships between the infrastructure network manager and the construction market, in this study referred to as the transaction.

The current businessplan of Rijkswaterstaat (Rijkswaterstaat, 2016a) indicates that Rijkswaterstaat will further develop into a leading infrastructure network and project manager. The infrastructure network will be the starting point for operations, with the required performance determining the type of contract and tendering that will be chosen. Furthermore, Rijkswaterstaat will involve the market in the early stages of the planning process and challenge market parties to achieve innovative solutions that contribute to better network management. Market involvement will be based on partnering (Rijkswaterstaat, 2016b). Unlike earlier businessplans, the businessplan explicitly links market involvement to the functioning of the infrastructure network and network management.

Above, the steps have been described towards a different relationship between government – in its role of client and infrastructure network manager – and the market. The question is whether this relationship has effectively changed in practice as was intended. How has the government as network manager and client for the market executed and filled in the intended shift in roles?, Has the market kept pace with that development in a complementary way? Does the quality of the network improve as a result of this market involvement? And, does such market involvement also lead to a structural change of the market towards a healthier and more sustainable market dynamic?

1.2 Problem statement and scope

As outlined above, public managers of infrastructure networks, such as Rijkswaterstaat and ProRail in The Netherlands, are currently developing into professional network managers (aimed at delivering optimal public services), and – simultaneously – into professional clients for market parties. The market is vital for the realization of infrastructure projects

⁶ The principle of 'market, unless...' means that Rijkswaterstaat involves the market outside of its core responsibilities, wherever the market will be able to carry out tasks more efficiently and effectively.

and for carrying out management and maintenance of infrastructure networks. As explained, the market policy is twofold. On the one hand, it is aimed at gaining maximum value for the infrastructure network (maintaining and/or improving network functionality, reduction of traffic nuisance, creating a better fit with adjoining network managers, etcetera). On the other hand, it is aimed at developing and maintaining a reliable and sustainable market. This market policy is (partly) filled in by clearing the way for the market to develop creative solutions of its own by allowing the market creative space for innovation. As a result, market companies should be able to distinguish themselves from the competition through creative combination of specific knowledge, experience and skills, instead of by way of (lowest) price only. However, a result of allowing creative space is more diversity in the solutions that are offered. More uncertainty with regard to solutions appears to be at odds with 'controlled' network management – a requirement of politics and society to (governmental) infrastructure network managers. This tension demands a direct link between market policy (and its execution) and network policy and management. After all, the purpose of stimulating the market to supply network value is to improve the way the network functions, now and in the future. The challenge is to link the management of the infrastructure network to a market approach that generates solutions, which contribute to an optimal network management, while at the same time stimulating a sustainable market dynamic in construction by stimulating the development of distinctive knowledge and skills. The aim of this study is to gain insight into the performance of the transaction between the (public) manager of the infrastructure network and the market. The transaction encompasses everything that shapes the relationship between these parties. As such, the transaction may be seen as a 'control switch' that regulates the connection. Through the transaction, a change in the network and/or the market policy affects the market – vice versa. In this study we explicitly distinguish the transaction from the contract, which is the focus of much construction-related research. The contract only concerns the formal reflection of the relationship between the client and the contractor. The transaction in this study is much broader, encompassing all relations between the network manager and the market. As a result of this, the double role of the network manager as both client for the market and manager of the infrastructure network is brought forward. Linking the market to network management, separated from a specific stand-alone project, is an important theme for sustainable market dynamics.

Infrastructure network managers maximize the functionality of the infrastructure network and realize expansion, wherever this is considered necessary because of a network vision. In order to achieve this, all sorts of adjustments have to be made to the infrastructure network: projects regarding regular management and maintenance, replacements (major repairs and renewal) and expansion projects (extensions)⁷. For all such adjustments, the market is brought in. In this study, all managers, clients and market companies working in the planning, preparation, realization, management, maintenance and financing of the large infrastructure are defined as the *construction sector*.

⁷ For the remainder of this study, all adjustments to an infrastructure network for the purpose of management, maintenance, repairs, renewal and expansion will be referred to as 'projects'.

Within the construction sector, the study focuses on those (public) clients who are also managers of an infrastructure network, the (*public*) *infrastructure network managers*, and the way they involve or could involve the market in their network management. Here, the *infrastructure network* is the cohesive, physical main network of roads, railways and/or waterways. In order to be able to make the comparison explicit, Rijkswaterstaat (and ProRail) will be used as a reference for the public network manager. Within the Dutch construction sector, Rijkswaterstaat is the largest public client. Moreover, Rijkswaterstaat has played a significant role in the development of the relationship with the market after the construction fraud discussed in Section 1.1 (Metze, 2010). However, the applicability of the study's results is explicitly not limited to Rijkswaterstaat only. Instead, we think that the results are relevant to all large (industrial, public and semi-public) network managers and the market parties involved in network management.

In this study the term network is used for the *physical infrastructure* network like the transportation networks of roads, railways, waterways and networks for the distribution of energy. However, the study focusses also on the *social* network of 'actors and their ties' (Newman, 2010, p. 36) related to the afore-mentioned transaction. To make this distinction clear the study will indicate the social network of the construction sector with the term *social system*.

According to Weber and Alfen (2011, p. 9) *infrastructure* can be defined as: "...all physical assets, equipment and facilities of interrelated systems and the necessary service providers, together with the underlying structures, organizations, business models and rules and regulations, which are used to offer certain sector specific commodities and services to individual economic entities or the wider public to enable, sustain or enhance social living conditions". In daily use, the term refers to the physical structures that support society, such as roads, railways, waterways, bridges, water systems, sewer systems, telecommunication, etcetera (Linden & Voogd, 2004). Functionally, infrastructure facilitates the production of goods and services, and, in addition, the distribution of finished products to buyers. The word 'infrastructure' is a combination of the Latin prefix 'infra', meaning beneath or lower layer, and the word 'structure' (Oxford English Dictionary).

In this study, the *market*⁸ means the construction market for (large) infrastructure projects. This encompasses all commercial firms working in the preparation, realization, management, maintenance, exploitation and financing of infrastructure projects. The study focuses specifically on large infrastructure projects related to roads, railways and waterways. On the one hand, this is because the way the transaction with the market is given form in these projects has undergone extensive development over the last decade. On the other hand, for the (major) market parties, it is these projects that play a dominant role in their positioning in the construction market.

⁸ In literature, the term 'market' is both used to indicate the sector and to indicate the market dynamics. In this study, the term 'market' will be used to indicate the sector from now on. Furthermore, the market in question will be referred to as the construction market. The construction market combined with its client will together be referred to as the construction sector in this study.

The (continuously changing) set of relationships between the infrastructure network manager and the market will be referred to as the *transaction*. This concerns relationships on the operational level (for example within projects), the tactical level (between market companies and, for example, the infrastructure network manager) and the strategic level (between the market sector as a whole and the government). A change in one of these relationships affects all other relationships within the transaction. The transaction is the relational connection between the manager of the infrastructure network and the market, and as such, also an instrument with which the network manager can influence the market – and vice versa, an instrument for the market with which to influence said network management.

In summary, the *research question* of this study can be defined as follows:

How can (public) managers of infrastructure networks link network management to a market approach that will both promote solutions that contribute to their network management (added customer value) and promote a sustainable market dynamic in the construction sector?

1.3 Contribution to planning practice

Infrastructure planning concerns the planning and management of implementation of infrastructure policy into functioning infrastructure networks. Planning, management, implementation and operation is done by actors, such as public infrastructure network managers and market companies. These actors interact through relationships. A deeper understanding of the practice of these relationships is essential for the further development of infrastructure planning and management. This deeper understanding helps to explain observed behavior of the construction sector, offers the possibility of evaluating intended change in the infrastructure network and/or market policies, and provides a basis for recommendations for planners and (public) managers of infrastructure networks and (public and private) professionals in the construction sector to improve valuable market involvement and thereby the planning and development of infrastructure networks. Actors in the construction sector and their mutual relationships form the *system* of the construction sector. This system can also be seen as an *arena* empowered and constrained by institutions “in a constant process of matching situation to rules and, as formal rules and wider contexts change, informal practices may be modified to fit new circumstances (Lowndes & Roberts, 2013, p. 58). *Institutions* refer to the frameworks within which the actors in the sector operate. These frameworks include for example cultures, norms and values, laws and regulations, agreements and technical possibilities. The actors are continuously making changes to these institutions while at the same time being subjected to their influence (Kooiman et al., 2008). The study in this book focusses on identifying the specific rules of behavior that are explicitly or tacitly agreed upon in the construction sector and in general followed by the actors, the ‘rules in use’ (Ostrom, 2005; 2011), and to explain identified phenomena with respect to planning and management practice.

1.4 Research approach

This study aims to understand the practice of relationships between infrastructure network management and market companies, in other words the practice of the construction sector (see also Flyvbjerg, 2004). Current practice is identified through interviews and focus group discussions and reflected to theory discussed in literature.

Literature review and defining a framework for analysis

In Chapters 2 to 6, the relevant theoretical background for this study is presented based on a review of (academic) literature. The theoretical framework in this study has been used *ex ante* to generate themes for the interview questions, and *ex post* to understand and explain observed patterns. By explaining, we mean the detection of general patterns that provide insight in the relationships, especially to explain what has been observed in practice in order to answer the research question.

In this study, the construction sector and its development are regarded as a complex adaptive social system. That is why the review starts with the system perspective in Chapter 2, in which the theory of complex adaptive social systems is explored. In addition, also theory regarding system evolution or transition is considered, because, as mentioned in the introduction, a transition of the construction sector was deliberately intended. System behavior is determined by interaction of actors by way of their mutual relationships, and by interaction of the system with its environment. Here, the transaction can be seen as a particular partial set of relationships within the system of the construction sector. Subsequently, Chapter 3 concerns theory about relationships, with specific focus on the phenomenon of partnering as a particular interpretation of the relationship between client and contractor. In the construction sector this relationship concentrates on projects and the contractual relationships in projects as a (strongly) coupled subsystem. The relationship between projects and the entire system of the sector is explored by way of the theory of loosely coupled systems. The perspective of system integration describes the way in which connections in the system come into being, and to which degree coordination is introduced into the system. We conceive a system as consisting of interrelated actors. Chapter 4 focuses in more detail on the construction sector and elaborates on the actors involved in infrastructure network management and the related market parties. Based on literature an institutional, economical and a cultural characterization of the sector is given to act as a basis for comparison with the results of the interviews and focus groups. Chapter 5 examines the market and market dynamics from the perspective of the theory of sustainable market dynamics. This Chapter elaborates on the concept of a sustainable market and the mechanisms behind market dynamics. In Chapter 6, the theories as discussed in Chapters 2 to 5 are combined with a system representation of the construction sector to form a framework for further analysis.

Interviews

As discussed before, the objective of this study is to gain an understanding of the performance of and the relationships between infrastructure network managers and market parties (in practice). To investigate this, we have chosen for a narrative way of interviewing (Bryman, 2008), to explore the way actors view ‘their world’ and the relevant

relationships within that world. As Flyvbjerg (2001, p.137) argued: “Narrative enquiries do not start from explicit theoretical assumptions. Instead, they begin with an interest in a particular phenomenon that is best understood narratively. Narrative inquiries then develop descriptions and interpretations of the phenomenon from the perspective of participants, researchers and others”. A deliberate decision was made to interview the network managers and the market separately, and to subsequently compare the results, because the similarities and differences in both views of the transaction are exactly what provides deeper insight into the relationships of the transaction. All interviews were conducted in the period 2012 to 2015. In the interviews with regard to the network (for brevity hereafter also called ‘network interviews’), public, semi-public and industrial network managers were compared in how they involve the market in their method of network management. A semi-public network is defined as a network that possesses the characteristics of a public network, but is commercially managed. An industrial network is in this study defined as a production network that is managed and developed by a private network manager. The interview population was selected in an evolving manner. It started with an a priori selection of organizations and people to be interviewed, based on personal knowledge and understanding, as well as a number of exploratory interviews. The selection was based on the assumption that it was necessary at least to interview Rijkswaterstaat, ProRail, one semi-public network manager and at least one industrial network manager (see Section 1.1), in order to enable mutual comparison. Furthermore, the basic principle was to interview individual professionals at the levels of both network management and contracting, as these are the main organizational levels that determine the way of market involvement. A standard element in the interviews was to ask for recommendations about other relevant organizations or people for additional interviews. As such, the population was expanded until saturation was achieved⁹. Appendix 1 provides an overview of all those who were interviewed.

The interviews relating to the market (for brevity called hereafter ‘market interviews’) are focused on the market as defined in Section 1.2 and the way in which the market is involved in the management of the network. Foreign contractors, active in the Dutch construction sector, were also interviewed. However, they were questioned specifically about their view on and experience of the Dutch construction sector.

Since the early 1970s¹⁰ several authors (see for example: Hunt, 1972; Porter, 1980; Tang & Thomas, 1992) have written about ‘strategic groups’, groups of businesses that follow the same or a similar strategy within a business sector. Figure 1.1 is a schematic representation of the most important strategic groups within the construction sector. For each strategic group, a selection was made a priori of the people and organizations that were to be interviewed. The basic principle was to interview at least one professional per strategic group, in addition to Rijkswaterstaat and ProRail. Individual interviewees were selected

⁹ Saturation means that the interview population has been expanded in an evolving manner to the point, at which no new individuals or organizations, no new themes and no new insights emerge from the interviews (Bryman, 2008). When saturation is achieved, it can be assumed that the interviews have yielded all relevant insights. At that point, the coverage may be assumed to be representative of the entire population (Hennink et al., 2011).

¹⁰ The term “strategic group” was originally introduced by Michael Hunt in 1972 (Hunt, 1972).

based on their understanding of the organizational and sectoral practice. The population for the market interviews evolved during the interviews to the point of saturation in the same way as described for the network interviews. Appendix 2 provides an overview of all those who were (eventually) interviewed.

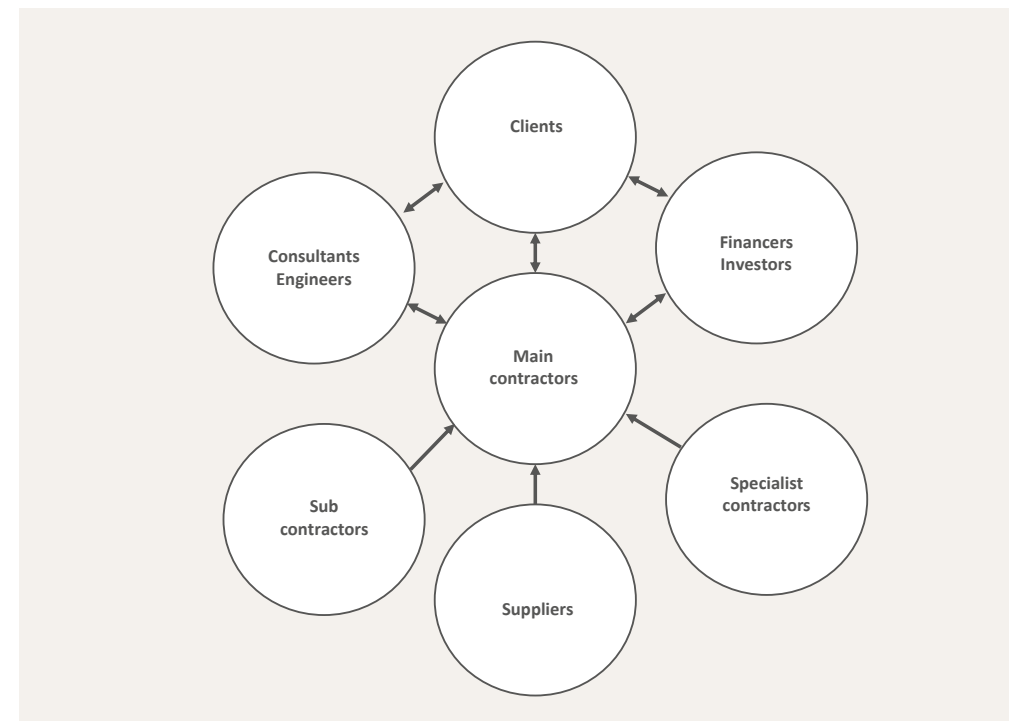


Figure 1.1 Strategic groups within the construction sector (based on Bower, 2003)

The interview questions relating to both the network and the market were derived from the research questions and the theoretical framework, as described in appendices 4 and 5. The questions were communicated to the interviewees prior to the interviews. The essence of the interviews was to generate the interviewee’s story by way of a conversation (narrative). With regard to the use of narrative interviews, several critical remarks have been made in literature. For instance, Taleb (2007, p. 63) states, that human nature aims to simplify its complex world by way of stories. As a result, the outcome of any single narrative does not necessarily represent the truth. This study deliberately seeks to find the (congruent and incongruent) views of the people concerned within the construction sector. The multitude of interviews, the use of saturation and the comparison of the outcomes to (largely) sector-independent theory all support the representativeness of the final results. Incidentally, Taleb (2007, p. 64) does not reject the use of narrative. Where it goes wrong, according to Taleb, is when we start using it to make predictions out of this understanding. However, no predictions are made based on the study; the study only observes and analyses to gain a deeper understanding of the performance of and the relationships between infrastructure network managers and market parties (in practice).

Focus groups

The findings from the confrontation of the interview results with the analytical framework (see Chapter 6) have been used as input for the next stage of the study which consisted of four focus groups. These focus groups were conducted in 2014. A conscious choice was made to have the focus groups respond to the analysis results of the interviews, because the group interaction was expected to yield validation and enrichment. The hallmark of focus groups is the explicit use of the group interaction to produce data and insights that would be less accessible without the interaction found in a group (Bryman, 2008). The discussion and interaction in the focus groups provide more detailed findings, which – combined with the initial findings from the analysis of the interviews – form the basis for the final discussion in this study (Van de Ven, 2007). For the focus groups, a maximum of six individuals (of equal stature) were selected per focus group, who have an understanding of the network domain as well as the market domain. Appendix 3 provides an overview of the participants of the focus groups as well as the themes discussed in the focus groups.

1.5 Structure of this book

After this introductory Chapter, Chapters 2 through 5 discuss (academic) literature, providing a theoretical basis for the study. Subsequently, in Chapter 6, the theory from these chapters is linked to the specific context of the construction sector to form a theoretical framework for analysis and further discussion. In Chapters 7 and 8, the interview results are discussed comprehensively and findings from the interviews are formulated. Subsequently, in Chapter 9 these findings are combined and enriched with the results of the focus groups. Subsequently, Chapter 10 discusses the overall results of the interviews and of the focus groups in the context of the problem statement as given in Chapter 1 and of the analytical framework as given in Chapter 6. From this discussion, final conclusions are derived, as well as recommendations for planners of infrastructure networks, (public) managers of infrastructure networks and (public and private) professionals in the construction sector.



Conceptualizing the construction sector as a complex adaptive social system

In this study, the construction sector is considered as a *complex adaptive social system*. *Complex*, due to the many mutually interrelated relationships. *Social*, because the sector appears to be capable of learning and building up intelligence. *Adaptive*, due to the fact that the sector acts in a very dynamic environment, evolves and has survived until now.

The theory of complex systems (Axelrod & Cohen, 2000; Sanders, 2002; Stacey, 2007; Aldrich, 2008) offers some notions for understanding the way a complex adaptive social system works. It generally posits that the observed behavior of a system cannot be decomposed into underlying mechanisms due to the complex interactions in the system. A complex system view of organizations conflicts with the more behaviorally-oriented view of organizations as taken by the social sciences. The behavioral theory (Cyert & March, 1992) states that the behavior of an organization comes from the underlying behavior of the actors of which it is composed. Ever since the 1960s and 1970s, complexity theory has incorporated elements of behaviorism as what may be called a theory of complex adaptive social systems. According to Nicolis and Prigogine (1989), a complex system cannot be steered in a certain direction. At most, conditions may be created under which a system can evolve in a certain direction. This contextual evolution forms the basis for the theories of system transition and system evolution. These theories will be discussed in more detail in Section 2.3 of this Chapter. As addressed in Chapter 1, the (Dutch) construction sector has been in evolution ever since the construction fraud. The foundation of this evolution in system transition and evolution theories will be elaborated in Section 2.4.

2.1 Complex adaptive social systems

What is a complex adaptive social system? As mentioned before, complexity theory functions as an umbrella for a multitude of theories, all based in natural sciences. For example, Sanders (2002, p.139) argued that “complexity theory is really a collection of ideas about the concept of change in complex adaptive systems”. The essence of these theories is to study ‘order’ within strongly dynamic, non-linear systems. The word ‘complexus’ is derived from the Latin word ‘plexus’, meaning braid or twine. Hence, *complexity* is associated with the intertwining of elements or actors within a system and of the relationship of this system with its environment. Heylighen (2008, p.4) stated “in order to have a complex, you need two or more distinct components that are connected in such a way that they are difficult to separate.... it is the relations weaving the parts together that turn the system into a complex, producing emergent properties...a system becomes more complex as the number of distinctions (distinct components, states, or aspects) and the number of relations or connections increases”. Complexity concerns the way in which a number of (reciprocal) relationships between constituent components and the system environment can lead to collective patterns of behavior of the system as a whole (*emergent behavior*). Emergence refers to the principle that a system as a whole displays properties that cannot be reduced to (or explained by) the properties of the underlying components or subsystems (Stacey, 2007). Rotmans et al. (Rotmans, Dirven & Verkaik, 2002, p. 10) define a *system* as: “interrelated elements that are considered a whole, and which, depending on the way in which the elements influence each other, is evolving in a certain direction”. A system fulfils a certain function in its environment. A system’s environment is made up of those elements outside of

the system, that exert influence on or are being influenced by the system. In principle, it is up to the researcher to indicate where he or she defines the system boundaries. Accordingly, Weinberg (2001, p. 52) argued that “a system is a way of looking at the world”. By defining the system, the boundary with the environment and the relationship with that environment are also defined. In a *complex system*, the constituent components themselves may also be open subsystems. A subsystem can be defined as a constituent part of the larger system with its own function, which is related to and contributes to the function of the larger system. By way of interaction with the higher system, they change that system, but undergo continuous change themselves as well. “There is not just one global hierarchy or non-linear organization, but a multitude of inextricable entwined suborganizations and subsystems” (Heylighen, 1989, p. 3).

Folke (2006) describes a *complex adaptive system* as a complex system, which is able to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks. The system adapts by way of cycles of variation, interaction, selection and retention (Axelrod & Cohen, 2000; Aldrich, 2008). According to Axelrod and Cohen (2000), equilibrium does not lead to change and evolution. A disturbance of the balance is necessary to make the system search for a new – and, considering a new context, better fitted – equilibrium. Evolution requires diversity or variation. The more possibilities for variation (possibility space) there are, the more adaptive the system is. Ashby (1956, p.207)¹¹ phrased this as “a system survives to the extent that the range of responses it is able to marshal (as it attempts to adapt to imposing tensions) successfully matches the range of situations (threats and opportunities) confronting it”.

Variation is created when the system possesses mechanisms for creating, destroying or transforming (groups of) actors or relationships. The standard mechanism for this is *copying*. Only those elements that seem attractive to the system will be copied. Occasionally, certain actors or relationships will increase or decrease in frequency within the system as a result of this mechanism. This means that copying eventually results in a decrease in possibility space. The system deteriorates into a mechanical system, in which everyone displays the same predictable behaviour. However, mistakes are made during copying, called *mutations*. These mistakes provide variation. But this happens slowly, and is only incremental when it comes to innovation. Another mechanism is *recombination*. Recombination concerns the creative rearrangement of existing parts of an organisation in order to generate new solutions (Abrahamson, 2004). Because recombination is an endogenous process, this implicitly leads to equalization of currently successful performance.

Selection is the mechanism that decides whether a variation is stimulated or contained. By means of retention, the selected variation is anchored in the renewed organizational structure. In this way an organization adapts under the pressure exerted by the environment. Adaptation arises from within the system. There is nothing outside the system that governs and controls adaptation and evolution.

¹¹ Known as Ashby’s Law of Requisite Variety (Ashby, 1956).

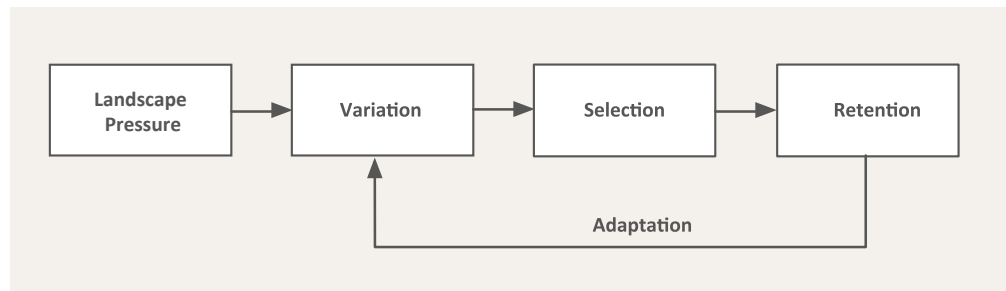


Figure 2.1: Basic model of adaptation as a result of variation, selection and retention (based on Axelrod & Cohen, 2000)

Most of the afore mentioned theories of complexity originate from mathematics and computer sciences. Actors and relationships are dots and lines on a screen. But what makes a complex system social? By learning and building up intelligence, a system develops social capacity. Gunderson and Holling (2002, p. 107) define a *social system* as: “any group of people who interact long enough to create a shared set of understandings, norms, or routines to integrate action, and established patterns of dominance and resource allocation. Like any system it is dynamic, meaning that it is difficult to change any one part of it, without considerable effects on other parts”. Miller and Page (2007, p. 115) state that in a social system, the actors possess intelligence: “Social agents must predict and react to the actions and predictions of other agents... Social agents...often alter their behavior in response to and in anticipation of the actions of others”. Stacey (2007) concludes from computer simulations that there is a direct relationship between the degree of connectivity and the behavior of the system. The system learns and evolves through interaction. The possibility of interaction arises as a result of connectivity. According to Stacey, the degree and characteristic of the connections largely determine the emergent behavior of the system and its adaptive ability.

Complex systems are continuously developing when it comes to behavior and structure (self-organizing and evolving). In fact, complex systems evolve from stable behavior to stable behavior (Axelrod & Cohen, 2000; Aldrich, 2008). In between, there is a temporary situation of instability. This instability offers the possibility to change the structure in such a way, that it can react to and anticipate developments in the environment. As such, instability creates room for a change in the structure, and the changed structure then becomes the basis for new (stable) behavior. Theorists of ‘the edge of chaos’ claim that system renewal mainly arises between order and disorder. Once a system becomes too stable, it is no longer capable of responding adaptively to external change. Once a system becomes too unstable, it will spin out of control and disintegrate into chaos. Their underlying claim is that evolutionary systems tend to structure diffuseness of their interaction patterns to achieve a good balance between exploration and exploitation (Axelrod & Cohen, 2000, p. 72)¹².

¹² This balancing between explorations and exploitation is in literature referred to as ‘organizational ambidexterity’ i.e. the ability of exploiting their existing competencies while simultaneously exploring new opportunities.

Gunderson and Holling (2002) describe change of social systems (organizations), from a social ecology perspective, as a cycle of alternating periods of relatively slow conservation of energy and materials (exploitation), and relatively fast periods of change, innovation and reorganization after instability (exploration). During the build-up phase, stability builds up. The system is reorganizing after a phase of relative instability. Energy and materials are stored. This can be compared to the build-up phase of a regime¹³ in an organization or a sector like the construction sector. The system becomes more stable, but also more inert. This continues until the moment when the system, using the current regime, is no longer capable of absorbing the external dynamics. The stored energy is released, creating (a certain amount of) instability (creative destruction¹⁴). A system possesses redundancy (resilience¹⁵), preventing it from falling apart and ensuring its re-orientation. This is the phase in which new ideas for change are given a chance. Stability is re-established once the system begins to re-organise. The system selects those ideas it considers suitable for the survival of the system (adaptivity). These ideas are then incorporated into the organization’s regime (retention), making the system yet more stable.

As argued by Gunderson and Holling, complex systems need a continuous nourishment of energy from their environment or adjacent systems in order to survive and grow. Seel (2006, p. 4) phrased this as follows: “When a dissipative structure leaps into a new order, it requires more energy or information to sustain it than the simpler structure it replaced”. In the context of the construction sector, energy can be seen as information, knowledge and skills, resources such as time and money etcetera. In short, everything the environment can offer the system (the construction sector), or whatever the system needs in order to evolve. Sanders (1998, p.68) argued “complex adaptive systems, are open non-linear evolutionary systems, that are constantly processing and incorporating new information. Their existence and structure depends on the constant flow of energy and information”. According to natural laws, systems configure themselves in a way that is the most energy saving (lowest entropy), unless energy is available in abundance. After all, a complex adaptive system does not have to be perfect in order to survive in its environment. All it has to do, is to be better than its competition as already coined by Darwin (1859).

¹³ The term ‘regime’ is further elaborated on in Section 2.4.

¹⁴ The term ‘creative destruction’ was introduced by Schumpeter (1943) to indicate that change can only take root when the old has been broken down, so that there is room for innovation.

¹⁵ The term ‘resilience’ in relation to the properties of systems was introduced by Gunderson and Holling as “the capacity of a system to experience disturbance and still maintain its ongoing functions and controls” (2002, p. 15). Folke et al. (2010) link the concepts of adaptability and transformation to the term resilience. They define adaptability as the capacity of a system to change its behavior in such a way, by learning and using experience and knowledge, that the system is able to maintain its position within the current stability domain. Once the system crosses a certain stability threshold, it will have to transform in order to survive under radically new circumstances. The whole of adaptability and transformability they define as resilience of a system.

2.2 The construction sector as a complex adaptive social system

Based on her specific characteristics, the (Dutch) construction sector is in this study considered a complex adaptive social system. The construction sector consists of multiple connected, related actors (see Chapter 3) and as such can be considered to be a system, in accordance with Rotmans' definition. The actors appear to be capable of learning and building up intelligence and are as such social actors. The social system seems adaptive, given the fact that the construction sector is not falling apart, despite the crisis caused by the construction fraud and the recent economic recession. Instead, it adapts to the changing circumstances and has the capacity to learn and hence survive (see also Verhees & Arts, 2016).

Also, the construction sector has characteristics of complexity. As will be discussed in the next Chapter, (traditional) linear chains of parties or activities are still frequently used in the construction sector. Relationships are one-sided, with the product being passed on from one party to the next. Optimization is perceived to mainly concern optimizing building logistics, planning and decision making, based on the idea that an optimization of constituent components will lead to the improvement of the entire system. The approach and way of operating is methodical and thematic, and extremely goal-oriented. The reality of reciprocity in the relationships, however, results in complexity. Things become more complex if part of the activities start to run parallel and relationships become reciprocal, rather than linear and one-sided. Coordination then becomes necessary to align activities. If relationships are reciprocal, the predictability of the end product decreases, because this develops out of the interaction (Teisman, 2005). An example of this is the introduction of participative and collaborative stakeholder management (Healy, 2006) as part of the planning process. Traditionally, the stakeholders were involved at a relatively late stage during the planning process (mostly by communication of plans) by means of unilateral relationships. As a result, the main process could remain relatively simple because of the lack of interaction with the stakeholders. However, once this relationship becomes interactive and reciprocal, stakeholders will also be included in the planning and development of a project. That means the simple linear system shifts towards a complex system. This corresponds with Hertogh and Westerveld (2010), who state that social complexity is the dominant form of complexity in large infrastructure projects. They define social complexity as the complexity that arises as a result of several players with diverse interests acting within the project and the project environment.

An important characteristic of a complex adaptive system is that it is able to evolve in time and as such can react on changing circumstances. As mentioned before the construction sector seems to be very adaptive since it has adapted itself continuously during the last decades to a strongly changing environment. The next Section firstly elaborates on theory of system evolution, before we further elaborate on the evolution of the (Dutch) construction sector in Section 2.4.

2.3 System evolution and system transition

A *system evolution or transition*¹⁶ is defined by Geels (2005, p. 681)¹⁷ as: "a shift from one socio-technical system to another, i.e. co-evolution processes, which involve technological changes, as well as changes in other elements. System [evolutions] involve simultaneous processes on multiple dimensions and levels. They are a blend of longer term and shorter term processes. System [evolution] requires that these processes link up and reinforce each other". A transition or evolution does not follow a set course, but is often a combination of several sub-transitions on different levels, determined by the external pressure on the regime (landscape pressure or macro level), the state of the regime (meso level), and the timely presence and strength of innovative ideas (niche innovations or micro level) (see: Geels, 2005, 2014; Geels & Schot, 2007; Genus & Coles, 2008 and also Figure 2.2¹⁸). The macro level concerns the exogenous environment of the considered system. On this level, landscape changes take place (socio-technical landscape, see Rip & Kemp, 1998), for example in the area of politics, culture and paradigms. Niches are located on the micro level, where innovation can arise¹⁹ (Geels, 2002, 2005; Rotmans, 2006). This is where we find the breeding ground for radical renewal and innovation (variation). Because the performance of radical innovation is initially low, these radical innovations mainly thrive in 'protected' environments. Geels (2005, p. 684) calls these niches the "incubation rooms for radical novelties". On the meso level, there are regimes, systems of dominant practices, rules and interests shared by groups of actors. The existing system is 'locked-in' in what is called its socio-technical regime (Rip & Kemp, 1998; Berkhout, Smith & Stirling, 2003).

Geels (2011, p. 27) defines a (socio-technical) regime as: 'the 'deep structure' that accounts for the stability of an existing system. It refers to the semi-coherent set of rules that orient and coordinate the activities of the social group that reproduce the various elements of socio-technical systems". According to Geels, a regime is not the same as a system. The system refers to tangible, measurable elements (actors and relationships). The regime refers to the intangible, deeper structures below (Geels, 2011, p. 31). Regimes often have a negative association as an inhibitor to innovation and change. However, regimes also cause peace and stability in the organization. Rip and Kemp (1998, p. 338) characterize regimes as: "intermediaries between specific innovations as these are conceived, developed and introduced and overall socio-technical landscapes" as is schematized in Figure 2.2.

¹⁶ The concept of transition in the meaning used here, appears in literature under several different names: system evolution, system transition, regime transformation, system innovation or technological transition, transition management, industrial transformation or socio-economic paradigm shift. For the remainder of this book, the term system evolution will be used.

¹⁷ Geels has developed his global theory of system transition based on analysis of the transition paths of technological innovation, that is to say, analysis of the past. His model indicates that despite a multitude of possible transition paths, coordinating patterns can be recognized in transitions.

¹⁸ In fact, Geels adds (hierarchical) levels to the ('flat') basic model of variation-selection-retention as presented earlier. Geels places the cycle of variation-selection-retention on the regime level.

¹⁹ A niche is defined by Geels (2002, 2011) as a relatively quiet environment, shielded from the current regime ('protected space'), a breeding ground for ideas.

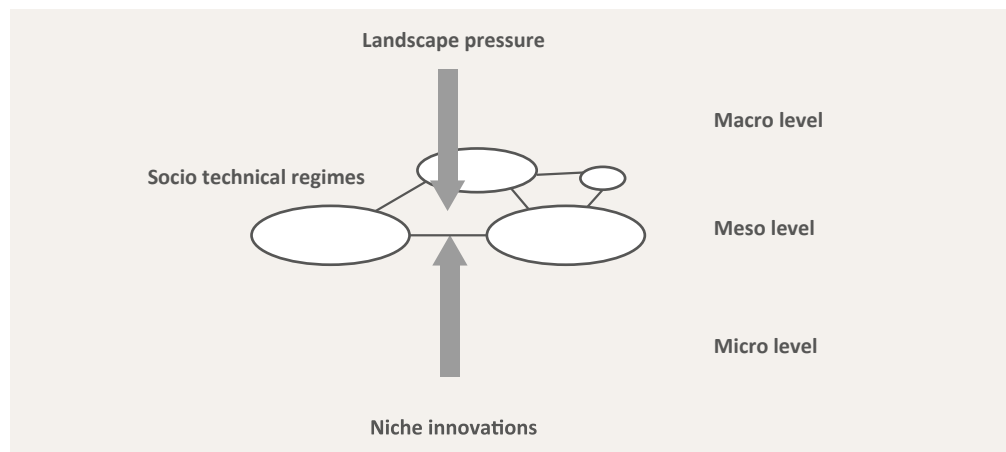


Figure 2.2: System evolution as a co-evolution process on three levels (based on Rip & Kemp, 1998; Geels, 2002)

Nelson and Winter (2002) applied the concept of regime to organizations. They present the notion of 'routines' as the core of the functioning of an organization, in analogy with the role genes play in biological processes. According to them, 'routines' should be understood as 'recurrent patterns of interaction' (see also Becker & Zirpoli, 2008). Routines evolve over time. Successful routines will be copied, and will survive. Unsuccessful routines will disappear as a result. New forms of routines can arise as a result of variation. Every change is then anchored through innovation of routines (adaptation). Because the searching process itself is controlled by routines too, the inclination exists to focus the search on familiar solutions. This means that change is usually incremental, not radical. Rip and Kemp (1998) denote the sum total of cognitive routines and social rules with the concept '*regime*' (see also Geels, 2014). According to them, a regime is the whole of both implicit and explicit rules and thinking patterns, which gives direction to the practical actions of people (or organizations) in their professional practice, and which in its turn is shaped and reconfirmed by these actions. Similar to the concept of regime, Prahalad (2004, together with Betis and Hamel) introduced the concept of 'dominant logic'. Their concept grew from the search for an explanation of why comparable companies can still differ fundamentally when it comes to performance. A dominant logic determines the actions of a company and steers its decision-making. It can be seen as the genetic blueprint of the organization, which comes into being over the years through learning and experience. The longer this experience is anchored into a dominant logic through feedback, the more it will determine the direction of the company. According to Prahalad, Betis and Hamel, dominant logic 'blinds' the organization, focusing it on the conservation of the existing balance – creating 'lock-in'.

As mentioned before, a system evolution or transition can be seen as a regime change determined by external pressure (landscape pressure), and the timely presence and strength of innovative ideas (niche innovations). Transitions are system evolutions from a system in equilibrium, through an unstable transition phase, to yet another equilibrium (Rotmans, 2006). They require time, because the existing stability needs to be broken. In Geels' model

(2005), a transition roughly passes off through different phases²⁰. In the early development phase, the existing regime (routines) curbs change. The regime is aimed at eliminating new, threatening developments and is focused on improving existing technology. Furthermore, the system preserves technology within the organization. If a series of internal and external disruptions coincide and amplify each other, the take-off stage of a transition may be reached. The system will then enter an unstoppable, irreversible development in a particular direction, the so-called acceleration phase. The inert system at meso level enters a phase of change, on the one hand caused by pressure 'from above' (the landscape), on the other hand by the onrush of innovation and creativity 'from below' (niches), and possibly also as a result of self-reflection (within the regime – see Figure 2.2). The existing regime may be (partly) broken down and replaced by a new regime²¹.

According to Mitleton-Kelly (2002) the above described process is continuous and not only reactive to external pressure but also pro-active. She (2002, p. 8) speaks of a 'complex evolving system' by distinguishing between adaptation and co-evolution²²: "change needs to be seen in terms of co-evolution with all other related systems, rather than as adaptation to a separate and distinct environment. Strategies consequently cannot be seen simply as a response to a changing environment, which is separate from the organization, but as adaptive moves, which will affect both the initiator of the action and all others influenced by it". A complex evolving system does not passively respond to stimuli and events but learns from past experiences, modifying its own behavior and structure in such a way that these adapt to those stimuli. Not only does it modify in response to stimuli, but it also anticipates a possible future based on previously observed patterns. "To survive an organization needs to be constantly scanning the landscape and trying different strategies" (Mitleton-Kelly, 2002, p. 14). Teece (2009) and Zollo and Winter (2002) speak in this respect about 'dynamic capabilities' of an organization.

2.4 Evolution of the (Dutch) construction sector

In the years preceding the construction fraud of 2000, the Dutch construction sector was relatively calm and stable (Vulperhorst, 2005). Enough (large) projects were put on the market by (public and private) clients to provide the large, medium-sized and small-sized contractors to guarantee a continuous turnover. Because of this stability there was little need for creativity and innovation (low degree of niche innovation). Companies simply did their business as usual, because the turnover did come anyway. To guarantee stability, a system of settlement of tender costs was agreed upon, which prevented contractors from being saddled with excessive tender costs due to calculation mistakes and risks. Profits were ordinary, but not extremely high. The (large) contractors often had property rights that took care of the high dividend expectations of shareholders or owners. The companies formed a closed community, they knew each other very well and granted each other their share (stable regime).

²⁰ Geels discerns several possible development paths for innovations. A transition is created when several development paths converge and amplify each other.

²¹ This model of change is similar to the adaptive cycle of Gunderson and Holling (2002).

²² Eisenhardt et al. (2001) use the term co-evolution for the search for synergetic advantages between companies.

Then the construction fraud came up (landscape pressure). Contractors were accused to be cheaters in the public opinion. Clients were accused of collaboration with the contractors. The stability came under pressure (Vulperhorst, 2005). The settlement system of tender costs had to be phased out, although this functioned until 2002. The societal and political pressure increased on clients and contractors, forcing them to change (increasing landscape pressure). As discussed in Chapter 1, committees were appointed by politics to determine the needed change and a steering group was appointed to accompany this change. Interestingly, both the committees and steering group members consisted of actors from the construction sector itself.

As mentioned in Section 1.1, the Dutch highways and waterways network manager, Rijkswaterstaat, conducted a radical change in their market approach by (more or less abruptly) introducing the concept of ‘market, unless...’ in the period 2002 to 2004, shifting more creativity space and responsibility to the market in line with the paradigm of new public value management (Eversdijk, 2013; Leendertse, 2015; Arts et al., 2016b). Other public clients, like ProRail, followed Rijkswaterstaat in this (Van den Brink, 2009; Leendertse, 2015). This step forced the contractors in the construction sector to act differently.

Interestingly, contractors initially reacted by adding activities that the client no longer did (designing) to their original activities (constructing). However, the responsibility for designing was also shifted to them. By combining designing and constructing the market company was supposed to have more room for a creative design suited to the construction capabilities of the market company. However, through design plus construct responsibility is added without room for compensation of this responsibility. It took several years (until approximately 2006) for the construction market to realise this difference (resulting in chaos). Then again the market stabilized (retention to a renewed regime). The large contractors focussed mainly on design & construct contracts (D&C contracts) and medium and small contractors mainly on engineer & construct contracts (E&C contracts) or only construct contracts (see for a discussion in detail Appendix 6). Revenue was available for all contractors. For the design work the contractors involved engineering firms. Engineering firms that were used to do design work for the public clients were now forced to partly shift to the contractors. Moreover, the contractors also put them more and more at risk, which generally did not correlate with their business model based on hourly rates.

Following the international trend of New Public (Value) Management (Stoker, 2006), Rijkswaterstaat (stimulated by the Ministry of Finance and the introduction of the European Monetary Union) introduced in 2006 DBFM-contracts²³ for large infrastructure projects. After the E&C and D&C contracts, this was again a new type of contract for the large contractors (Eversdijk, 2013; Lenferink, 2013; Verhees & Arts, 2016). Then the economic crisis followed by a real estate crisis (from 2008 on) hit. Public investments in infrastructure decreased. Possibilities to borrow from banks decreased. Market companies faced huge depreciation and profit reduction on real estate. Companies experienced great pressure from shareholders

²³ Design Build Finance Maintain contracts (Eversdijk, 2013)

to guarantee dividends. Moreover, the DBFM contracts increased the risk exposure of the large contractors. To survive (large) contractors were forced to acquire contracts and at the same time reduce their risk exposure by shifting risks to the supply chain or to the client. The result of this was increased price competition. Some contractors went bankrupt or almost bankrupt (chaos again).

The market policy of Rijkswaterstaat was to allow the market creative space for innovation so companies were able to distinguish themselves from the competition through value generation, instead of by way of the (lowest) price only (see Sections 1.1 and 1.2), however this market policy seemed still far away. All of this led to the current discussions between (large) contractors and (public) clients about such issues as: simpler and smaller contracts; more realistic risks allocation; reimbursement of transaction costs; and, partnering (Leendertse, 2015; PIANOo, 2017).

The main pattern which can be seen in the Dutch construction sector the last decades, is one of stable periods alternated with chaotic periods. Chaotic periods were mostly caused by external landscape pressures. Also the market policy initiatives of Rijkswaterstaat were caused by societal and political pressure. New stabilities seem not to be transformations or transitions, but rather a (slightly adapted) continuation of the existing regime. Niche innovations seem to be rather absent, apart from the new contract forms. The question is why so little innovation took place? And how more sustainable market dynamics could be enhanced based on innovation? The theoretical backgrounds of these issues will be addressed in the next Chapters.

2.5 Summary

To conclude this Chapter, the discussed theory of complex adaptive social systems and system evolution can be summarized by following points:

- An adaptive system responds adaptively to a changing environment by way of a continuous cycle of generating variation, selecting the ‘best fits’ from this variation, and implementing these into the system. This is a continuous process, initiated by the pressure from the environment (landscape) and/or from the system itself (self-organization).
- xSystem adaptation and evolution requires variation. In order to survive, organizations must continuously scan the ‘possibility space’ and look for variation in strategy or structure. That means that innovative capacity is a core competency of the system or an organization. The possibility space is in part determined by the connectivity, the number and the nature of the relationships between the actors in the system as well as between the system and its environment.
- Variation is created when the system possesses mechanisms for creating, destroying or transforming actors or groups of actors or relationships. The standard mechanisms for this are copying (with possible mutations) and recombination. Both are endogenous exploitation processes, which reduce the ‘possibility space’ for variation over time. In other words, over time, the system internally becomes more uniform.

- A system develops into a social system, through the fact that shared routines, patterns, norms and values are developed by way of interaction of actors within the system. A socially adaptive system can learn and evolve and the process of adaptation can move from being reactive to change to being proactive to possible change.
- Organizations are anchoring their experience, knowledge and culture in what literature calls regimes. A regime is the whole of both implicit and explicit rules and thinking patterns, which gives direction to the practical actions of organizations, and which in its turn is shaped and reconfirmed by these actions. Regimes secure experience, however, at the same time they make the system inert to change (a situation of 'lock-in').
- A change in organization is a change in the pattern of relationships between the actors in an organization and/or a change of the relationship with the environment.
- Of its own accord, a system does not have the inclination to change. A disturbance of the balance is the stimulus for adaptation only if the system will be forced to change. A disturbance can come from a changing environment (landscape; e.g. political or societal pressure). The adaptive tension imposed on the system by its environment is an engine for the evolution of the system.
- In order to be able to evolve, the system has to extract energy from an adjoining (sub) system or the environment, through its relationships. All forms of information, knowledge, skills, resources such as time and money etcetera can be considered to be energy.
- A transition evolves from stable phase to stable phase by way of a chaotic phase. The chaotic phase is the cradle of adaptive evolution. A transition is first set in motion by a self-enforcing stream of external pressure and available variation. The relatively short periods of system instability provide the opportunity to influence the direction in which the system is evolving.

3

Actors in the construction sector

This Chapter will discuss the main actors within the system of the (Dutch) construction sector. These are outlined based on a review of recent publications²⁴ and exploratory interviews (conducted during the early stages of this study). In Chapter 1, the construction sector is defined as all managers, clients and market firms working in the preparation, realization, management, maintenance and financing of the large infrastructure. What stands out in most publications about the construction sector, is the fact that the clients are only considered in their role of customer for the market. The fact that these clients are often (also) network managers is not examined. It is this pairing of roles that is at the core of this study. In relation to (public) infrastructure networks, a project's goal is not to realize just a project. The goal of a project is to create added value for the total network, the project being a part of it, now or in the future. In case the market is involved in creating this added value, this can also form the basis for the development of a sustainable market.

Section 3.2 further elaborates on the relationship of a public network manager to the market by means of commissionership. For practical reasons, the description is focused on Rijkswaterstaat and ProRail as the main public infrastructure network manager in the Netherlands, the construction market and the relationship between these two. This does not mean that the findings may not be used for other public network managers as well. As mentioned in Section 1.1 a comparison of the practices of public infrastructure network managers and commercial or industrial network managers may provide new insights in possibilities to reconstruct the sector. Therefore, in Section 3.3 the main differences between the practice of public network managers (such as Rijkswaterstaat and ProRail²⁵) and industrial network managers are outlined. Subsequently, Section 3.4 elaborates on the characterizations of the construction sector as a whole.

3.1 The public infrastructure network manager (Rijkswaterstaat)

Rijkswaterstaat is the executive agency of the Ministry of Infrastructure and Water Management in the Netherlands. On behalf of the Ministry, Rijkswaterstaat manages and develops the national networks of main roads, main waterways and main watersystems. The organization defines its task (national network manager) as managing and developing 'wet' (waterways) and 'dry' (main roads) infrastructure networks (Rijkswaterstaat, 2016a). Quoting Heeres (2017, p. 10): "network performance and socio-economic wellbeing ... are seen as policy instructions to infrastructure planning agencies and their operational counterparts".

24 We used Scopus and SmartCat to identify relevant international publications in the fields of infrastructure management, project management, industrial management, the construction sector or the construction industry. For practical reasons and because we are interested in the more recent evolution of the sector after the construction fraud we limited our search to publications of the last 2 decades (2000 to the present).

25 Different from Rijkswaterstaat, ProRail is an independent administratieve body 'under' the Ministry of Infrastructure and Water Management. This means that ProRail is partly run as a commercial firm. In that sense, ProRail can be considered as a semi public infrastructure provider.

Projects (of new infrastructure developments or major repairs) and regular maintenance can cause disruptions in the functioning of the network. In case the functionality of the network has to be preserved or improved, projects and consequently disruptions are inevitable. Because construction or repair projects as well as the management and maintenance are realized in a functioning network, Rijkswaterstaat functions as professional client and project manager for these projects. With regard to its environment, a project is also an intervention – one that will have to be incorporated into that environment in an acceptable manner. In addition, a project can also contribute to national policies, for instance regarding achieving accessibility, improving sustainability or market development. As most public infrastructure network managers, Rijkswaterstaat does not realize projects itself. Instead, it uses the construction market for this purpose by way of a transaction. The value chain²⁶ as outlined above is schematically represented in Figure 3.1.

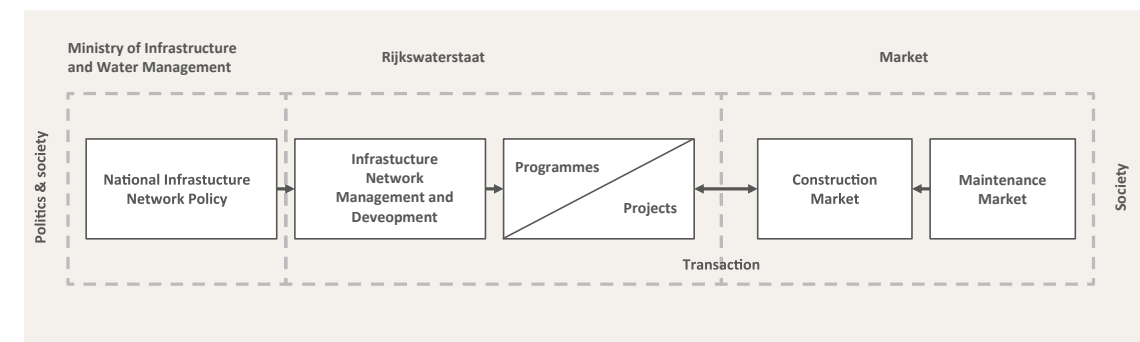


Figure 3.1: Public infrastructure network management value chain (based on Van Duivenboden et al., 2000; Busscher, 2011)

The development of infrastructure in the Netherlands traditionally is done on a sectoral and project-based approach. A future demand for mobility is predicted, bottlenecks in the existing network are observed, and subsequently, projects that should resolve these bottlenecks are defined. The approach is sectoral and project driven (Arts, 2010; Arts et al., 2016a,b; Eriksson et al., 2017). Projects are considered "as a single intervention in the infrastructure network, characterized by a fixed schedule and dedicated budget" (Busscher, 2014, p. 123). This means that projects are not considered in direct relation to their environment. This is advantageous from a thematic 'mobility' point of view. However, opportunities to gain added value for the greater network and the environment may be lost as a result (Heeres et al., 2012). In addition, the increasing influence of the environment on the project as well as the increasing influence of the project on its environment and on the network the project is part of, cause the project to become closely linked to the network and the environment (Arts, 2007). Quoting Heeres (2017, p. 9): "the planning of road infrastructure networks has long been primarily seen and organized as an engineering effort. Under increasing dynamics, this has slowly been abandoned, and the involvement of

26 Porter defines a value chain as a chain of activities or organizational units that add value to each subsequent step of the product and/or service delivered (Porter, 1985).

various... stakeholders has gained ground. With the involvement of actors a social aspect has been added to infrastructure planning". How is the value chain outlined in Figure 3.1 actually managed? *Policy makers from the Ministry of Infrastructure and Water Management* translates political and social needs and wishes into concrete policy. In the process, they will have to coordinate with other ministerial departments on their specific policies, and eventually he or she will formulate goals and preconditions for the infrastructure network manager, in the form of service level agreements (SLAs) for management and maintenance and a project program for new developments (MIRT)²⁷. An *infrastructure network manager* administers the utilization of existing infrastructure capacity through traffic management, through regular maintenance and management, and/or through major repairs (renewal) or new infrastructure expansion (asset management as infrastructure provider). All of this is done in coordination with adjacent networks (provincial and regional), while striving for minimization of disruptions (in mobility, safety and environmental functioning of the network) caused by incidents and unexpected events (incident management). A *project manager* then manages a project based on time (timely completion), money (staying within budget) and a defined project scope (the agreed functionality and quality). The scope is determined by the policy, the network manager and the placement of the project in the project environment (Arts, 2007).

A *market party tender manager* aims to find the balance between serving a client on the one hand, and on the other hand delivering value to the owner or shareholders of the mother company (i.e. dividend, profit and/or business continuity). First of all, a project must be acquired by the company. Once a project has been acquired, the minimal quality required by the client must be guaranteed, and the results from the order must be maximized. Results yields value to the owner or share holders, as well as investment reserves for the company. The investment reserve can be utilized for acquiring and developing specific competitive company competencies, thus securing the continuation of the business (this will be further elaborated in Chapter 5).

As is clear from the description, every actor in the chain in Figure 3.1 is part of a network of actors that are connected through mutual relationships (Borzel, 2011). As a result, the characteristics of the value chain of infrastructure network management as shown in Figure 3.1 shows both *actor network* characteristics²⁸ and value chain characteristics. As Ford et al. (2011, p.20) argued that "Managing in networks is complex. Actors in a network attempts to manage their individual relationships and to affect others elsewhere in the network".

27 The MIRT is the national Long-range Program for Infrastructure Spatial Development and Transport (Dutch Government, 2016). It arranges the planning, programming and budgeting for the main Dutch infrastructure. The MIRT-program contains an overview of all spatial projects and programs the national government is working on in cooperation with provincial and regional authorities. The MIRT is published yearly as an appendix to the Infrastructure Fund's budget (see for a more extensive discussion also Van Geet et al., 2019; Arts et al. 2016b; Klakegg et al., 2016).

28 Here, the term 'network' is meant to mean an actor or organizational network, as distinguished from a physical infrastructure network.

In the process steps, the manager is trying to find the intended balance within his relevant network of actors, which he or she will subsequently translate into a decision that is passed on to the next step in the process by way of a link in the chain as is schematized in Figure 3.2.

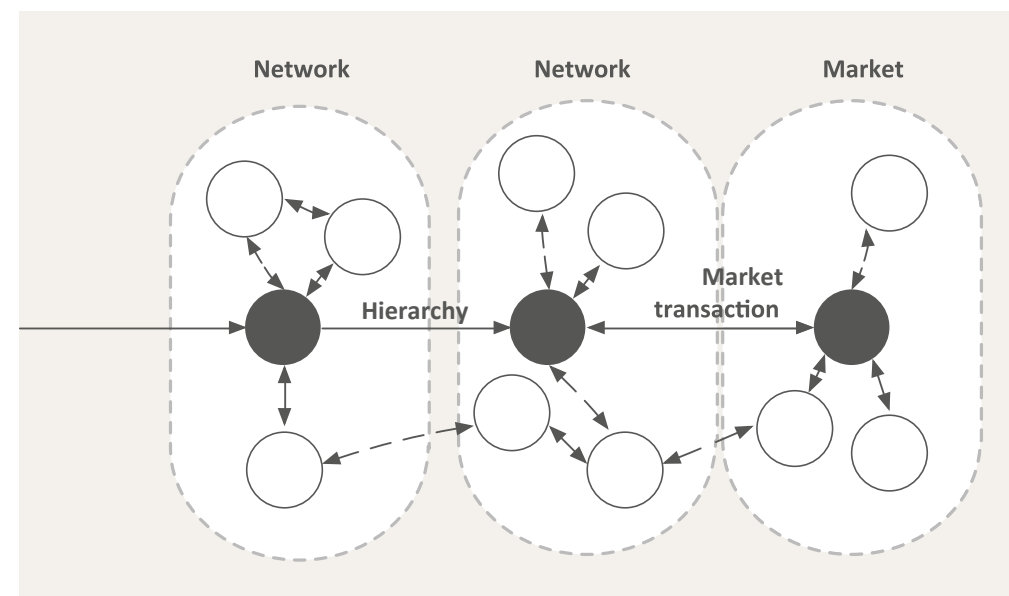


Figure 3.2: Wheel of hierarchies and networks of actors (based on De Bruijn & Ten Heuvelhof, 2008)

3.2 The industrial network manager

An industrial network²⁹ is in this study defined as a production network that is managed and developed by a private network manager. The business is based on a buyer, who pays for the production that is supplied³⁰. The optimization of production leads to network management that is focused on maximizing production by way of logistic optimization of the network and maximizing the reliability of the network function (Van Weele, 2014). The production is embedded in upstream (buyers) and downstream (suppliers of raw materials) transactions, as indicated in Figure 3.3. In addition, the market is involved for the management and maintenance of the network and for network development (services).

29 The term 'network' as a constellation of transmission lines, buffers, pumps, valves etc. is used in this book as we compare the management of physical networks in industry with the management of physical public infrastructure networks – such as roads, railways and waterways (see Chapter 1). However, it should be noted that the term industrial network (management) as such is hardly used in the industry. In industry usually terms such as installation, production chain or plant are used. For comparability the terms network and network manager will be used in this meaning from here on in this study.

30 This regards a commercial buyer, who is paying him/herself directly for the product or service the industrial network manager provides, while a public infrastructure network manager has primarily a political client (a Minister, Cabinet, and in the background the Parliament representing the taxpayers interests).

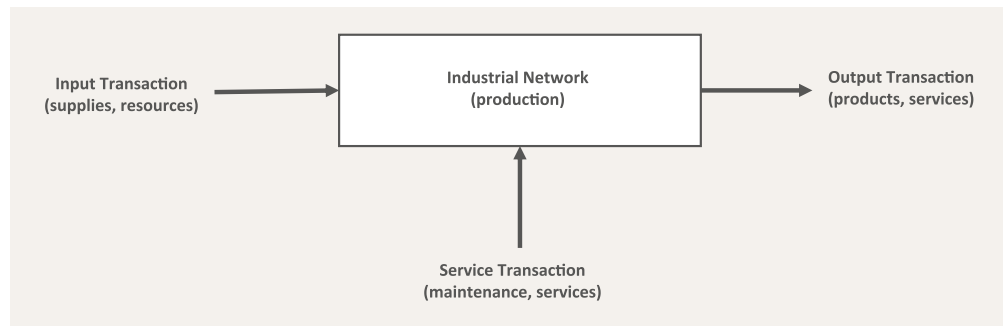


Figure 3.3: The transactions in an industrial production network (based on Van Weele, 2014)

Van Weele (2014) mentions a number of developments in production industry over the past decades, that play a determining role in the way a transaction is formed (Figure 3.3 shows the three main interrelated transactions in production):

- Reducing stocks: By enforcing discipline with regard to delivery, the company capital tied up in inventory is reduced. Furthermore, specialised stockpiling through suppliers – instead of integral stockpiling – leads to cost reduction;
- Innovation by collaboration within the supply chain: Successful industrial innovation is usually created by intensive interaction with and between suppliers and buyers;
- Increasing production flexibility: Minimization of stocks and the aim for a higher turnover rate (lean production) and higher production reliability lead to higher requirements with regard to supplier performance;
- Standardization: As a result of standardization, stocks are reduced and competition among suppliers is increased, both leading to cost reduction;
- Total quality control: Production companies set up quality improvement programs³¹ together with suppliers and service providers in order to decrease total expenses and increase reliability.

Ford et al. (2011, p.11) mention similar developments, to which they add the increased need for industrial companies to collaborate with partners and suppliers: “over time it has become increasingly difficult for a single firm to develop and maintain its own capability in each specific area of technology... so firms rely increasingly on suppliers as sources of technical development”. Collaboration is increasingly becoming a long-term relationship: “in order to make use of the capabilities of a supplier a long-term perspective is required since such investments will only pay off over time” (Ford et al., 2011, p. 12). In addition, Ford et al. (2011, p. 13) argue that collaboration is no longer one-on-one, but stretches further into the supply chain: “efficient supply chains require not only the involvement of the direct supplier, also suppliers to the suppliers”.

³¹ Examples are NEN-ISO certificates, Kaizen, Lean Management, the Agile model, Six Sigma and Theory of Constraints (see also Dale et al., 2007).

3.3 Characterization of the construction sector

Institutional characterization of the construction sector³²

A main characteristic of the construction sector is the limited number of (public) clients, who often have their own market policy. That means that the specific market that a company can focus on with its core competencies is relatively small. As a result of their expertise and their public responsibility, these public clients tend to specify in more detail, and as such, are less open to differentiation (De Ridder, 2011). The market’s dependence on a limited number of clients creates a relatively large negotiating power for the above-mentioned clients, which strongly determines the market companies’ strategies towards these clients (Noorderhaven et al., 2006).

Public clients are bound by (international and national) procurement regulations, based on equal treatment of potential market suppliers. In addition, because of their public responsibility, they have to be able to account for their actions to the general public. Equality and (public) accountability cause tension with regard to the distinction between suppliers (differentiation actually means non-equality) and client intimacy, which is needed for delivering added value. In Appendix 6, the formal framework for tendering under EU regulations is described. This framework mainly chooses competition as the basis for tendering. As Bajari and Tadelis (2006, p.15) state “Competitive bidding is perceived to select the lowest cost bidder, prevent corruption and favouritism that is opposed to efficiency, and it offers a clear yardstick with which to compare offers”. According to De Ridder (2011), competition in combination with a detailed request put to the market will always lead to price-based competition rather than competition based on a difference in quality.

Chapter 1 discussed the changing role of the large clients in the construction sector. The core of this change can be described by means of the following basic principles (Rijkswaterstaat, 2016b):

- From detailed design towards functional specifications and encouragement of innovation;
- From allocation to the lowest tender towards evaluation based on the price and quality of a tender;
- From traditional client – contractor relationships towards more partnering relationships.

The implication of this change in policy is that commissions are becoming more integrated, in the sense that more disciplines are being combined in the contracts and that more risks are allotted to the market (Leendertse et al., 2012; Lenferink et al., 2012; Leendertse & Arts, 2013), for example by way of design & construct contracts for new developments and performance-led contracts for management and maintenance (see for a discussion also Appendix 6). As a result, the role of the public client may shift from a project-oriented focus to a (public) value-oriented focus on determining what is wanted from the network perspective and at organizing effective market involvement (Vrijhoef et al., 2013).

³² The institutional characterization relates to defining elements in the structure and formal regulations, which influence behavior in the construction sector.

New types of contracts were introduced as part of the changing tendering policy: performance-led contracts for regular and minor variable maintenance, design & construct contracts for new developments and major reconstruction, and PPP contracts (public-private partnerships, mainly based on design, build, finance and maintain, DBFM) for the large integrated projects (Lenferink, 2013; Eversdijk 2013; see also Appendix 6). The essence of a performance-led contract is that the client assigns the contractor to bring part of the infrastructure network to a certain level of maintenance performance and keep it at that level. Contractors are relatively free to organise the work themselves in such a way as to achieve this. In a design & construct contract, a single party is commissioned for both the design and the construction of a project. As a result, more space is created for the market to develop its own solutions, including the responsibility for the design and realization. Over the past decade, public-private partnerships (PPPs) are more often employed for large infrastructure projects, mainly in the form of PFI³³ or DBFM-contracts. Appendix 6 examines the different contract types as utilized in the construction sector. Often, these so-called 'innovative' contract types cause a shift, both with clients and the market, with regard to requisite knowledge, division of responsibilities and liabilities (Leendertse & Arts, 2013).

Economical characterization of the construction sector³⁴

The strong orientation towards projects is characteristic of the construction sector. As Söderholm (2008, p. 81) states "organizations are more frequently referred to as being project based or project dependent with projects as a vital part of the organizational architecture". As already indicated in the previous Section, the Dutch construction sector has relatively many suppliers and a limited number of clients. As a result, the costumers' demand largely determines the supplier's behavior, as well as the content of what is offered. The client defines a playing field (demand) and the market can be creative within the boundaries of that playing field. An incentive arrangement determines the gains that are to be had (value capture). According to De Ridder, such demand-driven creativity (2011)³⁵ does not lead to a competitive market. The market will organize itself around the requested creativity (once-only). The value that is to be achieved has been defined in advance by way of demands, wishes and preconditions (Drechler, 2009). The offered creativity will take place (only) within the given framework and from the prevailing dominant logic of the sector.

Because these frameworks are strongly project-related, the offered creativity is generally once-only. That means investments must be recovered through a limited number of projects. However, *product innovations* in construction require relatively high investment and have a high risk profile. This means that, in addition to investing in specific knowledge, market companies must also invest in those risks that the client is not prepared to bear. Processes

33 PFI stands for Private Finance Initiative, a form of PPP much used in such countries as the UK, Australia and Spain (see for more information about PFI: Morledge et al., 2006; NAO, 2018).

34 Economical characterization relates to material stimuli that affect the behavior of actors in the construction sector.

35 In response to the strongly demand-driven market, De Ridder (2011) developed the Living Building Concept. This concept is based on transforming the construction chain (see Figure 3.1) from demand-driven to supply-driven.

include more repetition, and in addition, *process innovations* can be used for more than one client. Furthermore, process innovations are generally less costly than product innovations. As a result, it is more worthwhile to invest in process innovation than in product innovation (De Bruijn & Maas, 2005).

The actual uniqueness of construction projects is an ongoing discussion. In his discussion about the Living Building Concept, De Ridder (2011) states that, despite appearing to be unique, construction projects in fact show a large degree of uniformity. Often, only the projects' exterior made to fit local circumstances is what is unique about a project. The Living Building Concept proposes to base projects on a smart combination of standard building blocks ('legolizing construction') that can be recombined. As a result, product innovation will be obtained by way of process innovation.

Performance Information Procurement or Best Value Procurement (PIP or BVP), which is coming into vogue in the construction sector, also suits this tendency (Morledge et al., 2006; Van de Rijt & Santema, 2013). The essence of PIP or BVP is that the role of the client changes, from expert (with regard to content) to the role of recognizing and effectively bringing in specific expertise through best value procurement. The client gets 'best value' when the right experts are carrying out the task, the expectations of the outcome have been agreed upon by both client and contractor, and the risks have been correctly allocated. In this philosophy, the client's role is limited to describing what he thinks he wants (expectation), selecting the right experts, and making decisions, providing that decisions are only necessary in case there is doubt with regard to future conditions (for a further elaboration of PIP or BVP see Appendix 6)

Despite attempts to give (more) even weight to value in allocating contracts (MEAT³⁶), the price is still the dominant criterion when it comes to allocating contracts (De Ridder 2011, Leendertse, 2015). A number of specific characteristics influence competition in the construction sector, and therefore the market dynamics (Bower, 2003; Morledge et al., 2006; Noorderhaven et al., 2006; De Ridder, 2011). First, the number of large infrastructure projects is limited, so that the risk of discontinuity is large. As a result, market companies become dependent on these projects. Second, it is usually necessary to produce on site, resulting in customized production and, as such, limited economies of scale. Therefore, the building process is typically set up as a one-off project by way of a temporary coalition organization (consortium). Third, the options for stockpiling are limited, making it difficult to meet fluctuations in the number and/or size of commissions. Fourth, high transport costs and the fact that some critical building materials are bound to specific locations reduce competition in specific market segments. Fifth, in addition, the detailed requirement specification³⁷ and specific selection criteria by clients limit the market. Sixth, the uncertain (long-term)

36 Awarding based on MEAT (Most Economically Advantageous Tender) means that several criteria derived from and related to the requested subject – including price and quality – are considered in the evaluation of the different offers.

37 Klijn and Teisman (2000) mentioned the public planning and decision-making framework for projects as reason for this extensive detailing: "the planning process is being organized in great detail by public actors, reducing the private actors to simple implementers" (Klijn & Teisman, 2000, p. 88).

programming of projects as a result of political and governmental influence makes it difficult to create a long-term strategy based on differentiation. Moreover, although the culture of the construction sector is in itself very closed (strong regime) (see also Section 1.1), the actual practice is very transparent which makes it difficult to hold onto any unique advantage. Seventh, projects are becoming more integrated, have a higher risk profile and require more financing by the market. The number of companies capable of carrying out these projects is limited, and getting ever smaller.

Various authors (Arts 2007; Verbaan 2008; Hertogh & Westerveld, 2010) discuss the tendency for the increasing complexity of projects. Projects are getting more integrated, incorporating more disciplines incorporated in the project (this is related to the shift from product to system) – such as civil engineering, spatial designing, planning, (contract) law, financing etcetera. As a result of the integrated approach, projects are being organized as networks of disciplines: “projects are organized in networks having several partners thus being dependent on several host organizations and somewhat different goals” (Söderholm, 2008, p. 81; see also De Bruijne, 2006). Most projects have to be realized within ‘ongoing business’. The ‘greenfield’ character of construction projects is decreasing through the further development of infrastructure networks, and with that, the level of interaction with the environment and stakeholders is growing (Willems et al., 2016; Willems, 2018). Stakeholders are becoming more numerous, more articulate, and better organized. The political-administrative sensitivity of projects is increasing. Regulations with regard to projects are getting ever more stringent, which leads to increased juridification of the relationships (Arts et al., 2016b). Furthermore, the pressure on projects to yield results within time and budget is increasing (see also Flyvbjerg, et al., 2012). Due to the increased complexity of projects, market parties are compelled to join forces, for example by forming a consortium, in order to combine disciplines and spread risk. Increasing complexity leads often to more control rules and instruments, resulting in increased transaction costs and overhead in projects³⁸. The higher risk profile of the large infrastructure projects calls (strongly) on the companies’ capital position, negatively impacting their competitive position in other markets.

38 Bourne and Walker (2005) refer to this as the control paradox. A certain degree of control can help to monitor activities and progress of projects while still being open enough to allow new ideas and interaction. However, beyond a certain point of control most flexibility is lost and excessive bureaucracy and control take over, losing the ability to learn, innovate, and function in a complex environment. When too little control is maintained, the project can quickly be considered as ‘out of control’, which is why managers of projects often prefer adequate mechanisms of control to keep the outcomes predictable.

Cultural characterization of the construction sector³⁹

Bygballe et al. (2010) describe the collaboration between client and market in the construction sector as project partnering in a dyadic relationship between client and main contractor, with great emphasis on formal instruments. According to Beach et al., this is caused by the specific culture in construction: “questions remain as to whether an environment which is frequently characterized by one-off contracts and short-term gains is capable of supporting a concept which is based on mutual trust and long-term collaboration” (Beach et al., 2005, p. 612).

Collaboration between market parties by way of vertical integration (chain integration) is a tendency that has been around for several years, particularly in the direction of suppliers and subcontractors (Ford et al., 2011; see also Appendix 6). Vertical collaboration is a way of controlling costs, and therefore prices, which also offers possibilities to prevent companies outside the market segment from entering the market. In addition, Ford et al. (2011) point out the necessity for vertical and horizontal integration, because companies are increasingly using a multitude of quickly developing tools and technologies. Furthermore, horizontal collaboration is a way of acquiring market power and limiting competition (De Bruijn & Jonkhoff, 2006). Moreover, as a result of projects becoming more integrated, horizontal collaboration becomes necessary in order to integrate the necessary disciplines and spread risks (see for example Noordhuis, 2015).

3.4 Summary

To conclude this Chapter, the findings are summarized:

- In the system of the construction sector, the most important actors are the construction market and ((semi)public and private) infrastructure managers, in the role of policy maker, infrastructure provider and client to the market.
- The relationship between both is formed by what is defined in this study as the transaction.
- The transaction is part of a public infrastructure value chain that realizes social and political wishes through policy making, infrastructure management and the definition of projects and programs and involvement of the market for implementation. This is mainly organized as a linear hierarchical chain. In practice, however, each step is part of an actor network.
- The construction market is strongly demand driven in practice, with the result that creativity and innovation are mainly determined by client demand and less by the specific strength of the companies. As these demands are often specified in detail, price competition remains the main market dynamics. Creativity and innovation therefore strongly focus on process innovation above product innovation.

39 The cultural characterization relates to the entirety of customs, usages, practices, and informal standards and values within the construction sector.

4

Relationships in the construction sector

In Chapter 2, a system was defined as a network of actors, connected through relationships. Recent literature considers a system as a relationship network with actors at the nodes. The actors are no longer the core of the system – the relationships are central. The relationships determine the emergent behavior of the system, whereby actors are visible as the managers of those relationships. From that image, the relationship portfolio turns out to be an organization's most important asset, along with the organization's ability to manage and develop this. This study focusses on the transaction as a particular set of relationships within the construction sector. In Section 4.2, the concepts *relationship* and *transaction* as a particular set of relationships and the position of a contract in this set of relationships are explored further. Relationships can be tight, or less tight. The theory of 'loosely coupled systems' posits that the distribution of tightness of the relationships determines part of the (emergent) behavior of the system, and as such, determines the *adaptive capacity* of the system. This theory is elaborated on in Sections 4.3 and 4.4. Relationships in a complex system are reciprocal, they influence each other. A special form of reciprocity is *partnering*, aimed at aligning mutual goals. Partnering can vary, from exchanging information (a relatively loose relationship) to integration of activities and organization through e.g. a joint venture (a tight relationship). Sections 4.5 and 4.6 more thoroughly explore partnering as an interpretation of a reciprocal relationship.

4.1 Relationships, transaction and contract

The concept *relationship* is defined by Ford et al. (2011, p. 18) as “the pattern of interaction between companies and the mutual conditioning of their behavior that take place over time”. According to them, a relationship is defined by the division of capacity and resources (capabilities) and by dealing with uncertainty or the management of risks (uncertainties). Ford et al. (2011, p. 23) state that “a business customer brings its problems and uncertainties to a relationship and the supplier brings its ability to provide a solution. But a supplier also brings its own problems and uncertainties to the relation and it also relies on the abilities of the customer”. According to Ford et al. (2011), the division is determined by technological connections (the one resource cannot do without the other), economic logic (a pursuit of maximal return of investment) or institutional logic determined by the current the regime of the sector (see Section 2.3). According to them, the actual behavior within the relationship is further determined by the degree of mutual dependence and respective power, looking for conflict or cooperation, and the balance between trust and control.

Ford et al. (2011) describe a company⁴⁰ as an organization that is continuously working to use its available resources for optimization of its business. Part of these resources⁴¹ are located within the company itself, others need to be linked to it through relationships. There is usually not a single company that possesses all necessary resources. Therefore, developing

40 Ford et al. (2011) focus on the perspective of a commercial company in relation to its supply and demand chains.

41 In Håkansson's '4-R model', resources are referred to as products, facilities, organizational units and business relationships (Håkansson & Ford, 2002, see also Ford et al., 2011).

and maintaining a network of relationships is an essential part of what an organization does. Ford et al. (2011, p.5) define developing and maintaining a network of relationships as *networking*: “the attempt of the management to change and develop the organizational interactions and relationships with other”. According to them (Ford et al., 2011) a number of developments exist that force organizations towards networking:

- For their success and development, companies depend on their relationships with suppliers, clients, partners and others. There is not a single company that possesses all knowledge and skills necessary for success;
- There is not a single company that can completely manage and control the working of a relationship or the combination of relationships. Therefore, relationship management should be interactive and evolutionary. There is not a single relationship that is continuously 'fit' for all circumstances;
- Network relationships never relate to a single company or client or to any specific problem. A relationship is always part of a network of relationships.

Therefore, one of a company's core competencies is its *ability to network* i.e. “the creative bundling of multiple technologies and client knowledge and intuition, and managing them as a harmonious whole” (Prahalad, 1993, p. 45). Networking makes the organization (partly) dependent on others, leading to loss of control. However, it is indispensable for the development of competitive technology, and as such, for the value creation of an organization (Argote & Ingram, 2000). In this context, networking is the continuous actualisation of a company's relationship portfolio in line with the definitions of co-evolution (Middleton-Kelly, 2002) and co-evolution (Eisenhardt & Galunic, 2001) as discussed in Section 2.4.

Ford et al. (2011, p. 18) define a *transaction* as a momentary 'photograph' of “one of many episodes in a continuing relationship between two companies. The relationship connects these episodes to each other over time...Each episode will be affected by the experiences held by the participants in their previous interactions..., by the expectations of the participants of their future interactions and of the relationship of which it forms part”. Williamson (2007) characterises a transaction with the concepts transaction structure and transaction culture. The transaction structure can be described as the set of connected management and structural elements that forms the basis for the transaction between a client and a market party, aimed at effectively and efficiently realizing (project) objectives given a certain context (of that project). The transaction culture is the way people deal with each other, the roles they play. The transaction connects the business of the market to the business of the client. As Williamson (2007, p.2) argues “the lens of contract divides into two related branches: public ordering and private ordering”. He sees the transaction as the transfer of a good or service across a 'technologically separable interface'. According to Williamson, the dynamics of market is the instrument for efficient production. A true dynamic market only works in a perfect market. Uniqueness (asset-specificity)⁴², however, results in failure of the market and unequal distribution of power if a client depends on these

42 With asset specificity, Williamson means a client's need for a specific asset. A provider that has this at his disposal, holds power over that client – but also over the competitors who do not have this asset at its disposal (distinguishing capacity).

unique assets. Furthermore, parties are only partly rational, and as such cannot foresee all potential uncertainties. As a result, contracts are almost always deficient. As a result of deficient contracts, combined with natural behavior of parties if uncertainty is not taken care of up front (i.e. opportunism), parties will want to protect themselves against this by taking measures (safeguards)⁴³. The set of related measures forms the specific transaction structure. Based on this reasoning Williamson reduces the transaction to just the contract, where as this study tends to focus on the transaction as a set of relationships in line with the above mentioned perspective of Ford et al..

In line with Ford et al. (2011) a *contract* may be considered as a balance in the relationships between client and provider, congealed at a certain moment (as a result of a tendering process) and focused on future task fulfilment (division of tasks with responsibilities and role fulfilment) with flexibility to counter any disruption to the balance during the period in which the contract is effective. Essentially, a contract is a legally enforceable agreement between parties in which the mutual obligations have been recorded (Von Branconi & Loch, 2004, p. 119). The contract aims to incite both parties into carrying out their assigned tasks appropriately and in accordance with the agreement. It is based on mutual promises. According to Bower et al. (2002, p. 37)⁴⁴ the contract is aimed at: “making effective management arrangements to try to ensure that the separate motives of designer and contractors line up as closely as possible with those of the client”. Bower (2003) posits that contracts have three functions (comparable to the previously given definition by Ford et al. of a relationship as a division of capabilities and uncertainties): division and combination of tasks, risk allocation between parties, and incentives, in order to align the interests and objectives of client and contractor. With regard to aligning interests and objectives, Turner and Sinister (2001, p. 462) extend the definition of the contract to include collaboration as “a way of creating a cooperation”. According to them, the contract is a means to transform an opportunistic system into a cooperative system. This relates to behavioral scholars (see the introduction of Chapter 2) such as Levitt and March (1995, p.12) who argue that “the problem of organizing is one of transforming a conflict system into a cooperative one. A conflict system is one in which individuals have objectives that are not jointly consistent. It organizes through exchanges and other interactions between strategic actors. A cooperative system is one in which individuals act rationally in the name of a common objective”. The aspect of cooperation or partnering will be further discussed in Sections 4.5 and 4.6.

4.2 The construction sector as a ‘loosely coupled system’

The theory of *loosely coupled systems* (Orton & Weick, 1990; Weick, 1976) considers systems as groups of tightly coupled actors with their own discernible function, which are more loosely coupled between themselves. The pattern of mutual relationships and the nature of the relationships determine the behavior of the entire system. Axelrod and Cohen call this

43 The transaction cost theory (Williamson, 2007; Gibbons, 2010; Tadelis & Williamson, 2010) presumes that the relation between market and organization is shaped in such a way, that the total (transaction) costs involved in the realization of the contract and production are at their lowest possible level

44 This refers to specifically construction-related literature.

mix of tight and less tight relationships the necessary basis for a healthy, complex adaptive social system, because it can be used to balance exploitation of existing resources and exploration of new resources (Axelrod & Cohen, 2000). As such, a tight coupling refers to more interdependence, a stronger coordination and a larger mutual flow of information than in a loose coupling. They do not consider a loose coupling to be a weak coupling, but rather to be an adaptive connection with a more tightly coupled subsystem: “...loose coupling is really the glue that holds them together...” (Weick, 1976, p. 3, see also Granovetter, 1973). In Orton and Weick’s model of thinking, systems can be formed in such a way that tight coordination and flexibility can be combined (Orton & Weick, 1990). It is by combining tight and loose couplings (modular build-up) that Orton and Weick believe adaptive ability⁴⁵ is created, because:

- Local adaptation is possible without it affecting the entire system;
- The looser couplings are functioning as a buffer for environmental influences, so that the entire system does not need to adapt to every change that occurs;
- The loose couplings function as a kind of (environmental) sensors of the entire system, without every stimulus immediately leading to a reaction;
- The system has more capacity for variation. By modularly building up the organization, modules can be added, replaced and/or removed, while the modules themselves can be managed tightly.

Dubois and Gadde (2002) specifically describe the construction industry as a loosely coupled system⁴⁶. They are coming from the idea that the construction industry is a complex system, as its behavior is mainly determined by uncertainty (through incomplete specification, lack of uniformity, and unpredictability of surroundings) and interdependence (caused by the large number of applicable technologies and their mutual relationships, the rigidity in the succession of activities and the large number of parallel processes). They describe the construction industry as a location-specific, project-directed activity. Project organization is the dominant organizational form, focused on efficiency of project realisation. The prevailing paradigm for efficiency is competitive tendering. According to Dubois and Gadde (2002, p.4) “the strong emphasis on individual projects favours a narrow perspective, both in time and scope. Efficiency is supposed to be promoted by competitive tendering”. The strong focus on projects implies a varying role for the parent organizations. “The activity scope of firms tends to be broad, including design, production and distribution in various combinations, which may also vary between different projects” (Dubois & Gadde, 2002, p. 4). From this image, a project can be seen as a temporary, tightly organized network within a more permanent network of parent organizations.

45 Weick’s model of thinking can also be found in the system evolution theory of Geels as described in Section 2.4. Geels does not consider the regime (meso level) to be a single regime, but rather a ‘patchwork of regimes’, a conglomerate of tight clusters, connected by means of looser relationships (2005, 2014).

46 Dubois et al. (2002) refer specifically to construction-related literature. Their description of the construction industry concerns both commercial and industrial building, as well as the civil construction sector. The part of the civil construction sector within the entire construction industry can be compared to the market share within the construction sector, as defined in the present study (see Section 1.2).

The relationships are tight due to the directing interests of time and budget, riskmanagement, and the mutual dependence of activities. Projects act relatively autonomous. As a result, the coupling to the parent organization is relatively loose. These parent organizations are also involved in other projects, in which they have to coordinate their contributed activities and/or resources with a (partially) different set of parent organizations. Hofman (2010) describes this system as a ‘loosely coupled decentralised network’ in which no single company has the dominant knowledge or power to develop rules for the direction and design of the whole system. As stated by Hofman (2010, p. 14) “in a loosely coupled context, unlike in a tightly coupled centralized network, no single company has sufficient architectural knowledge about modules and their interactions or sufficient control to take the lead in developing modular design rules”.

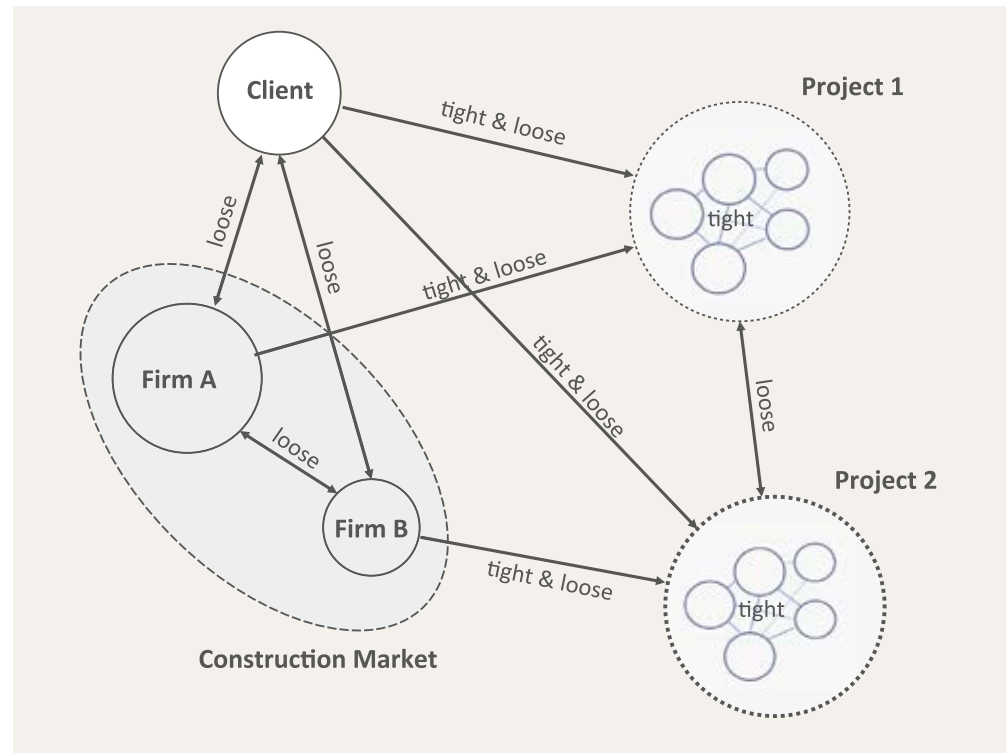


Figure 4.1: The construction industry as a loosely coupled system (based on Dubois & Gadde, 2002).

Dubois and Gadde (2002) consider the intra-project coupling as the most important coupling in the construction industry. They describe this coupling as tight. According to them, the tightness of a coupling refers to the degree (relative, as compared to loose) in which changing an activity leads to change or re-orientation in other activities. In addition to ‘tight’ and ‘loose’, they also use the term ‘tight and loose’ for a relationships that are mainly dependent in a single direction (Dorée, 2004). The coupling from a project in the supply chain to subcontractors and suppliers is considered by Gadde and Dubois as ‘tight and loose’. They consider the coupling from a building company to parallel or sequential projects (inter-

project) to be loose. They also consider the coupling between building companies across individual projects as loose. Dubois and Gadde reason that, whenever couplings become tighter somewhere in the system, they have to become looser elsewhere. If the coupling to the parent company is to become tighter, this is only possible if the intra-project couplings are loosened. Figure 4.1 schematically represents the image of Dubois and Gadde of the construction industry.

As such, the construction industry can be characterised as a system of tight couplings within the separate projects, and of looser couplings in the permanent network of parent organizations. As a result of the loose couplings on the sectoral level, variation will mainly arise on the project level. Dubois and Gadde (2002, p.14) state: “The pattern of couplings makes each construction site an experimental workshop. In complex networks experimentation is an important breeding ground for innovation”. However, these same loose couplings inhibit the spread of innovation to the parent organizations. This relates to the statement of Axelrod and Cohen (2000, p. 90; see also Hansen, 1999): “to build social networks that are strongly clustered. That can have the side effect of reducing the agents’ ability to explore a wide range of options. The result may be insufficient exploration”.

4.3 Integrating the system

The question is how, given this focus on projects, the sector as a whole can come to adaptation. In other words, what is holding the construction system (i.e. the construction sector) together or what elements contribute to the integration of this system?

Dubois and Gadde (2002, p. 10) point to *the strong ‘community of practice’* in construction as a coordination mechanism (the “glue” in Weick’s quote, above): “collective knowledge is generated when people work together in tightly knit groups known as communities of practice.....a strong community of practice reduces uncertainty and serves as an informal coordination mechanism in loosely coupled systems”. According to Kadefors (1995), this strong community of practice has arisen as a result of the large degree of governmental regulation in construction, the large degree of standardization, the generally accepted working methods as a result of the sector’s strong project orientation, and the continuous working in different formations. Hofman (2010, p. 71) mentions cognitive couplings in addition to contractual couplings as a basis for the strong community of practice. “Cognitive coupling is the act of creating trust, shared values, and shared strategic beliefs among dispersed firms...Firms with aligned strategic beliefs about what to do and how to do it are more likely to collaborate and innovate successfully. It provides the harmony of interests that erase[s] the possibility of opportunistic behavior”. As a result, a community of practice acquires the character of the regime described in Section 2.2.

As we have discussed in Chapter 2, complexity theory states that systems cannot be managed by a single actor. An actor is part of the system, and the system as a whole continues to develop. From a management point of view, networks contain *points of focus or hubs (focal firms or groups of firms)*, which take on a coordinating role within the network as *system integrators* (Möller & Svahn, 2003; Möller & Rajala, 2007). Focus points are points in a network where a number of relationships come together distinctively. Abrahamson (2004

calls groups of actors who share something in common in the network⁴⁷ clusters (comparable with the above mentioned communities of practice) with a tighter mutual coupling, which may act as coordinating hubs. System integration takes place in parts of the network of actors through the distribution of tight and loose couplings.

In Section 3.4 we discussed the tendency of (public) clients in the construction sector to integrate more disciplines and tasks in an integrated (or innovative) contract. Offering an integrated solution means providing a coherent combination of products and services, geared toward the client's specific needs and wishes, by means of a combination of design, supply, financing, maintenance, support, management and operation throughout the entire life cycle. This makes *system integrators* more than assemblers of products and services alone. It pertains to specific core competencies for coming to integral tenders, geared towards the clients's needs and coming from the playing field and the available network of relations, and to also take responsibility for them (Davies, 2004; 2007).

Davies (2007) distinguishes two practical forms of system integrators. The first, he mentions the vertically integrated system integrator, consisting of a group of companies (temporary as a consortium or in a strategic alliance), which jointly fulfil the task of system integrator⁴⁸. Often, this group is led by a leading contractor, which is responsible within the group for the totality of the integration. The other form is a single company, which takes on the role and responsibility of system integrator. As Davies (2007, p. 184) argues: "In its pure form, a systems integrator is the single prime contractor organization responsible for designing and integrating externally supplied product and service components into a system for an individual client (general management)". Within the production chain, the system integrator is responsible for the coordination of a network of suppliers and subcontractors (upstream in the chain), integration into an integral solution and the addition of relevant services (downstream in the chain). System integration is not a simple, step-by-step process, but rather a dynamic, interactive process between earlier and later phases in the chain (Lenferink, 2013). This is only possible if the system integrator has knowledge of the client's business, the actors involved in the chain, and their coherence and knowledge to integrate into an integral solution. As Rutten et al. (2009, p. 286) state: "they integrate components, technologies, skills and knowledge from various organizations into a unified system for an individual customer".

47 Axelrod and Cohen (2000) talk about 'types of agents' as a distinctive group of agents with common properties within a larger population.

48 In the construction-related literature, (see e.g. Vrijhoef & Wicherson, 2010; Lenferink, 2013) system integration is rather considered to be a form of chain integration. The system integrator is a chain player or combination of chain players, integrating a part of the production chain.

4.4 Tightening relationships through partnering

An important question is how system integration in the construction sector is achieved. Here the concept of partnering can be considered relevant. Partnering brings professionals together, which provides a setting for knowledge sharing and innovations that in turn could lead to time and cost savings (Cheung & Rowlinson, 2011). However, partnering needs time and effort of the various parties involved in the relationship and is basically an inefficient process (Skeggs, 2004). Therefore, cooperation will not emerge naturally. It arises when the assumed effectivity (i.e. the 'common and mutual benefit') is larger than the assumed inefficiency, which is generally referred to in literature as the 'transaction costs' (see Glossary).

What is in literature meant by partnering? According to Kitzi (2002) and others (Li et al., 2000; Camarinha-Matos & Afsarmanesh, 2006), partnering should be considered on a continuum from simple information exchange, via coordination of activities and cooperation by exchanging resources, to integrated collaboration when information, activities, resources and responsibilities are jointly planned, implemented and evaluated to achieve a common goal. The basic form of partnering is communication and information exchange. Subsequently, coordination can be added, that is the attuning and adapting of mutual activities in such a way that results can be achieved more efficiently. Cooperation means that, in addition to the exchange of information and attuning of activities, resources are also shared in order to attain goals. In the case of collaboration, information, resources and responsibilities are shared in order to jointly plan, implement and evaluate activities for the purpose of attaining a goal together. Collaboration derives from the Latin word 'collaborare', which means 'to work together' and refers to creating something together by making use of each other (Denise, 2005). The ultimate form of partnering is a merger of organisations into one. The steps described above can be seen as steps in the degree of alignment between parties and thus the tightness of the relationship. The basis of partnering is alignment of information, in fact, the levelling out of information asymmetry (see Eisenhardt, 1989). Coordination is alignment of activities. Cooperation concerns the alignment of objectives and interests. And finally, collaboration is alignment of organization and management through integration.

Alignment of interests is at the core of partnering (Rose, 2008; Bresnen, 2009). A current discussion in literature focuses on the question whether it is possible, in principle, to align both public and commercial interests simultaneously. For instance, Broadbent and Laughlin (2003, p. 355) argue that: "some suggest that the profit motive, which inevitably must drive the private sector suppliers, is fundamentally different to, and likely to clash with, the values and ethos of the public sector". In her dissertation, Reynaers (2014) points out the importance of the will of market companies to provide public value, stimulated by incentives. "Besides the importance of the quality of the contract and output specifications, compliance depends on the attitude or willingness of the consortium to comply" (p. 171). Alignment can be reinforced through incentives, by which "a provider is motivated to achieve extra value added services over those specified originally" (Bower 2003, p. 78). However, Bresnen and Marshall (2000) revealed that most of the incentive systems used in partnering projects do not provide expected motivation for collaborating actors due to a disregard of cognitive and individual differences, a disregard of the impact of social relations, and a focus on solely extrinsic rewards as a source of motivation.

Generally, literature distinguishes between financial and non-financial incentives. According to Bresnen and Marshall, (2000) the incentives in construction contracts are predominantly financial in nature⁴⁹. These incentives can be narrowly defined as the extent to which the contractor gains financial rewards (or penalties) when it exceeds (or fails to achieve) certain targets specified in the contract, which can be represented by a specific gain-share or pain-share mechanism (Hosseinian & Carmichael, 2013). Basically, there can be distinguished three types of financial incentives in contracts currently used. First, in a fixed-price contract, the entire performance to be delivered is specified in the price. There is no mutual alignment of interests other than the contract specifications. Second, a cost-plus contract reimburses the costs of the contractor with an additional fee (plus) for pre-defined performance. Third, an incentive contract works with a bonus/malus scheme around a fixed price or through the distribution of the financial residue after delivery of a performance – for example through an alliance fund (Bajari & Tardelis, 2006). Bresnen and Marshall (2000) and Kadefors (2004) argue that not too much faith should be put in financial incentives, and that these should not overshadow or replace means intended to stimulate intrinsic motivation and mutual trust. Based on studies of the Australian construction industry, Rose and Manley (2010) point out, that financial drivers alone are not enough to entice involved parties to implement partnering. They specifically examined the effects of non-financial incentives (Table 4.1).

Table 4.1: Key non-financial incentives in the construction industry
(based on Rose, 2008 and Rose and Manley, 2010).

| Motivator | Description | Source |
|-----------------------------|--|--------------------|
| Risk Allocation | An equitable and balanced risk profile contract, matching the contractor's ability to adequately manage project cost risks. | Contract |
| Potential future work | Potential for future work with the government client; increasing the attractiveness of achieving above specified performance. | Relation |
| Quality of the relationship | Relationship building (workshops) between client and contractor, to build project relationships and provide a joint project culture. | Relation |
| Involvement in the planning | Early market involvement of the contractor and main suppliers or subcontractors in the development of design for maximum control of risks. | Process-management |
| Value driven selection | A 'value-driven' tender selection process, containing non-price criteria that promote the selection of the best tenderer based on project priorities and not only on lowest price. | Selection process |

⁴⁹ In construction, parties frequently work with cost-plus or performance bonus schemes, or a combination of both.

An equitable risk-allocation is indicated as a prime condition for partnering (see also Kadefors, 2007). When risks are allocated matching the contractor's ability to adequately manage these risks, it is a strong motivator for partnering. Potential for future work is related to the condition of a long-term perspective and of increases of the attractiveness to invest in a partnership. The quality of the relationship is important to create personal commitment and provide a joint project culture. Gadde et al. (2010) argue for creating a favourable 'relationship atmosphere'. Early involvement in the planning process means that contractors, main suppliers or subcontractors can have control of risks and risk allocation through the co-development of the design (see e.g. Lenferink, 2013). Early involvement creates an understanding of each other's businesses, and may form a basis for added value creation and facilitates joint problem solving (Eriksson et al., 2009). The potential revenue from added value and risk control as such are strong motivators. According to various authors (such as Kadefors et al., 2007; Lahdenperä, 2007; Eriksson et al., 2009) a careful selection process focusing on value rather than price allows contractors to offer added value based on their distinctive business competences. It motivates to join a partnership based on the company's competences and possibility to further reinforce that competences.

As discussed in Section 3.4, clients are normally in the habit to specify a detailed output, without actually challenging the contractors to help achieve the project goals. If the only value that can be created is the value pre-specified by the client, then there is no real motivator to achieve more than the value asked for in the tender. This may result in a lacking motivation to participate in partnering and to invest in the further development of distinctive competences, which keeps the industry 'locked-in' (Leendertse, 2015). Although in literature long-term commitments are frequently discussed as being favorable for partnering the construction sector still focusses on short-term and stand-alone projects (Söderholm, 2008; Eriksson et al., 2009; Gadde & Dubois, 2010; Leendertse, 2015). This strong project orientation leads to client dependency. Offers and organizations are dedicated to the specific market requests of these clients. Consequently, distinct competitive capabilities will disappear and competition concentrates on price alone, decreasing the motivation for partnering (Bygballe et al., 2010; Leendertse, 2015).

4.5 Types of partnering

Based on Barringer and Harrison (2000) different forms of partnering between organizations (interorganizational relationships) can be distinguished: mergers, joint-ventures, consortia, networks, alliances, sessions or licences, trade associations, interlocking directorates and outsourcing. In Table 4.2 below, the different forms are discussed in more detail. The tightness of the relationships (based on Dubois and Gadde, 2002), is also indicated, referring to the steps of mutual alignment discussed in the previous Section.

Table 4.2: Forms of partnering (based on Barringer and Harrison, 2000).

| Partnering form | Tightness | Description | Step of mutual alignment |
|---------------------------|----------------|--|---|
| Merger or Stakeholdership | Tight | The merging of two or more companies into one company through acquisition or purchase of shares | Collaboration |
| Joint Venture | Tight | Combining a part of the means and resources of two or more companies into one joint new company | Collaboration |
| Consortium | Tight | Grouping of companies, aimed at specific problem solving or technology development | Collaboration |
| Network | Loose to tight | A relationship configuration used by an organization (hub) to organise a complex of interrelated companies it is dependent on | Information exchange or coordination or cooperation |
| Alliance | Loose to tight | Collaboration, aimed at exchanging resources, knowledge and skills based on a contract, without there being any joint property or ownership. | Cooperation |
| Concession or License | Loose to tight | Permission by the holder of a copyright or patent or other right, given to a company for using that right | Coordination |
| Trade Association | Loose | A non-profit organization, formed by companies from the same field in order to generate or exchange knowledge, give specific advice, organize training courses, and create a platform for joint lobbying | Coordination and information exchange |
| Interlocking Directorate | Loose | An interlocking directorate is formed when the manager of a company takes a seat in the board of another company. | Information exchange |
| Outsourcing | Loose | Contracting of a previously specified product or service | Information exchange |

The partnering between a public organization and a market party is called a public-private partnership, or PPP. Iossa et al. (2007, p. 17) define a PPP as “any contractual arrangement between a public-sector party and a private-sector party for the provision of public services with the following four main characteristics: (i) the bundling of project phases into a single contract, (ii) an output specification approach, (iii) a high level of risk transfer to the private sector, and (iv) a long-term contract duration”. Literature mentions also other elements as essential for PPP, such as financial involvement of the private sector, distribution of risk between private and public parties, orientation on public functions and services, and the approach of the life cycle (Verhees, 2013; Lenferink, 2013). In the literature about PPP,

usually the distinction is made between a concession model and an alliance or partnership model of PPP (Klijn & van Twist, 2007; Eversdijk, 2013; Lenferink, 2013). The *concession-PPP* is oriented on the separation of responsibilities between public and private parties, and connection by way of a contractual line. All kinds of forms of contracts can be found in literature, under such names as PFI (Private Finance Initiative), DBFM (Design-Build-Finance-Maintain), or DBFMO (Design-Build-Finance-Maintain-Operate). In case of a concession-PPP, the public ‘partner’ is generally in charge, while the private ‘partners’ take on a more executive role. This still is and remains therefore a hierarchical client-contractor-relationship, shaped by an integrated contract for the execution of public tasks.

In a *partnership-PPP*, separate activities of the partners are integrated to create additional value. As such, this type of PPP is an organizational collaboration (alliance), in which several constituent projects or disciplines are brought together. The added value is created by the synergy that is achieved as a result of several projects or disciplines being linked. Parties contribute knowhow, and work together towards an objective, with a distribution of risks that agrees with the contribution of means, accepting and sharing the risks. From this point of view, parties are not just working on a project, but working towards a common objective. In the case of an alliance-PPP, there is joint commissionership, often in the form of a jointly founded company (joint venture) with a joint final responsibility for achieving the desired results.

4.6 Summary

To conclude this Chapter, the described theory of relationships in the construction sector can be summarized as follows:

- There is not a single company that possesses all necessary resources for success. Therefore, developing and maintaining a network of relationships is an essential part of what an organization does. Networking means continuously keeping a company’s relationship portfolio up to date.
- The transaction between two organizations can be defined as a continuously evolving portfolio of all relationships between these organizations.
- A ‘loosely coupled system’ is a network of tight and less tight relationships. The pattern and the nature of mutual relationships determines the behavior of the entire system. Adaptive ability is created by combining tight and less tight relationships. Tight relationships are relationships with intensive exchange of information, strong interdependence, and strict coordination.
- The theory of loosely coupled systems offers a functional ‘explanation’ for a number of characteristics that are specific for the construction industry: the low degree of innovation compared to other sectors, the strong focus on projects, and the strongly uniting role of the regime (community of practice).
- Construction is characterized by a strong focus on projects. A project can be considered as a temporary, tightly organized network within a more permanent network of parent organizations of the contractor and client. Projects are directed relatively autonomously. As a result, the coupling to the parent organization is relatively loose.

- There is not a single company that possesses the dominant power or knowledge to determine the structural rules of the system of the construction sector. System integration is achieved by means of communities of practice, clusters of organizations that act as hubs of relationships and system integrators.
- The alignment of mutual interests is at the heart of a tight relationship. Overlapping interests (goal alignment) form the basis of partnering, which can vary from the simple exchange of information, to coordination of activities and cooperation on the use of resources, to intensive integrated collaboration (joint venture). These steps can be seen as steps in the degree of alignment between parties and thus the tightness of the relationship.
- Alignment of interests (common interest) can be created by way of incentives in the relationship. Incentives can be both financial and non-financial in nature. Often, financial incentives work by way of cost-plus or non-claims bonus mechanisms, or a combination of the two. The most important (non-financial) incentives for market parties in construction are: a clear, controllable risk allocation, future work with prospects of continuity, a good relationship with the client, involvement in the design so that specific own qualities may be contributed, a selection based on added value to the project and team formation with the client, in order to come to the best results based on partnering.



Conceptualizing sustainable market dynamics and customer value

This Chapter further discusses the notions of ‘sustainable market dynamics’. As described in Chapter 3, the construction sector is a mainly demand-driven sector, in which competition is primarily based on price. Competition forces providers into quoting based on an optimal price-quality ratio. When the quality is largely prescribed by the client, a company can only distinguish itself from competition by the efficiency of its production process. Competition based on efficiency alone eventually leads to decline (price spiral). Or, according to Porter (1996, p. 65): “competition based on operational effectiveness alone is mutually destructive, leading to wars of attrition that can be arrested only by limiting competition”. Companies will continually have to look for distinguishing capacity when compared to their competitors; “competitive strategy is about being different. It means deliberately choosing a different set of activities to deliver a unique mix of value” (Porter, 1996, p. 64). Innovation, looking for continuous renewal of processes, products and services, is a means to achieve this distinguishing capacity. However, in a monopsony⁵⁰, as is the case in the construction sector, distinguishing quality only leads to a better competitive position if the client allows space for this, and appreciates distinction.

5.1 Sustainable market dynamics

The concept of *sustainable market dynamics* has been widely discussed in literature, especially by competitive strategy economists. In general, this discussion focusses on two paradigms. The positioning paradigm – associated with for instance Porter (1980; 1996) – argues that market structure drives firms to positional strategies related to competitors. The resource based paradigm argues that a firm’s ability to achieve and sustain a competitive advantage is directly related to firm-specific resources (Barney, 2011; Kraaijenbrink et al., 2010). It centres on the idea, that a business is a portfolio of ‘resources and capabilities’ more than a portfolio of products, and that these ‘resources and capabilities’ determine the business’ strategy and results. Resources are the assets that a firm owns. Capabilities are what the firm can do with these resources. Only the capabilities to (optimally) use the resources of a firm can lead to competitive advantage. Based on these resources and capabilities the firm creates a service or product which the client perceives to be better than the competition’s product.

The *resource-based paradigm*, emphasizes the role of building unique and valued knowhow and capabilities that rivals cannot easily imitate (Barney, 2011). Matthyssens and Van den Bempt (2008) argue that, due to the specific nature of the construction market involved in infrastructure development, i.e. a limited number of public clients relative to the number of suppliers (a monopsony), competition based on positioning seems less sustainable than competition based on differentiation. This study will therefore focus on the latter strategy. This strategy is based on targeted investments in resources and capabilities that are “likely to create value, rare among competitors, costly to imitate and have no close substitutes” (Barney, 2011, p. 4). Helfat and Peteraf (2003) argue that new resources and capabilities

⁵⁰ A monopsony is a market with a limited number of clients, in which the market parties are (partly) dependent on those clients (Besanko, 2004).

must be developed, existing sources and capabilities improved and incompetent capabilities removed. Some scholars (Peteraf & Barney, 2003; Teece, 2009) point out that it is not so much individual resources that matter, but the synergetic combination of resources that can be created by the firm, i.e. the capability to recognize and exploit opportunities. In order to enhance sustainable market dynamics, policy makers may facilitate a supportive environment for firms to develop their resources and capabilities. Key in such an environment is that the client appreciates added value through a reimbursement that is higher than the costs needed to deliver this value (Kraaijenbrink et al., 2010; Heene, 2010; Teece, 2010). Figure 5.1 schematically shows the above described relationships as what we will call the ‘differentiation cycle’ in this study (see also Leendertse, 2016)⁵¹.

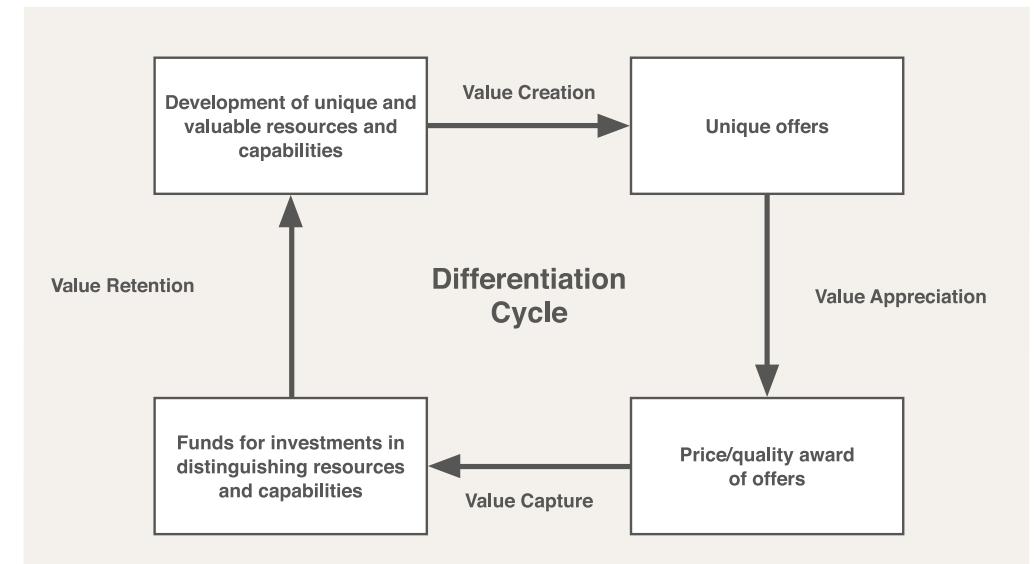


Figure 5.1: Cycle of sustainable market dynamics based on differentiation

The figure shows that value creation, value appreciation, value capture and value retention are key elements to advance sustainable market dynamics. Value creation contains all the activities that provide a greater level of benefits to clients than they currently possess and are willing to pay for (value appreciation). If the value creator does not capture all the new value that is created, literature speaks of value slippage (Lepak et al., 2007). Through competition and commoditization value slips away from the creator to competitors and clients. The more slippage there is, the less incentive there is to continue value creation. Moreover, differentiation is temporary. Unique competencies become less unique through

⁵¹ The cycle as described does originate in theories of company strategy. It is an investment cycle by way of value delivery and value capturing, aimed at building up distinctive capacity compared to the competition. The cycle needs time in order to build up resources and to allow those resources to yield a profit. In the classic model, this mainly relates to capital investment. More modern organizations organise resources by way of relationships, networking. This makes companies more flexible and adaptive in the event of a changing context.

imitation, competitors' innovation and clients' habituation (Matthyssens & Van den Bempt, 2008, p. 317). Matthyssens et al. (2004) use the term *commoditization* to indicate that clients get used to added value through "a dynamic process that erodes the competitive differentiation potential and consequently deteriorates the financial position of any organization" (Matthyssens & Van den Bempt, 2008, p. 317). Tidd et al. (2005) argue therefore that a build-up competitive advantage will therefore diminish over time. This in turn should stimulate companies to continually search for and invest in (value retention) new distinctive qualities, which can create new value for clients. Literature refers to this as innovative capacity or dynamic capacity, i.e. the creative skills to continuously develop unique technological and market-driven solutions that are valuable for clients (Treacy & Wiersema, 2007; Porter, 2008; Teece, 2010).

According to Ford et al. (2011) the strategy of many firms is aimed at using and improving its market position. However, firms always act within a network of relationships. They consider *networking* to be the true core competencies of firms (see Section 4.2). In their view, strategy is making relationship choices within a continually changing network: "The business of modern companies is to modify, add to, combine, distribute and sell what they buy from others. Some of these other companies (clients or suppliers) are vital" (Ford et al., 2011, p. 8). According to them (Ford et al., 2011), successful companies are not based on turnover and maximum use of resources that are available (within the company), but based on a smart, continually adaptable portfolio of relationships. That is what makes them flexible, service-oriented, and adaptive. Solutions are based on multiple kinds of knowledge, without being limited by the available in-house knowledge. Distinguishing ability and client-focusedness can thus be realised by way of a smart relationships portfolio (see also Carlile, 2004).

5.2 Customer value

From the point of view of the company, Porter simply describes the concept of customer value as: "what buyers are willing to pay for what a firm provides" (Porter, 1985, p. 38), adding that value is created when a company charges a lower price than its competitors for the same quality, or when a company offers unique advantages to the customer for an acceptably higher price. Besanko (2004) defines this as the market balance between 'willingness to pay' by the consumer and a producer's 'minimum supply price'.

Graf and Maas (2008) carried out an extensive literature review, researching the concept of value as seen from the perspective of the supplier and the perspective of the client. They concluded there is no univocal definition of customer value, but rather that such definition depends on the perspective used to look at value. Customer value is "a subjective construct made up of multiple value components" (Graf & Maas, 2008, p. 4), it is a subjective opinion of the producer about his product, or of the customer or client about that which is offered to him. The intrinsic and extrinsic objectives of the organization or person involved are used as the starting point for this valuation. For the concept of customer value, Flint et al. (2002, p. 103) distinguish between the so-called 'perceived customer value' (hindsight) and 'desired customer value' (upfront): "perceived value is the customer's assessment of what has happened in benefits and sacrifices by receiving a product or service. Desired value is what the customer or client wants to happen (benefits sought) by receiving a product or service".

This means that in their view, value is not an absolute quantity, but something that is created through a process of incremental steps:

- The customer or client has, or makes, an idea of what he expects to get (desired value). The customer has this idea based on his desires and needs, and his insights in the possibilities that exist at that moment;
- The producer translates his idea of the customer's need (supported by the demand) into a product and/or service, which he then offers (delivered value);
- The customer values what is offered to him compared to his explicit and implicit expectations, and the reality of the moment (perceived value). If the perceived value is larger than the desired value, value has been supplied. However, if the desired value is smaller than the desired value, the client will consider what has been offered to be insufficient. A satisfied customer or client can then only be created when the customer adjusts his expectations, or if the producer supplies a different product and/or service.

In infrastructure networks value is generated through a value chain, a chain of planning- and decision making activities, tendering, production and acceptance of a product or service by the customer. Practically, the transaction links planning and decision-making to production by way of tendering. In the planning and decision-making chain, societal needs are translated to a market demand (desired value). The production chain turns raw materials or components into a product and/or service (delivered value). Tendering is the process used to link these two chains together. The described value components are depicted in Figure 5.2. The figure shows clearly that market provision is not a single value, but comprises several value components, which determines integral 'customer value'.

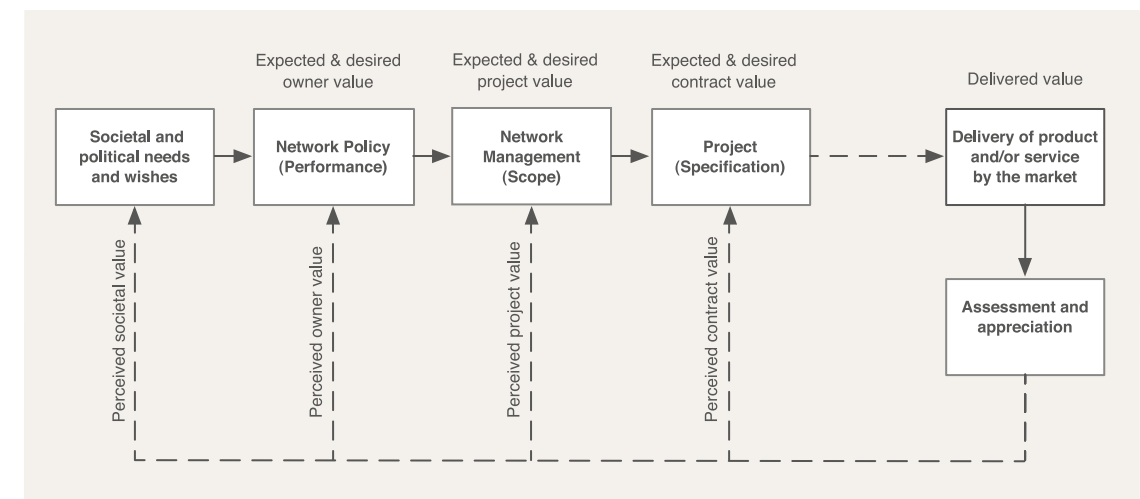


Figure 5.2: Value generation in the public infrastructure network value chain

In the construction sector customer value proves to be strongly related to project success or the success of a project. Project success is a widely discussed subject in literature (Turner, 2007; Koops, 2017). Besides traditional success criteria like time, budget and quality, more

dimensions have been introduced in the last decades such as satisfactory commercial benefit; perceived performance; technical and functional performance; and, satisfaction of the needs of the client (Davis, 2014; Koops, 2017, p. 21). A project is generally defined in this discussion as a setup to achieve a specific objective, which involves a certain scope of work within a set of specifications. Some scholars make the distinction between project success and project management success, whereas the latter is related to the effort of project management and the first to the whole lifecycle of the object created in the project (Male et al., 2007; Koops, 2017). Male et al. (2007, p. 1). argue that value can be managed and that value is the outcome of a value management process. Value management has to do with learning to know the customer's value system and gaining insight into those factors that determine value for the customer, the 'hidden factors of value' (Kelly et al., 2004). In order to be able to generate customer value for the customer's value system, Treacy and Wiersema (2007) speak of the strategy of *customer intimacy*. The firm is focused on continuously adapting supply to the demands of the individual customer. Important for such a strategy is the continuous investment in customer relations, directing towards customer value. Customer intimacy involves creating a long and intimate relationship with customers.

5.3 Competitive distinction by innovation

The discussion in the previous Sections shows that a good competitive strategy is not focused on defending existing competitive advantage or market position, but on creating temporary advantage again and again. Companies can distinguish themselves from competition by means of innovation (Tidd et al., 2005). Analogously, Debackere (2006, p.1) states "competition results in innovation, innovation results in competition". Does competition result in more innovation? First of all, there is the argument (Schumpeter, 1943) that innovation stimuli become stronger as the expectation of the resulting profit increases. The more monopoly power the company has, the higher said profit will be. Or, vice versa, the more competition there is, the lower the profit will be – and the lower the stimulus to invest in new technology. On the other hand, it can be argued that more competition is what forces companies to invest in process and product innovation, in order to stay ahead of the competition. However, competitors will not be sitting still. They copy or improve on other company's innovations, so that the built-up competitive advantage decreases again. So, the race between competitors to create the best product may encourage continuous innovation (Treacy & Wiersema, 2007). As there are two contrasting mechanisms, the relationship between competition and innovation does not seem to be unambiguously determined up front.

In Section 2.3 the term regime from complexity theory was introduced as the dominant practices, rules and interests that are shared by groups of actors. Analogously, in management literature, terms like 'industry recipe' (Spender, 1989) or 'dominant logic' (Prahalad, 2004) are used to refer to a complex of beliefs about products and/or services, technology, marketing, strategies etcetera, which are universally accepted within a certain context (a business sector). This means that many players within an industry (implicitly or explicitly) subscribe to these beliefs, which are considered to be universally accepted. In markets with a dominant industry recipe or logic, firms approach the market in a similar

way and create a similar type of customer value. After all, they are using the same recipe for organising their activities and for offering problem solutions to customers. A firm can then only distinguish itself from the competition by becoming more and more efficient in the execution of the existing recipe (through price competition). However, the competition is doing the same. According to Kim and Mauborgne (2005, p. 4), real distinguishing ability can only be created by breaking out of the prevailing dominant logic: "you focus on making the competition irrelevant by creating a leap in value...thereby opening up new and uncontested market space".

One of the discussions in literature concerns the question whether or not the construction sector is innovative. In 2006, a study of the Netherlands Organization for Applied Scientific Research (TNO) concluded that Dutch construction companies are lagging behind compared to other industries when it comes to productivity development (De Bruijn & Maas, 2005; De Bruijn & Jonkhoff, 2006). The TNO-study identified the customer-centric market as the first cause. Suppliers only produce what is requested, and mainly focus on (mostly incremental and ad hoc) process improvement. Innovation usually takes place with colleagues, and hardly ever with the client. As the second cause, the TNO-study mentions the market structure. The project-related nature of building production and the method of tendering are not conducive to innovation. Construction companies work together in varying ways in ever varying projects. The clients' requests are predominantly focused on execution and construction, with innovation usually aimed at finding solutions for ad hoc problems. Manseau and Shields (2005) describe a similar view: innovations are mostly smaller, incremental innovations⁵², aimed at optimal project and process control during one or just a few building projects. The aim of these innovations is to achieve a more efficient and hence more cost-reducing construction process. They identify the following reasons: the traditional and segmented construction process, strong government regulation; typical product characteristics such as being location-bound; and, operating in a sector with many small, local players with limited long-term vision.

5.4 Summary

To conclude this Chapter, the described theory of sustainable market dynamics and customer value can be summarized by the following points:

- A sustainable competitive strategy can be based on supplying distinguishing customer value based on specific core competencies of the business at a competitive price. If a company wants to distinguish itself from the competition, it will need to have specific, hard to imitate competencies at its disposal.

⁵² Manseau and Shields (2005) distinguish several forms of innovation. Incremental innovations are small developments whose impact on the existing system is limited. Process innovations contain innovations in the field of execution, the actual construction, and process management during construction. Radical innovations can be considered as employing a totally new product or production process.

- Investments have to be made in order to develop and maintain these unique competencies. In order to be able to invest, appreciation of the added value by the customer is necessary. The room for investment thus depends on the price that can be obtained for the offered quality of a product or service compared to the costs that have to be made in order to deliver this quality.
- Through networking, resources, knowledge and skills of related companies can be linked to the business⁵³. As a result, investments in specific core competencies may be narrowed down, and the variation of offers made by the company may be increased. This way, companies become more adaptive and less dependent on specific customers.
- Unique competencies are made less unique by imitation and customer habituation (commoditization). If a company wants to sustainably distinguish itself from the competition, it has to continuously upgrade its competencies. This makes innovative capacity, the ability to continually renew its processes and products or services an important competency for companies in a sustainable market.
- Customer value is not an absolute quantity. Customer value is a subjective opinion of the producer about his product, or of the customer about that which is offered to him. Value is the outcome of a process of creation by the producer, of expectation and valuation by the customer, and of capturing by the creating producer.
- Strong regimes or dominant industry logic force companies in a sector to universality. Distinction can then only be created by breaking with the prevailing dominant logic of the system in which one is acting.

⁵³ By way of networking, a relationship portfolio is created, often based on partner relationships. Through partnering, new disciplines can be linked to a firm's own knowledge and skills.



Constructing an analytical framework for the construction sector

In Chapter 1, the construction sector was defined as all managers, clients and market firms working in the preparation, realization, management, maintenance and financing of large infrastructure. In Chapter 2, a system was defined as a set of interrelated actors or groups of actors that are considered a whole. Chapter 3 started with a description of the 'value chain' of a public infrastructure network manager (we used Rijkswaterstaat as case) as a stream of linked activities with corresponding actors and their mutual relationships (as elaborated in Chapter 4). In Chapter 5 the concept 'sustainable market dynamics' was further elaborated. In this Chapter the 'value chain' will be combined with the definitions of a system, the specifics of the construction sector and the concept 'sustainable market dynamics' to an overall framework that will further be used for analysis in this study.

As stated in Chapter 2, in this study we consider the (Dutch) construction sector a complex adaptive social system in this study, a network of actors connected by relationships. The system is complex because of the many interdependent relationships. It is social because the industry seems to be able to learn. It is adaptive due to the fact that the sector operates in a highly dynamic environment and continues to thrive. As discussed in Chapter 2, characteristic of a complex adaptive social system is that the behavior can often be described using a limited number of simple processes. Complexity is not created by complex processes, but by the interaction of relationships and iteration of processes. Evolution of the system occurs by a cycle of the generation of variation (by copying and mutation, recombination, and innovation), the selection of suitable solutions and the implementation of these solutions in the regime of the sector. Regarding this, a regime is a set of dominant practices, rules, and interests shared by a group of actors. The regime mostly determines the behavior of the system. Regimes give stability, but also make the system inert to change. The combination of external pressure on the regime and the presence of innovation initiatives or innovation niches are crucial for system evolution. Pressure on the system necessitates seeking variation and the presence of variation stimulates innovation.

In this system of the construction sector, projects can be seen as potential breeding grounds for creativity in the construction sector and thus a source for system evolution. Through specific relations within the system of the construction sector, creativity spreads and develops in the entire system. However, some relationships are more influential for system evolution than others. The system is thus made up of groups of tightly linked actors or groups of actors (e.g. projects) and less tightly linked actors. This arrangement can be used to explain certain behaviors of the system. Processes relevant to the functioning and development of the system, such as system evolution, system ordering or integration and the development of sustainable market dynamics, will go through specific sets of relations. This Chapter gives a framework for studying these processes and relations in the system of the construction sector.

6.1 The system of the construction sector

In Section 3.1 the public infrastructure network value chain was represented (see Figure 3.1) as a chain of linked activities and associated actors. This 'value chain' rudimentarily contains a strategic level (represented in Figure 6.1 as the system block top left: network governance), a tactical level (see in Figure 6.1 the system block top middle: network management), and an operational level (depicted in the Figure as the system block top right: project and programme management). The strategic level is concerned with strategy and policy, which give direction to the tactical level. The tactical level is concerned with programming and managing the infrastructure network. This programming creates the frames for the operational level. On the operational level, the market is involved through tendering⁵⁴. The market itself can also be considered on an operational level (Figure 6.1, system block bottom right: contractors and suppliers, who concretely carry out assignments for clients), their parent companies (see system block bottom middle in the Figure), and the collection of parent companies as a business sector (Figure 6.1, system block bottom left).

The actors within market and infrastructure network management and the relationships between them make up the system of the construction sector, as it will be considered in this study. In Figure 6.1, the separate blocks do not represent actual actors, but subsystems of relatively closely linked actors. The arrows in the figure represent the mutual interaction through relationships. There are relationships between all actors that are mentioned. All relationships are interactive and reciprocal, resulting in an internal cohesion of the entire system. This means that a change to a single relationship immediately has consequences for all other relationships. Therefore, they cannot be considered independently. A special set of relationships within the system is what we call in this study a transaction. A transaction is the (continuously changing) set of relationships between the infrastructure network manager and the market (see Section 1.2).

By defining the system boundaries the environment of the system is also defined. The environment influences the system, but in its turn is influenced by it. The project's environment (see Figure 6.1) consists of its surroundings, such as the physical environment as well as the people living nearby, stakeholders, interests groups, etcetera. Politics and governmental policies influence and are influenced by the strategies of the network managers and the market, with the market being especially (directly) sensitive to economic developments (booms and recessions). In public networks, the economy's influence on the network management takes place indirectly by way of politics and government. The role of the user in public networks is distinct. Indirectly, the user is represented through politics and government. Directly, the user influences the functionality of the network by means of his behavior, and his behavior is influenced by the network governance and management. Figure 6.1 shows the considered system (dotted outline) as well as the environment of the system.

⁵⁴ The 'value chain' follows the so-called Asset Management Model (Campbell et al., 2011), which consists of an Asset Owner who sets the framework, and who outsources the management of his assets (network) to an Asset Manager. Subsequently, the Asset Manager outsources the actual work to a Service Provider.

Public infrastructure networks do not stand alone. There is always interaction with adjacent networks, such as the underlying road network or networks of other modalities (for instance: road network and rail, waterway networks; but also – and increasingly so – road and energy or ict networks – see De Bruijne 2006; Spijkerboer et al. 2018). This is where public infrastructure networks are also different from industrial networks. This study does not specifically look at the interaction with adjacent networks. Therefore, the interaction with adjacent networks is not represented separately in Figure 6.1 (partly for the sake of clarity), but is considered to be integrated into the network governance and management blocks.

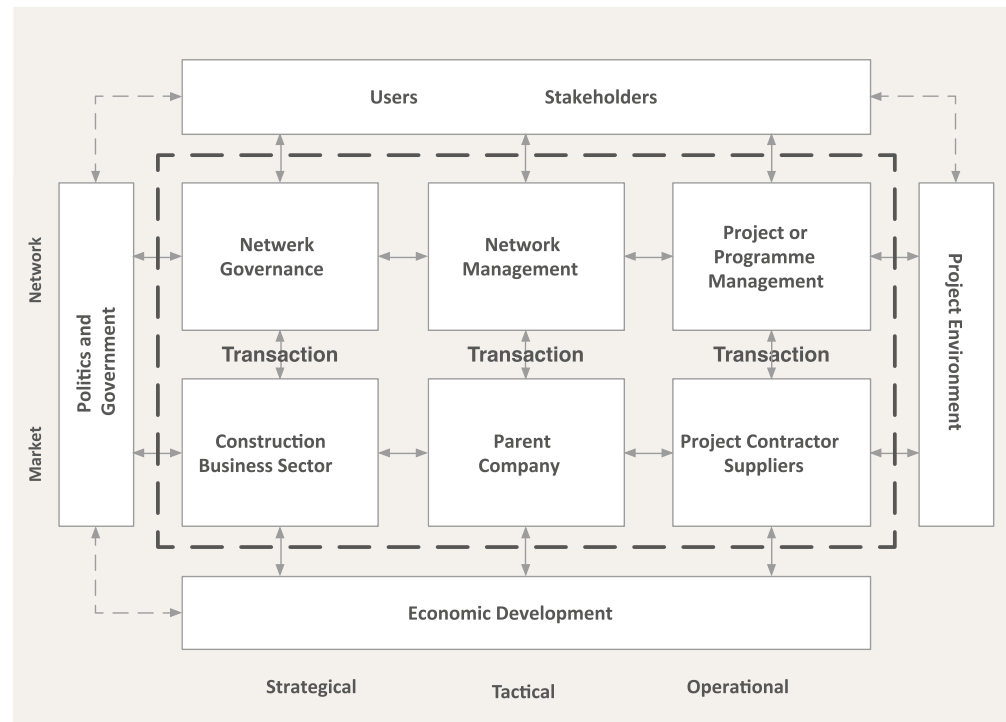


Figure 6.1: Schematic representation of the construction sector as a system

In Chapter 1, we defined the transaction as the (continuously changing) set of relationships between the manager of an infrastructure network and the market parties involved in the network development, on an operational, tactical and strategic level. Figure 6.1 indicates the relationships relevant to the transaction. It is built up from a network perspective, the system of network management, and the market that is involved for this purpose. However, a system is always defined from a certain perspective. For example, from the perspective of the project, the system may consist of the project/program managers, and the market parties involved in the specific project (operational level). The tactical and strategic levels then become part of the environment. Figure 6.2 represents the system (dotted lines) and its environment from such project-oriented perspective. From a project perspective, the definition of transaction is narrowed down to the relationship between the client's project organization and the market, that is to say, the *contract*. This is the main focus in literature

(see Chapters 3-5). The study at hand, however, is focused on the entire system of network and market actors involved, as well as their mutual relationships. To solely focus on the project or the contract would be oversimplifying the interaction in the entire system. In the remainder of this study, the broad network perspective on the system of the construction sector is used.

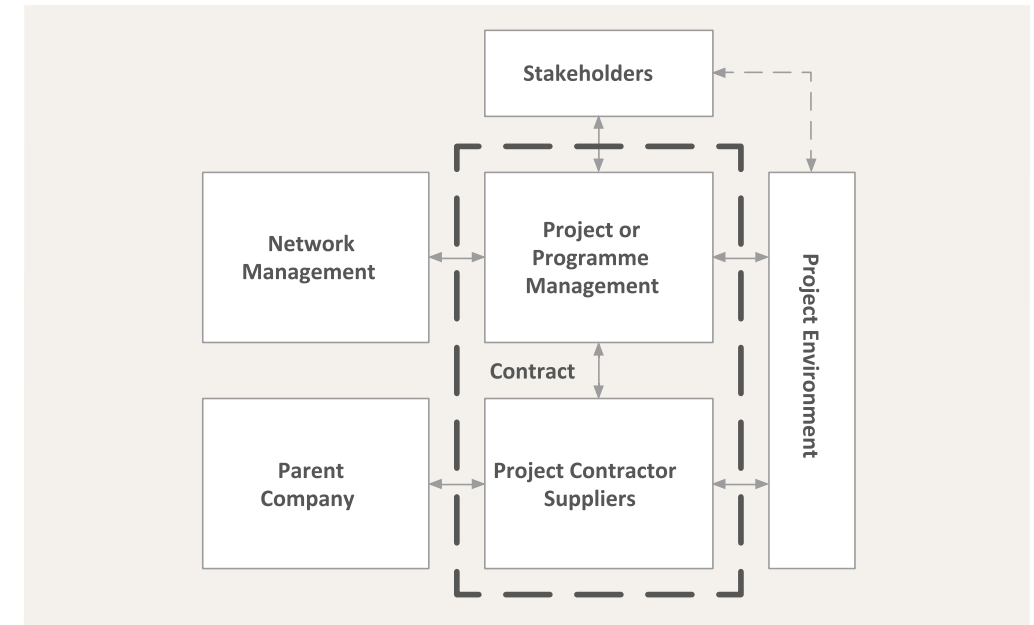


Figure 6.2: System definition from a project perspective

6.2 System evolution

As stated in Chapter 2, in this study we consider the (Dutch) construction sector a complex adaptive social system in this study, a network of actors connected by relationships. The environment of this system (its 'landscape') is continually changing. Therefore, the system will also have to continually co-evolve with its environment. Characteristically, the course of this process leads to an adjusted regime by means of generating variation, selecting best fits and implementing the chosen solution (retention). According to Geels (2005), the regime, the niche space for innovation, and the pressure from the environment ('landscape') are determining elements for system evolution. As discussed earlier, variation in the construction sector is mainly generated in and from projects. As such, projects form the breeding grounds ('niches') for innovation. The process of variation and selection within a project is regulated by way of the contract between contractor and client. However, projects are temporary arrangements. Sustainable and durable innovation can only take place on the higher tactical and strategic level (see Figure 6.1). These levels determine both the room for and curtailment of variation in the projects. First, by translating the network policy to the concrete agreements for the projects by way of the market policy of the network manager. Second, the parent organization of a contractor determines the amount of room given to any

contractor involved with the project. Thus, these two relationships largely determine the possible variation development and selection within a project (possibility space), and as such together constitute the arteries that allow for system evolution and innovation. In order to achieve sustainable innovation, the selected variations must be implemented in the network management and network governance by way of these relationships, as well as in the parent organizations of the contractors involved and the market sector.

6.3 System ordering by means of tight and less tight relationships

As discussed in Chapter 4, the pattern and the nature of mutual relationships determines the behavior of the entire system. Some relationships are tighter and more important to system evolution than others. Dubois and Gadde (2002) characterise the relationship from parent organization to project as tight, and that of project to parent organization as loose. They see the tight couplings within construction sector projects as a major reason for the relatively loose coupling of projects to parent organizations. The advantage of tight couplings within a project is that they are strongly focused on the specific project's interest. As a result of the loose coupling of projects to parent organizations, the learning capabilities from the projects towards the mother organizations are not facilitated, so that adaptation and innovation mainly seem to arise from (temporary and demand-based) recombination of resources on the project level.

These loose couplings can be tightened through alignment of interests by incentives in the relationships. In construction sector practice, the incentive mechanisms mainly occur through the project relationship (tendering and contract), where they serve a double purpose: on the one hand, they promote a solution approach from the market demand linked to the specific project, on the other hand, they promote behavior outside of the specific project context. The intended change in behavior is a change in the behavior of the parent companies of both client and contractor, and through these parent companies, in the behavior of the sector as a whole. As a result of the relatively loose coupling between project and parent company, a single incentive at the project level will not immediately stimulate such change. The change in behavior will only occur if this is stimulated in a coordinated way, aimed at the sector at the strategic level, on the separate companies at the tactical level, and by way of the requests for projects at the operational level.

6.4 Sustainable market dynamics

An important incentive for a market party is getting its created value appreciated (as elaborated in Chapter 5). The creativity provided by the market needs to take root in the network by way of the project results. This means that the solutions created by the market should have added value for the functioning of the network, i.e. added value for stakeholders, users, network environment and politics. Value capturing can be considered as the degree of reward a creator receives for his contribution. This reward is necessary for investment in the development of specific competencies that discern the creator from his competition (differentiation). Subsequently, these competencies form the basis for the ability to develop creative solutions. Distinctive capability – and as such, implicitly – value capturing forms the basis for the continuation of firms and prevents a company getting bogged down in a

downward pricing spiral. Sustainable market dynamics is thus based on a cycle of value creation, appreciation of the added value by the client, value capture by a market company, and investment in particular distinguishable competences (see also Figure 5.1). Figure 6.3 shows the cycle of value creation placed in the schematic representation of the system of the construction sector.

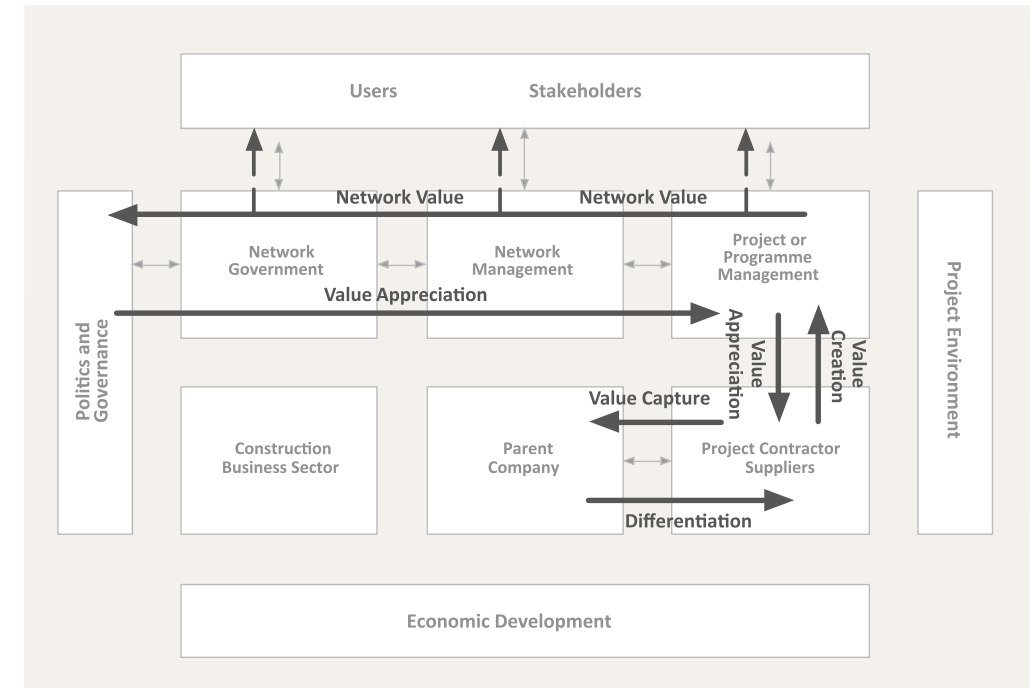


Figure 6.3: The paradigm of system evolution linked to the construction sector



A network management view on the construction sector

This Chapter discusses the outcomes of the network interviews with professionals working as network managers (see also Section 1.4). The purpose of these network interviews is to compare public, semi-public and industrial network management with regard to the way in which the construction market is engaged in the business. Through ‘narrative’ interviews (see Section 1.4), the way interviewees view ‘their world’, their position in this world, and the relevant relationships within that world have been explored. In order to enrich the description to what was posited by the interviewee, (anonymous)⁵⁵ quotations from the interviews have been added to the text. In total 23 network interviews were conducted. Appendix 1 provides an overview of the interviewees. Appendix 4 provides an overview of the interview questions.

7.1 Characterizing the networks

This Section focusses on the similarities and differences of character between public infrastructure networks and industrial and semi-public networks respectively.

Public infrastructure networks and industrial networks

An industrial network is in this study defined as a production network that is managed and developed by a private network manager. The interview results suggest a difference between industrial and public infrastructure networks. They showed that large interventions through projects hardly ever happen in the industrial networks that were considered. Industrial networks are focused on operation, and optimisation of maintenance, with programming of maintenance at their core. This programming is risk-based and focused on reliability and the functioning of the network. As an interviewee stated: “our maintenance is entirely risk-based” (SEMP). Where the industry works by central governance, the interviewees pointed out the plural governance that steers public network managers: the first responsibility of the government is to guarantee the public interest and to realize public objectives” (PUB).

In public networks, governance is often focused on a combination of maintenance, projects, and traffic management. Moreover, the strong social embeddedness demands public network management to be adaptable to the dynamics of the environment (political and social dynamics). The interviewees mentioned that industrial network managers have a singular priority focused on operation, linked to maintenance. Projects are ‘guests’ on the network, and are planned using time slots or periods of suspended service. Being operational is the prime concern, partly because of the way this is linked to the supply contracts that are agreed upon. By means of portfolio management⁵⁶, operation, maintenance, projects and programs are continually adapted to current events.

⁵⁵ Quotations were anonymized and categorized by public (PUB), industrial (IND) and semi-public (SEMP).

⁵⁶ The Project Management Institute defines portfolio management (Project Management Institute, 2008) as managing a changing set of activities, projects and programs in order to achieve an organization’s strategic goals.

Table 7.1 provides an overview of the characteristic differences between industrial networks and public infrastructure networks, as indicated by the interviews.

Table 7.1: Main differences between industrial networks and public infrastructure networks

| Industrial network | Public infrastructure network |
|--|---|
| <ul style="list-style-type: none"> • Large initial private investment in standalone projects, chiefly maintenance during life cycle; • Direct relationship between production and return on investment; • Focus on maximisation of production, in relation to the market demand. Completely optimized chain of production, based on maximally used capacity with minimal redundancy; • Projects are strictly planned and defined; • Limited spatial impact during life cycle; • Strict internal safety and environmental requirements; • Dependency on quality of suppliers and service providers leads to long-term market relationships. Market involvement not bound by European procurement rules; • Fixed stakeholders. Strong target congruence. | <ul style="list-style-type: none"> • Large public investments in projects, relatively limited investments in maintenance; • Indirect relationship between functioning of the network and social benefits. Production is defined as turnover of expenditure; • Strong project orientation and political focus on project delivery. Creating redundancy is costly; • Projects are planned long-term, large societal changes may take place within this time frame; • Projects have major spatial impact and must comply with strict legal requirements; • Strict safety and environmental requirements; • Public tendering based on strict European procurement rules; • Stakeholders are varied and variable. Interests must be continuously balanced. |

Public and semi-public infrastructure networks

A semi-public network is in this study defined as a network that possesses the characteristics of a public network, but is commercially managed. Depending on the organization, semi-public networks show the characteristics of an industrial network or those of a public infrastructure network. A typical example of a semi-public infrastructure network manager is ProRail, the Dutch main railway network manager.⁵⁷ Based on the interviews, the characterization of ProRail strongly resembles the characterization of the industry as described above. As an interviewee (PUB) stated: “The main difference between ProRail and Rijkswaterstaat (as typical public network manager) is the fact that ProRail has a contractual client, in the form of the transport operator. Every year, ProRail enters into access agreements with the individual transport operators. These contain agreements on the number of trains, schedule, and the performance supplied by the infrastructure” (SEMP).

⁵⁷ ProRail is an independent company with the Dutch State (in effect the Ministry of Infrastructure and Water Management) as sole shareholder.

Table 7.2 provides an overview of the characteristic differences between ProRail (semi-public infrastructure network manager) and Rijkswaterstaat (public infrastructure network manager), as indicated by the interviews.

Table 7.2: Differences in network policy and management of ProRail and Rijkswaterstaat

| | ProRail | Rijkswaterstaat |
|---------------------------|---|---|
| Business characterization | <ul style="list-style-type: none"> Public transport is a public function, as such, it is a public responsibility; Transport operators act as clear and dominant customers; Availability of the network (reliability) and safety are key in management; Network consists of multiple connected subsystems; Limited redundancy within the system; Relatively slow system development. | <ul style="list-style-type: none"> Main road network is a public function, as such, it is a public responsibility; Minister of Infrastructure and Water Management (politics) are considered the main customers; Project management is dominant; Network is strongly connected to adjacent (road)networks; Network capacity is not continuously fully used, adjacent alternative routes for diversion are available (redundancy); Relatively rapid system development (for example smart mobility). |
| Network policy | <ul style="list-style-type: none"> Central long-term network vision used as basis for programming; System integration on national management level; Clear prioritization between operation, maintenance, and projects; Increasing sturdiness and reliability through de-complexing of critical elements like junctions. | <ul style="list-style-type: none"> Currently developing a national and regional network vision; System integration mainly at regional level; No clear prioritization between new developments and management & maintenance. Focus on projects and better use of existing assets; Reliability focussing on managing the complexity of specific assets such as tunnels. |

| | | |
|--------------------|---|---|
| Network management | <ul style="list-style-type: none"> Portfolio management dominant management approach on strategic level; Central risk based programming; Substantive own knowledge of critical components and existing assets; Controlled suspension of service by way of programmed stops to accommodate interventions in the (functioning) network. | <ul style="list-style-type: none"> Multiple governance for network development, operation and maintenance; Framework-setting mainly focused on standardization and control; High level of outsourcing; Dominant project approach. |
| Market | <ul style="list-style-type: none"> Specific selection of market companies by way of certification on safety; Limited available market for maintenance; Construction market comparable to Rijkswaterstaat. | <ul style="list-style-type: none"> Wide public market for construction and maintenance; Limited specialist market with regard to information technology and traffic management systems. |
| Market involvement | <ul style="list-style-type: none"> Public tendering by way of MEAT; No freedom for the market regarding critical processes (safety), optimization of freedom regarding less critical processes. | <ul style="list-style-type: none"> Public tendering by way of MEAT; Nationwide market policy: "market, unless..." and early market involvement; |
| Transaction | <ul style="list-style-type: none"> 'Design & construct, unless...' This 'unless' applies to critical elements of the system; Performance based contracts for maintenance; No DBFM type of contracts because of interaction of several systems; Over 25 million Euros: 'alliance, unless...', provided it is functional; Partnering with engineering firms. | <ul style="list-style-type: none"> Standard design & construct contracts for construction projects, performance-led contracts for maintenance, and DBFM contracts for large integral PPP-projects; 'DBFM, unless...' for projects of 60 million Euros and up. |

As a result, operation is given priority over maintenance and projects. These are programmed for the long term and fitted into operation by way of ‘stops’ (suspension of operation). “Right now, the network’s operation is our primary concern. Regular maintenance and maintaining operation take precedence over large projects – so, we keep the shop open during remodelling. If projects don’t fit, they are pushed back” (PUB). Adaptation to the changeability of current matters is done by way of portfolio management by the managers of operation, maintenance and projects, in that order of priority.

Interviewees pointed out the very limited redundancy of the network, which demands tight programming. As a result, ProRail has extended internal knowledge with regard to critical elements of the system, allowing the market little freedom. Accordingly, an interviewee (PUB) said: “The policy is design & construct, unless...In principle, ProRail enters the market based on functional specifications. As it turns out, that is quite complicated in practice. There is always rail work involved, which is related to protection and safety of trains. That is the core of the railway system. And we’ve taken all this upon ourselves”. A unique characteristic of the semi-publicly managed railway system that emerges, is the interconnectedness of multiple basic systems (safety, power supply, rail, among others) that together make up the infrastructure network. This interconnectedness makes the network very complex and sensitive to changes in the framework conditions. As an interviewee (PUB) stated: “Our main problem is that a number of consecutive, accumulating disturbances can make the logistic system impossible to predict. These are a result of the current timetable, personnel and rolling stock planning of our largest transport operators, together with the sensitivity of the infrastructure to disturbances. It’s a complex system, and the disturbances impact each other”. Interconnectedness leads to complexity of the system and consequently makes the system sensible for disturbances.

The interviewees considered Rijkswaterstaat to be a (true) public infrastructure network manager. Its clients are both the network users, and politics through the Minister of Infrastructure and Water Management. “Largely, we do not score on the performance of the network, but on the prerequisites for network performance. Projects, maintenance, that sort of thing. They contribute to the performance of the network, but they are not the performance itself” (PUB). Internally, there is a contractual relationship with regard to availability (Service Level Agreement, SLA) between the Ministry of Infrastructure and Water Management and Rijkswaterstaat, the executive agency of that Ministry. “When you look at network management and maintenance at Rijkswaterstaat, everything is linked to the SLA, the performances you agree upon related to policy, and which you then execute as an agency” (PUB). However, this relationship is less strict than the network contracts between ProRail and commercial railtransport operators.

A characterization that follows from the interviews is the fact that projects and availability of the network have separate lines of governance that are prioritised per situation. “The daily use of the network determines Rijkswaterstaat’s success. So management is linked to that. And the impulses for the development come from that. Partly as a result of our political setting, the order has been turned around...In the end, performance depends on daily availability, the actual use of the network” (PUB). The interviewees said that the presence of comparatively much redundancy in the network allows for the possibility to give

a relatively large amount of freedom and responsibility to the market. Giving much freedom to the market by public clients is a result of a new market policy (‘market, unless...’, see Section 1.1) that has been introduced since the construction fraud of 2002 in order to allow the market more creative freedom to stimulate its development. However, the introduction of ‘market, unless...’ went hand in hand with the disposal of the corresponding critical network knowledge, although interviewees said this course is now being abandoned somewhat. Knowledge with regard to critical elements of the network is once more considered to be essential. “More and more, Rijkswaterstaat is developing into a professional network manager, based on a clear long-term vision with regard to the network” (PUB). The interview results indicate a tendency in society to hold the public infrastructure network manager increasingly accountable for maximally using the invested capital and optimizing the network functions. As a result, the public network requires a more industrial management approach based on an integral network vision (comparable to ProRail). “A significant change that we have made is to start thinking from the point of view of the users of the network, focusing on the quality of the network as it is used” stated an interviewee (PUB). What is interesting here, is the fact that it is the market policy that now appears to become the driving force, in part, for the development of an integral network vision. “The changes in the way in which we want to interact with the market force us, as network managers, to develop more strongly” (PUB). Whereas in industry, the network vision determines the contracting, this seems to be the other way around for Rijkswaterstaat.

7.2 Preserving and increasing network value

How do network managers preserve and increase the (functional) value of their networks? The interview results indicate that industrial network managers focus on maximizing their production. As an interviewee (IND) indicated: “you want your production to be in line with market developments. Production should always be above market demand”. The whole logistics chain is optimized to suit the working capital, focusing on lean production and reduction of (own) stocks. The interviews suggest that optimizing the production leads to a greater need for the network chain to function reliably: “to offer the maximum of network availability with the minimum of disturbance. The essence is 24/7 reliability, with a particular focus on operations, operations, operations” (SEMP). Reliability means a strong focus on maintaining the assets, over future related innovation and network development. Maintenance is programmed in advance and, where possible, carried out in combination with necessary (from the point of view of production) stops. Industrial and semi-public interviewees stated that maintenance should be programmed based on risk, using internal knowledge of the network’s critical components: “if infrastructure is of strategic importance to your operation, you ought to know every last details of its status” (SEMP). The interviewees argued that optimization of production does not necessarily mean a reduction of redundancy. In this study, we define redundancy as the ability to absorb the disruption of functionality without reduction of said functionality (see also Section 2.1). The industry optimizes its own production process, but as a result, transfers part of the (necessary) redundancy to its service providers and suppliers on the assumption that specialists will be able to organise this better: “the more comprehensive the package, the more difficult stock management becomes. There comes a time when it is better to start producing on demand. It’s a nice idea to have stocks, but often, they are not what you need” (IND).

The interview results indicate that, as the available room for absorbing deviations in the production process is becoming smaller (or the processes becoming leaner) the importance of the reliability of the quality provided by service providers and suppliers has to be increased. This quality must be guaranteed by the service providers and suppliers. Deliveries must be made (just) in time and must reliably meet the specifications. In concrete terms, this means that the risk of stockholding is transferred to the supplier, and that the supplier is forced to supply products of better average quality. However, reliable quality requires investments and will have to be rewarded by the client. If the supplier cannot be compensated, he will not be able to make the necessary investments, which will lead to a decrease in quality for the client (see also Section 5.1). This means that quality has its price, and the price is justified by increased efficiency on the part of the client (trade-off). Contrary to (mostly stand alone) industrial networks, the infrastructure network of Rijkswaterstaat has redundancy through its connectedness with the underlying or parallel infrastructure networks ('taking the long route round'), through the fact that the network is not continuously operating at full capacity so that it is possible to spread capacity over time, and by being indirectly linked to the user (traffic jams are accepted). As an interviewee (PUB) indicated: "Rijkswaterstaat has redundancy on multiple levels. Day and night. During the day it may be possible at certain times to divert traffic. Using parallel roads. If neither works, then there is redundancy by means of an entirely different road, which means a diversion over a longer distance". But, the more complex the network, that is to say, the connection between the network components, the less predictable and controllable the effect of any disturbances will be. Public network managers in particular mention reduction of network complexity as a way of increasing the network's reliability: "reducing complexity makes the network simpler, and therefore more robust and reliable" (PUB). Industrial network managers mention risk reduction in particular as a way of increasing the reliability of the network. They know their own system and its components and they program and prioritize interventions based on the risk for the entire system's functionality.

7.3 Governing the network

This Section focusses on the various ways public infrastructure networks as well as industrial and semi-public networks govern their networks.

Network vision and market policy

The interviewees explicitly mention the connection between network management and the market policy. For instance, "The development of the concept of network management partially determines the market and the composition of that market" (PUB). The work of industrial network managers is based on a network vision and they align their market policy to that vision. Market involvement should benefit the functioning of the network. Rijkswaterstaat's recent businessplan (Rijkswaterstaat, 2016b) allows for a transition to public infrastructure network manager, based on an integral network vision including a policy about market involvement (see also Section 1.1). However, this was nuanced by interviewees, "The Rijkswaterstaat network vision does not exist...They have started categorising the network and subsequent linking of performance levels...You shouldn't start based on a portfolio of construction projects, but by saying: this is my network, my system, this is its performance, and how do I fit in the projects and the market" (PUB).

In industrial networks project are considered "guests" in the network (see Section 7.1). However, in public networks projects seem to be imposed on the network management and the network management has to adjust to these projects. It is also important, regarding the development of a sustainable construction sector (see also Section 5,1) to hold on to the same strategy for longer periods of time, so that the market can align their strategy. As stated by an interviewee (SEMP): "once you commit yourself to a policy, you have to commit for a longer period of time. Otherwise, the market will not adjust to it!".

System integration

As the interviewees indicated, managing a network is a continuous balancing game between operation, the necessity of carrying out maintenance, and projects that benefit the network's development. With regard to industrial networks, the interviewees mentioned a strong focus on operation and maintenance. By way of risk-driven programming, necessary maintenance is integrated into the existing functionality. Network development projects are relatively standalone. Interviewees said that(semi-) public infrastructure network managers like ProRail and Rijkswaterstaat are continuously looking for the balance between operation, maintenance and projects. ProRail prioritizes upfront, being operational as the prime concern, partly due to availability contracts with rail operators. Maintenance is secondary, projects are tertiary. The balance is monitored and actualized by way of central portfolio management.

A public manager such as Rijkswaterstaat uses a dual line of governance for management and maintenance, as well as for projects initiated by the Ministry of Infrastructure and Water Management. An interviewee (PUB) clarified: "At this stage, Rijkswaterstaat is still a project- and impulse-driven organization. Projects come and go, and the manager breathlessly chases after them ". But when there is no clear prioritization in the governance, the question is how system integration is guaranteed. This tension was clearly indicated by the interviewees: "Rijkswaterstaat gives the task of programming to regional network programmers. The members of the regional board are then responsible for the regional programming...But that means there are seven different integrators...And who is going to integrate all that on the main network level?" (PUB). Public infrastructure networks seem to be never stand-alone; they are part of a complex of adjacent networks (see Section 3.1 and Chapter 6). The interviewees indicate that public pressure to function in an integrated way is increasing, requiring a different level of system integration: "We, as a governmental authority, are held integrally responsible for our performance as a whole...We see a continuing trend toward network managers working together, joining efforts to come to a combined performance" (PUB).

Programming as core business of network management

Guaranteeing reliability by way of controlled interventions in the network (for management and maintenance, and renewal) through programming is considered a core activity by industrial network managers. "Programming is really something that we do ourselves. After all, it is at the core of our business" (IND). Industrial network managers in particular feel that the responsibility for programming cannot be outsourced, even if the actual task can be (in part) outsourced. As stated by an interviewee (SEMP): "A model in which the market is responsible for the strategic assets would be extremely risky".

The network managers indicated that having a long-term vision is necessary for programming. Coordinating operational management and the programming of management and maintenance leads to programmed stops (slots), suspension of operation of parts of the network. “With everything that comes with it, a two-week stop means a month’s production loss” (IND). The interviewees emphasized the importance to infer market engagement in the programming of maintenance and projects, and as such, in the network vision. This means that the market policy is linked to the network policy by way of programming: “industrial network managers tend to link the contract to the programming cycle” (PUB). In the industry, programming of regular and major maintenance is risk-driven, supported by system classification: “Classification is the basis for the management system....Which leads to programming of maintenance in a way that takes the importance of parts and the maintenance concept into consideration. The programme is alive...we carry out regular assessments and adjust where necessary” (IND).

Industrial network managers posited that, for programming, it is necessary to have knowledge of the network, the critical parts, the way in which they are connected, and the current state of the network. Therefore, an interviewee (IND) argued: “Management of knowledge and integration (planning) should always be in-house...after all, the interest of the total cost of ownership is at the level of the client!”

7.4 Involving the market

This Section focusses on the various ways public infrastructure network administrators and industrial and semi-public networks administrators involve the market in their business of network management.

For industrial network managers, market involvement is mainly concerned with bringing in suppliers and service providers. As an interviewee (IND) indicated: “A distinction must be made between two markets. The market of asset suppliers. And the market of service providers...80% of our time as purchasers goes into contracts with the service providers. Purchase of parts only accounts from 20% of our time”. The market of suppliers (parts and raw materials) is a relatively small market of specialists with a low degree of innovation: “the market is quite mature. There are few true innovations” (IND). The requests to suppliers are strongly standardised and are traditionally arranged in framework agreements. Service providers are mainly contracted based on long-term relationships through partnering contracts.

The interview outcomes also indicated the importance of a creative market for the industrial network management: “we were stubborn enough to think we knew better than the market... And that also happened the other way around. You need to recognize when you have internal knowledge, and when you need to bring in knowledge from outside”. Slightly different from industrial network managers, public and semi-public administrators mainly involve the market as main contractors for construction, maintenance or refurbishment and for engineering services and consultancy services.

Partnering and competition

A number of specific considerations regarding partnering and collaboration were mentioned in the interviews. Building a good relationship as partners takes time. “relationships are based on partnerships for the long term. We don’t take those out onto the market every year” (IND). The goal is to make maximal use of knowledge and creativity in the market, in a close interaction with internal knowledge: “partnering provides the opportunity to add our internal knowledge to the process” (PUB). Long-term relationships are founded in trust. As a result, the investment in checks and inspection can be lower. The risk is that you lose focus (on the price) when there is no market mechanism. Often, the relationship contains the contractual right to carry out benchmarking in order to be able to verify the market conformity: “sometimes, long-term relationships can put you to sleep. It is necessary to benchmark every now and then. But it’s hard to get rid of a knowledge-intensive business” (IND).

Partnering of a market party with a client does not automatically mean that these market parties partner in the chain of subcontractors and suppliers. As phrased by an industrial network manager: “Problems tend to arise with subcontracting and sub-suppliers. Companies are in dialogue with us, but outsource specific things”. It was frequently mentioned in the interviews that collaboration should be based on clear process agreements: “partnering assumes an open environment, but that is based on a solid business approach” (PUB). These process agreements should specify the defrayment of costs and a realistic division of responsibilities and risk allocation (see also Kadefors, 2005). Partnering is always about shared responsibility: “what is important about partnering is that, if you do your work well, your costs will be reimbursed and you are guaranteed a standard margin” (IND). The interviewees repeatedly mentioned the tension between collaboration and accountability especially concerning public clients. Accountability should be clearly laid down in the process agreements: “optimal cooperation is not the same as optimal accountability” (IND).

Different parties have different interests. The interviewees argued that it is essential to show respect for each other’s interests: “the essence of partnering is not whether or not something was down on the page of the contract, but whether or not it could have reasonably been foreseen. You want to look for common ground. What do I need from you, and what do you need from me” (IND). There should also be overlap in the interests: “people should benefit from working with you. There should always be a win-win” (PUB). An important win-win is to be able to use each other’s skills and knowledge. As an industrial network manager stated: “partnering is only possible if you bring knowledge to the table as well. You can’t do that when you withdraw into supervising only”.

The interview results indicate that collaboration happens between people who feel the right stimulus to work together to reach a common goal. “Collaboration is about human actions. So you have to insist on continuity in people” as was mentioned by a public network manager. As a result, the incentive for a good performance is mainly in the continuation of the collaboration and, as such, in a guaranteed turnover in time. An industrial network manager stated: “In the past, we used to have bonus-malus systems. But the remedy seemed worse than the disease...Incentives always work in one direction only... When it comes to business economics, a business can always consider penalties...But it is of much greater importance to maintain continuity with my client!” .

Where industrial network managers emphasize the importance of partnering, the preference of public network managers for competition is noteworthy. The following arguments were mentioned in the interviews:

- Competition leads to the best value for money (price/quality ratio);
- Competition always allows for justification of the price relative to the offered scope (accountability);
- European and national tendering regulations uphold the principle of equality, which is guaranteed through competition;
- Competition prompts creativity, which is beneficial for the development of the market and fits the client's interests as well.

Two-stage tendering

In the industry, contracts are often tendered by way of two-stage tendering (also known as two-phase tendering) (see Mosey, 2009). This type of tendering starts with a functional basic design or basic program. The service provider can then add his own creativity. The plan is further developed in an intensive dialogue until the partners reach a consensus. An industrial network manager explained this way of tendering: “we start with a functional setup, an indication. Then, the contractor is free to come up with the best plan...that action plan is not yet a yes or no. You carefully go through the plan. Add your own management aspects, and so you move on the next step...This step-by-step development based on a functional setup and an action plan by the contractor, moving ahead by way of dialogue, works much better for us”.

Once the parties reach consensus, the plan is fixed and priced in accordance with a method of calculation that has been previously agreed upon: “the action plan is the starting point for the dialogue. It is used to agree on a scope, which is then translated into a price” (IND). The realization of the plan does not start until after the scope and price have been definitively established: “you only receive the commission once you have convinced us that your design is solid” (IND). The specification of the intervention is generally detailed, so that it is exactly clear what the intervention entails, how and when it should be carried out, and what its consequences will be. However, the world tends to change, so, “a good procedure for deviations is essential” (IND).

Two-stage tendering separates the creative (uncertain) part of the transaction from the more or less fixed intervention in the network. Some interviewed industrial network managers said that this is a conscious choice, in order to increase the reliability of the interventions. This high degree of reliability is a necessary consequence resulting from the optimization of the production process. For the creative phase, the industry often elects a one-to-one-partnering relationship with a market party. The reason being that, in that case, it is possible to contribute own internal knowledge as well. Knowledge of the network is considered to be essential, and as such, so are longer relationships with market parties in order to secure this knowledge.

Public infrastructure network managers often tender by way of standard performance contracts for management and maintenance, by way of design & build contracts for large construction projects, and by way of DBFM contracts for specific large projects. Tendering

takes place in accordance with European and national regulations (see also Appendix 6 that provides an overview of the (strict) procurement regulations for public clients). Dutch public network managers often choose a competitive dialogue in a way that is comparable to two-stage tendering as used in the industry.⁵⁸ This is a way of tendering that allows for critical components (for which no singular specifications can be made up front) to be further developed and specified through dialogue. As a disadvantage of competitive dialogue, the interview outcomes reveal that it is not easily possible to develop long-term partnering relationships. Also, adding internal knowledge in interaction during the development of the design is difficult using this model. Finally the transaction costs of this type of procurement are considered high.

7.5 Relationships and transaction structures

This Section focusses on the various ways public infrastructure network administrators and industrial and semi-public networks administrators structure their mutual relationships.

As previously described, (a type of) two-stage tendering is often used in industrial network management as a way to involve the market. The interviewed industrial network managers said that it is a conscious choice to separate the creative part from the actual interventions. The two stages are linked by way of a previously agreed upon price calculation method. However, as a result, there is no competition when it comes to price setting, especially when the dialogue is with one party only. Market conformity is obtained through benchmarking and/or measuring project performance, linking this back to the long-term partner agreement. As an industrial network manager stated: “you want projects to perform well. But you also want them to be in conformity with the market. The quality of the performance is measured continuously. That way, you can establish a yearly score. Depending on that score, the conditions of the framework agreement may be adjusted”.

Benchmarking is used to keep market tension in the process. The industrial network managers indicated several methods for benchmarking:

- Going through stage 1 with multiple competing parties. This is comparable to the competitive dialogue used by many public clients. The disadvantage is that one-to-one interaction and co-creation become difficult when trying to treat all parties equally. Furthermore, this way of involvement makes it almost impossible to build a stable, durable relationship;
- An open or restricted tender in stage 2 after stage 1 has been completed with a ‘preferred’ party. The party used in stage 1 has the advantage of dedicated knowledge, which this party should be able to convert into value by way of its offer;
- Occasionally there is a change of partners through open or restricted tenders. As an industrial network manager stated: “All framework contracts state that they are preferred supplier, but that we are free to occasionally approach the market”.

⁵⁸ The competitive dialogue seems to be much more often used by Dutch public infrastructure administrators as in other countries. See Lenferink et al. (2011; 2013).

Table 7.3 gives an overview of the essences of the transaction for service provision and supplying in industrial network management, as indicated by the interviews.

Table 7.3: The transaction for service provision and supplying in industrial network management

| Transaction | Essences of the transaction in industrial network management |
|---|--|
| Service provision (service directed to the functioning of assets) | Partnering based on long-term framework agreements; Engineer & construct for realization, sometimes separately, sometimes linked to partnering in two-stage tendering; Previously agreed upon method for price calculation; Market conformity checks (benchmarking); Performance procedure linked to the partnering agreement; |
| Supplying (delivering assets) | Standard contracts, specified in detail; Framework agreements with price agreements; |

Whereas the industrial management consciously chooses more partnering in service provision and engineer & construct contracts for the actual interventions, public network managers choose to offer room for creativity through design & construct and performance-led contracts. The interviewees indicated that design & construct in its true sense never occurs in practice, but rather, hybrid design & construct contracts are used. By carrying out a competitive dialogue before allocation of the project, the party in question already has to develop and specify parts of the design. Often, there are approval or acceptance procedures for the design in place after allocation. And as mentioned before, the tenders are often relatively extensively specified by the client.

By providing functional design space, businesses can develop and market companies can use their specific strengths. However, once responsibility is moved to the market along with this functional space, this implies a shift from product delivery to performance delivery, including the freedom to choose (part of) the solution. This freedom of choice is necessary in order to take on the shifted responsibility. And it precisely this freedom of choice that distinguishes the public market approach from the industrial market approach. In the industry, the network manager feels integral responsibility for the production, and freedom of choice for the market is not permitted, or permitted in limited ways (not regarding critical components). In relation to this a public network manager argued: “when network management is important, you need to have the courage to take responsibility, rather than denying responsibility by so-called ‘allowing freedom for the market’”. However, a semi-public network manager nuanced: “infrastructure which is strongly tied up with operational processes, where any disturbance is critical, cannot be tendered to the market based on integrated contracts. You have to do it in a traditional way. All projects that can be literally fenced off, can be done by way of design & construct”. According to the interviewed industrial network managers, just this led to the separation of the creative part of the execution in two-stage tendering.

Table 7.4 provides an overview of the characteristic differences between engineer & construct, design & construct, and two-stage tendering as based on the interviews.

Table 7.4: Differences between engineer & construct, design & construct, and two-stage tendering

| Engineer & construct | Two-stage tendering: one-to-one | Two-stage tendering: competitive dialogue | Design & construct |
|--|---|---|--|
| Detailed specification | Functional start state one and detailed restart in state two, fixed intervention in the network | Functional start state one and detailed restart in state two, fixed intervention in the network | Functional specification |
| Market is not allowed space for creativity | Creative space through interaction in dialogue | Creative space through interaction in dialogue, restricted by equality principle | Market is allowed space for creativity |
| Price-based competition | No competition, tested for market conformity by way of benchmarking. Price is formed based on previously agreed upon method of calculation. | Competition based on price/quality (MEAT) | Competition based on price/quality (MEAT) |
| Internal (client's own) knowledge required for specification | Possibility to combine client's network knowledge with the knowledge of the market | Client's network knowledge only as unilateral information, as a result of equality principle | Only 'functional' knowledge (client) required for functional specification |
| No possibility for partnering | Foundation for building long-term partner relationship | No possibility for (custom) partnering | No possibility for partnering |
| Maximum control over possible solutions | Maximum control over possible solutions | High level of control over possible solutions | Possible solutions can be chosen within functional space by the market |
| High internal (client) preparation costs, low transaction costs for the market | High transaction costs for the market, fully compensated | High transaction costs for the market, partly compensated | High transaction costs for the market, partly compensated |

7.6 Resume and findings

In this Section the results as discussed in the previous Sections are integrated, starting with the dominant actors and relationships that emerged from the interviews by using the schematic representation of the construction sector as described in Section 6.1 (Figure 6.1). Next, the results are integrated using the perspectives of system evolution, system ordering by means of tight and less tight relationships and sustainable market dynamics as described in Sections 6.2, 6.3 and 6.4. The Section ends with main findings which summarize the network management view on the construction sector.

Dominant actors and relationships

The interviewees from the industry put a strong focus on hierarchical network governance by way of 'infraproviding' (i.e. availability of assets) and production and this focus determines the way the market is involved. The foundation is system reliability, which puts a strong focus on programming of interventions. Interaction with the environment, or politics and government seems to be limited. The relationship with the market is mostly shaped through long-term partnerships on company level and controlled interventions on project level. When the image presented by the network interviews is fitted into the schematic representation of the construction sector as given in Figure 6.1, this leads to Figure 7.1. Any relationships that were not or hardly mentioned in the interviews have been omitted from this figure. The thickness of the arrows and darkness of the shades are based on the degree to which an actor, group of actors or a relationship was mentioned and emphasized in the interviews.

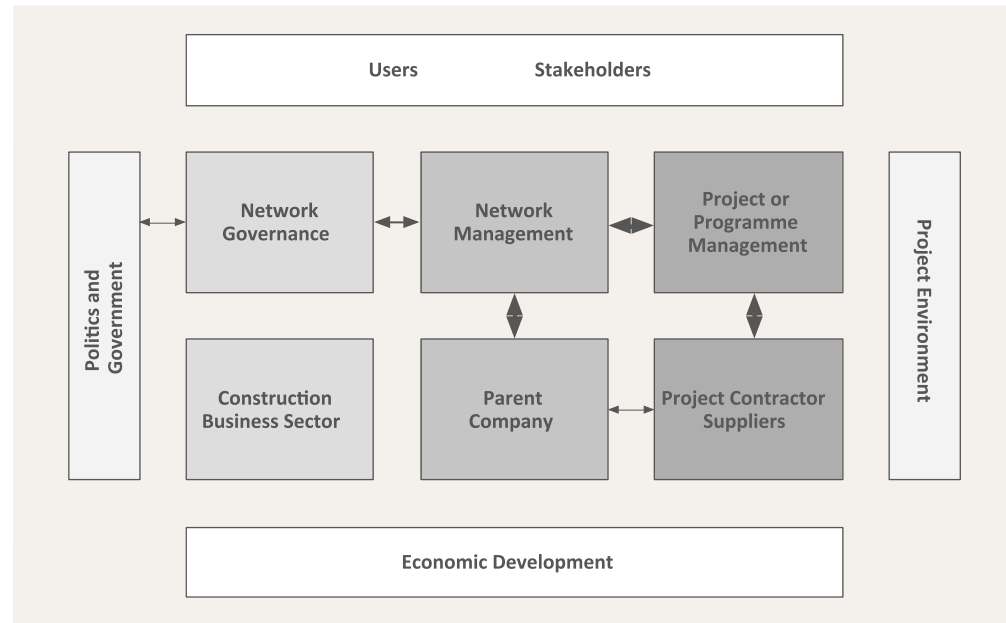


Figure 7.1: Relative focus on actors and relationships in industrial networks

The interviewees from public network managers (i.e. Rijkswaterstaat) put a strong focus on projects. Governance and politics have a stronger influence on the network management as compared to industrial networks. The relationships with the market on the company level are not strongly emphasized. If the market is mentioned at all, it is mostly in relation to the project level. When this image is fitted into the schematic representation of the construction sector (Figure 6.1) this leads to Figure 7.2. Again, the thickness of the arrow indicates how much emphasis the interviewees put on each relationship. If the arrow has been omitted, that means the relationship was not or hardly mentioned by the Rijkswaterstaat interviewees. A darker grey tone indicates that the actor or group of actors is more strongly emphasized in the interviews. The image that is outlined by the ProRail interviews matches the image outlined by the industry.

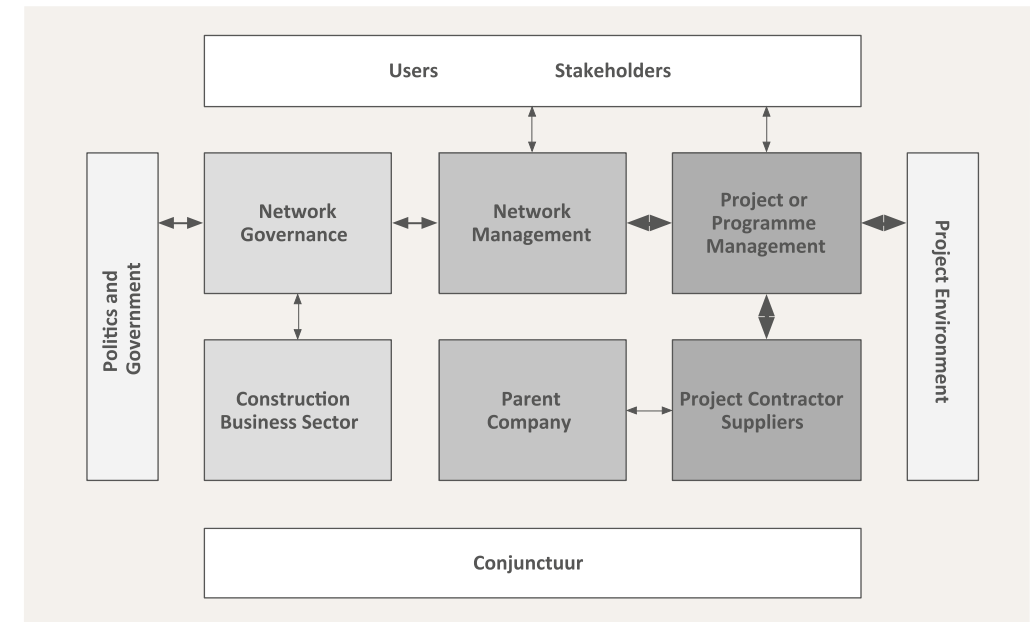


Figure 7.2: Relative focus on actors and relationships in public networks (Rijkswaterstaat)

A striking difference between Figures 7.1 and 7.2 is the manner of system integration and governance. Note the strongly centralised governance in the industrial networks (with a focus on network management) and the linearly hierarchical governance of Rijkswaterstaat, combined with a very strong focus on projects and project environment.

System evolution

Public network managers in particular indicated that variation is mainly generated on the project level. They see projects as unique breeding grounds for innovation. However, as a result of the relative autonomy of projects in relation to the parent organization (both regarding the client and the contractor side), it is hard for (innovative) ideas resulting from the projects to take root in the existing organizations (retention – see also Section 2.1 and Section 4.2). As a result, the learning capacity of the sector is low, as is its adaptive

capacity. Adaptation mainly results from the recombination of the already available means (exploitation – see also Section 2.1). Industrial network managers put less focus on projects. Emphasis is placed on central governance and programming, from which the market involvement is defined. More often, they work with long-term preferred partners (service providers), with continual improvement of quality and increased reliability as their goals. The partnering takes place between the network management and the market companies, relatively unconnected to realization (for example by two-stage tenders). Because of the fact that the market is very close to the business of the client, added value is generated on the system level, independent of the specific interventions. Investments in specific competencies pay off as a result of the long-term relationship and shared risks.

System ordering by means of tight and less tight relationships

Whereas industrial network managers showed a strong focus on long-term partner relationships with the market organizations, public network managers seemed to have a stronger focus on the project relationship. As indicated in the previous Section, the latter leads to exploitation of existing resources over exploration and innovation. This effect is enhanced by the strong ‘cliquish’ regime, the limited number of clients and the relative uniformity of market companies. The market is focused on the project request and the incentives included therein. This leads to one-time solutions, which are not primarily based on the company’s core capacities, but on optimization of the offer made to answer the request. Customer value is limited to project value or contract value. As a result, value capturing is project-bound and is used to create a positive business result, rather than being used for investments in the parent company. Competition amplifies this effect. As a result of the relative loose coupling between the part of the market company participating in a project and the parent company, and between project management and network management in the clients’ organization, innovation (variation) is mostly maintained in the projects. The learning cycle toward the parent companies is limited, and as a result, so is the learning capacity of the parent companies. The relationships described are represented in Figure 7.3 (right side).

Industrial network managers seemed predominantly to opt for long-term, tight relationships with market companies through partnering. Because of the fact that partnering puts the market very close to the business of the client, added value can be generated for the entire chain, irrespective of specific requests. Risk sharing makes (investment in) exploration possible and useful. Because the market works for multiple differentiated clients, it is useful for market parties to transfer the development results and gained knowledge to the parent companies. Whereas the ‘variation-selection-retention cycle’ in public network management predominantly takes place in projects, the variation in the industry is predominantly bound to the service quality for the network through service partnering between network management and market companies (see Figure 7.1). This makes the relationship between the project and the parent company less critical with regard to implementation of innovation. The relationships described are represented in Figure 7.3.

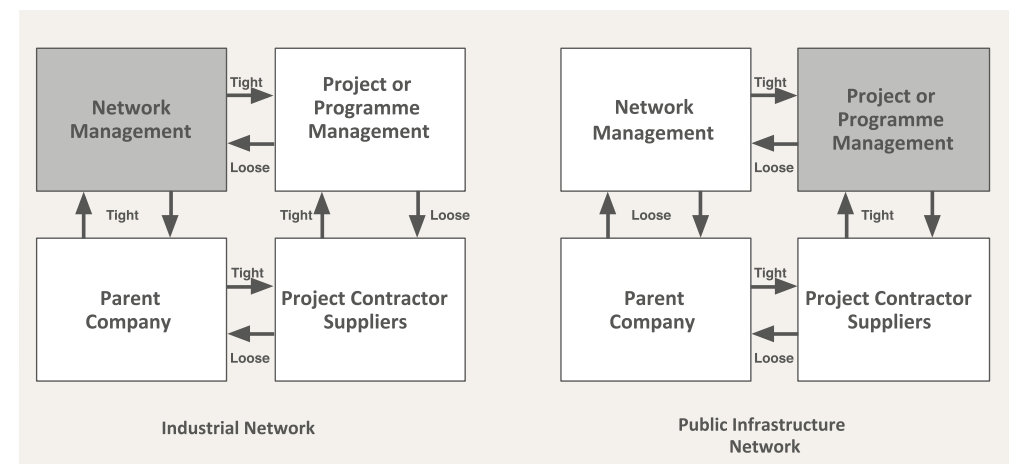


Figure 7.3: Pattern of tight and less tight relationships in industrial and public networks (represented only for a part of the system as represented in Figure 6.1)

Table 7.5: Motivators used in the transaction with the market by industrial network managers

| Incentive (theory) | Description | Use of incentive ⁵⁹ |
|--|--|--------------------------------|
| Clear risk allocation that is manageable for the market party; | Development takes place outside of specific interventions, often through partnering or two-stage tendering. Compensation is based on ‘cost plus’-settlement with previously agreed upon tariffs, and possible bonuses for positive performance. Realization is often based on extensive specifications, so the contractor only carries the execution risk. | High |
| Involvement with the subject | Intensive during preliminary phase. | High |
| Selection based on added value | Selection often based on past performance. | Low |
| Future work with the prospect of continuity | Long-term partnerships. | High |
| Teaming with the client | Development is often done one-to-one, either by way of a dialogue as part of two-stage tendering, or by way of partnering. This has the advantage that both parties can contribute their knowledge. Market conformity is guaranteed through benchmarking. | High |

⁵⁹ The descriptions are taken from the interviews. The valuation provided (based on the intensity of use) is a personal interpretation made by the researcher based on the interviews.

The tightness of the relationship is partially determined by the alignment of interests in that relationship. Interests can be directed through incentives. Incentives are motivators for delivering certain results, or to trigger certain behaviors. As described in Section 4.5 theory indicates the following main (non-financial) motivators for market parties in the construction industry: a clear risk allocation that is manageable by the market party, being involved in the design, a selection based on added value, future work with the prospect of continuation and teaming with the client, so as to come to the best results based on collaboration. The interviews indicate that industrial network managers use all incentives mentioned in their transaction with the market to a greater or lesser degree (Table 7.5).

For comparison, Table 7.6 shows the motivators in the transaction with the market as used by public network managers and semi-public network managers for example Rijkswaterstaat and ProRail (as taken from the interviews).

Table 7.6: Motivators used in the transaction with the market by Rijkswaterstaat.

| Incentive (theory) | Description | Use of incentive |
|---|--|------------------|
| Clear risk allocation that is manageable for the market party | Traditionally, risks are allocated in advance in the request by the client. Market parties can enter a dialogue with regard to risk allocation through competitive dialogue, but only within the framework that has been defined by the client in advance. | Average |
| Involvement with the subject | The market is involved through early market involvement and competitive dialogue. | Average to high |
| Selection based on added value | MEAT is used to value specific added value, often based on local criteria that may not be consistent throughout Rijkswaterstaat. This results in project-oriented custom work. | Average |
| Future work with the prospect of continuity | Projects are tendered separately. Selection criteria are general, not based on actual past performance. Options for taking past performance into account in the selection of future projects are currently being developed. | Low |
| Teaming with the client | A strong focus on (standardized) contracts and accountability. Contracts are based on the client-contractor-relationship in a project. | Low |

Notable about Table 7.6 is the fact that the incentives used by Rijkswaterstaat are strongly focused on their own (short-term) interests. Incentives are mainly focused on generating 'value for money', not on encouraging future behavior and, with that, a change of regime in the construction sector. The long-term motivator (continuity) that is widely used in the industry, scores particularly poor with public infrastructure network managers.

In theory (see Section 4.5) partnering may vary from simple information exchange, via coordination of activities and cooperation by exchanging resources, to integrated collaboration when information, activities, resources and responsibilities are jointly planned, implemented and evaluated to achieve a common goal. With increased partnering, the degree of alignment between the partners increases accordingly. The partnering model used by industrial network managers is that of collaboration (see Section 4.4 and 4.5). This implies that, in addition to the exchange of information and coordination of activities, they also look for the optimal way to make use of both parties' resources in order to achieve their set objectives. This often takes the shape of a (long-term) contractual alliance (see Section 4.6), which guarantees the basic costs for the market party, and includes an incentive for providing added value. The added value for the network manager is made explicit by the joint development of solutions. Realization responsibility is outsourced through rather traditional engineer & construct-contracts. Functional responsibility is not outsourced, or only in a limited way, because the interventions (especially regarding critical components) have been previously specified in the partnership.

The interviews indicate that, for public clients, competition is the paradigm in force with regard to market engagement (see also Section 3.3). The reasons that are most frequently mentioned include obtaining the best value for money, accountability by way of competition, and fear of the appearance of collaboration, partly as a result of the construction fraud. The interviewees repeatedly stated that competition impedes the development of long-term relationships, and as such, impedes partnering. Partnering is limited to exchanging information and coordinating activities, mostly focused on the projects. Providing added value for the network only pays off when this is valued in the project based on the request. The client defines any added value that may be provided by way of a valuation mechanism (through MEAT, see Appendix 6). It does not pay off to provide any added value outside of that scope. As a result, there is no real need for the market to empathize with the client (customer intimacy, see Section 5.2), other than to thoroughly understand the request and the valuation methodology. The interviews show that in practice, price is still the dominant mechanism for tendering, despite MEAT. There is an on-going discussion in literature with regard to the question of whether or not competition increases creativity (see also discussion in Section 5.3). Yet the tendering model used by the public clients is based on the idea that allowing room for creativity, combined with transferring responsibility in competition, will lead to a sustainable and competitive market in the long term. It should be noted that the main incentives for the long term – 'future work with a prospect of continuity' (security of investments) and 'teaming with the customer' (customer empathy and knowledge development) – are hardly used by the public clients.

The interviewees emphasized a strong centralization of the system coordination in a single system integrator by industrial network managers (see Figure 7.1). This system integrator bears full responsibility for the system. Interviewees also indicated that it is not possible or desirable to outsource this. The internal responsibility for system integration leads to a centrally directed, hierarchical style of governance. The focus of the system coordination is on production (functionality) and the reliability of the system. The following elements are considered key to reliability: knowledge of the system; risk-based asset management; system redundancy; and de-complexing of the system. The system redundancy is optimized

(in many cases minimized) as a trade-off between necessary redundancy for keeping the network functional, and the costs involved in this redundancy. Interventions in the system are strictly programmed and defined in advance (engineer & construct). Creativity and innovation by the market are mainly encouraged outside the system, independent of the real interventions (two-stage tendering) by way of (service) partnering. The objective is to achieve an increase of value for the network as a whole.

Reconstruction and expansion projects are often incidental in the industry, and are generally linked to the programming of maintenance through suspension of operation (slots). The focus is emphatically on optimal (risk-driven) incorporation of necessary maintenance in the operation (programming), to ensure the functionality of the network (reliability).

In public networks, the coordination is an on-going, ever-changing compromise between functionality, maintenance, and projects. Interventions are contracted by (partly) functionally specified design & construct contracts, transferring responsibility for performance to the market party. Management and maintenance are contracted through performance-led contracts. Performance-led contracts lead to more integral and functionally specified requests. After all, freedom of choice is necessary in order to be able to take responsibility. However, the traditional market parties in the construction sector consider integration primarily as more scope and thus (in part) increased turnover. As there are hardly any new entrants, the traditional market parties have shifted to a sort of system integrators, merely coordinating production chains.

Especially striking is the strong emphasis the interviewees from the industry put on system integration and governance, as compared to public network managers. Industrial network managers mentioned that the following elements are essential for good governance:

- A shared long-term network strategy or vision as a foundation;
- A clear prioritization between operation, management & maintenance, and construction/expansion projects;
- Central coordination and governance;
- Portfolio management in order to be able to adaptively react to changing circumstances;
- Risk-driven programming of interventions in the network;
- Internal knowledge of the system and its critical components;
- Clearly defined interventions with regard to scope, time, cost, and impact on the critical network components.

Industrial network managers believed that the division between giving the market room for creativity for development, and the actual interventions in the network (two-stage tendering) is at the core of optimal market involvement, while allowing for controlled governance. Creative room for the market is created through development partnerships and two-stage tendering. This represents an essential difference with the public clients, who often combine development room for the market with the intervention itself (through functionally specified design & construct contracts). The difference might be explained by available redundancies in the network. Industrial networks are logistically optimized and have minimal redundancy. This means that the quality of the interventions has to be guaranteed in order to secure the

reliability of the network. In general, public networks have more redundancy. There is more room to absorb variations in quality, meaning that it is less necessary to be able to rely on the maximal functioning of the network at all times.

Figure 7.4 represents the main relationships between industrial network managers and their market, based on the network management interviews (the blocks are similar to the schematic representation of the construction sector as given in Figure 6.1, however, the activities and relationships are expressed through descriptions mentioned in the interviews). The designation of the main groups of actors and their relationships has been aligned with the terms used in the interviews.

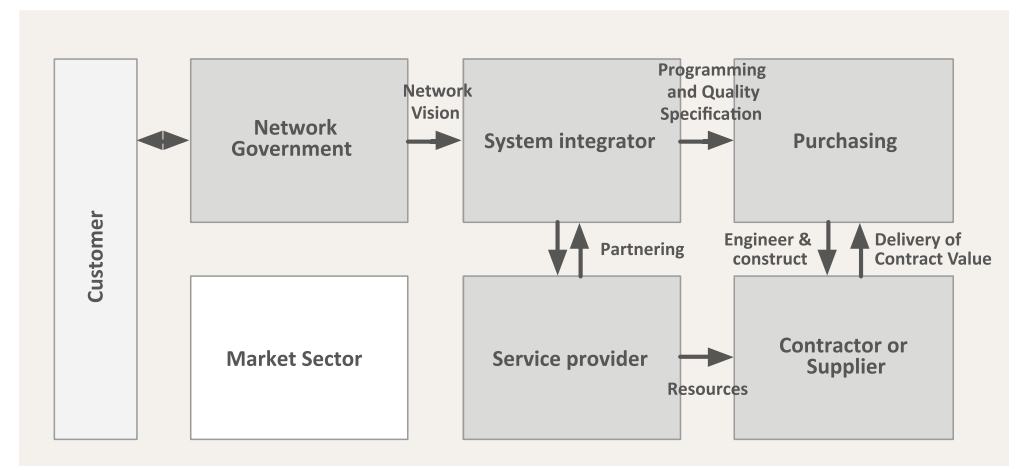


Figure 7.4: Main activities and relationships between industrial network managers and their market

Sustainable market dynamics

As described in Chapter 5, a business can achieve continuation when it is continually looking for innovation and distinctive capacity (exploration), made possible because the client values (and prices) added value on that basis. In order to achieve this, it is important for the market party to know what the client considers to be added value. The motivators 'being involved in the design' and 'teaming with the client' prove to be essential here, as they offer the possibility to create empathy with the client (customer intimacy), i.e., to gather knowledge of the client's business. Based on this knowledge, a business can invest in unique discerning qualities. This is possible if added value is factored into the selection and leads to appreciation of offered added value by the client. Captured value can then be used for investing in the company's core competencies. This process is visible in industrial networks.

As a result of the public infrastructure network managers' strong focus on projects and the resulting one-time requests, however, market parties have begun to focus on ticking the boxes as specified in the tender. Compensation is linked to a value capturing mechanism in the project relationship (MEAT). This compensation has to cover both competency development and the cost of the intervention itself. According to the interviewees, added value is not or hardly valued outside the specific request, that is to say, beyond the cost

of the solutions offered in the tender. Competitors generally respond to a tender on a cost-plus basis. As a result, there is hardly any financial space left for the parent company for investments in discerning competency development. As there is no prospect for the long term, and policy changes occur frequently, there is no consistent foundation on which to base long-term investments. As a result, market parties focus on exploitation of existing resources. The less value can be captured, the higher the pressure that is put on efficiency and exploitation of existing resources. Competitive distinction becomes then mainly a result of increased efficiency of internal processes. Moreover, as a result of the construction sector's open culture, it is easy to copy this competitive distinction, so that any discerning qualities never remain discerning for long. This results in uniformity of competitors, pulling businesses down into a negative pricing spiral (see Section 5.1).

Furthermore, the sector's strong regime turns distinctive businesses into outsiders. If you want to be distinctive in other ways than through process optimization, you have to break with the regime (see Section 5.3). Also, possibilities for new businesses to enter the sector are limited, resulting in a locked-in situation for market companies within the construction sector.

What stands out from the interviews with industrial network managers, is that terms like creativity, (customer) value, valuation of value, and innovation are hardly mentioned. Instead, interviewees mention cooperation and partnerships, knowledge of the system, reliability and quality. For industrial network managers, network value comes from a guaranteed quality, the certainty that an intervention will be carried out in time and according to the specifications, and with that, reliability. Partnerships allow the market party to convert specific client knowledge into internal capacity, which in turn leads to the creation of distinctive capacity. Partnerships offer a unique opportunity for exploration by combining internal knowledge with knowledge of the client. Partnering is a long-term relationship and offers the prospect of continuity. For the network manager, any loss of competition as a result of partnering outweighs any potential loss of reduced reliability of the system. Benchmarking is used to keep the market on its toes. As a result of partnerships and risk sharing, the risk of policy variation lies mainly with the client. Large investments are (partially) made at the risk of the client, who benefits from this arrangement through the quality and reliability of production. The value that is provided by the market (by way of the intervention) consists of quality that has been agreed upon in advance by the client and the contractor (engineer & construct).

The client values this value by compensating the cost of the intervention on a cost-plus basis. This compensation also implicitly covers the creativity and innovation that has been (jointly) developed (by the client and the market). This means that the knowledge that is built up as a result remains with the market company, so that this knowledge can be further developed as a company skill. This concludes the differentiation cycle as described in Chapter 5. Figure 7.5 shows the described cycle for the industry, including the described content of the respective relationships.

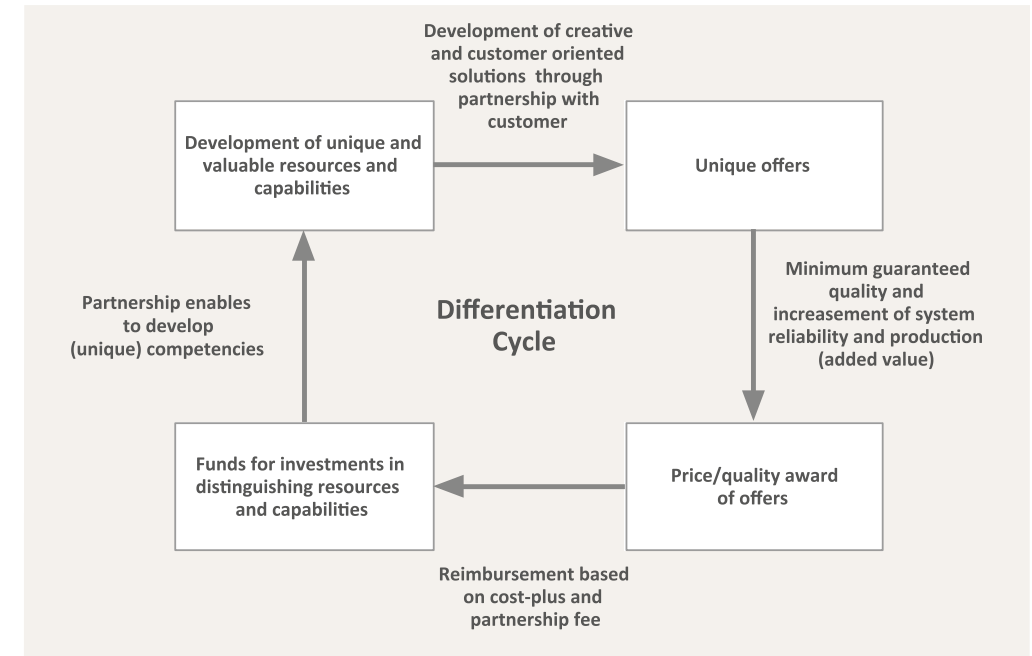


Figure 7.5: Continuation as a result of value creation in the industry

Main findings from the network management interviews

The network management interviews as discussed in this Chapter result in the following main findings:

Finding 1: Projects offer an ideal room for creativity and innovation. As a result of the relative autonomy of projects in relation to the parent companies, innovation does not structurally take root in this sector. A condition for system evolution of the construction sector is to decrease projects' autonomy by tightening the relationships between the project and the parent companies (both on market and network level), and by strengthening the relationship between the network management and the market organizations (e.g. by way of partnering).

Finding 2: Integral system responsibility can not be transferred or outsourced. Partial responsibility can be outsourced if parts of the system can be functionally separated from the system as a whole. Total system integration is then created through interaction between and across the outsourced components. Industrial network managers deliberately separate production responsibility from creativity through two-stage tendering, consisting of a creative stage and an intervention stage. Interventions are prespecified and realized under under maximum responsibility of the industrial network manager.

Finding 3: Having a long-term network vision is necessary for programming and for a stable market policy of clients. Subsequently, programming is the basis for network management and market involvement. Network management and system responsibility can only be taken on with knowledge of the relationships within the system, the critical components of the system, and knowledge of the status of these critical components. This management has to be alive, adaptive, by for example portfolio management.

Finding 4: Partnering between network manager and a market party can only arise from a long-term relationship based on a realistic allocation of responsibility and risks. Long-term relationships develop when goals are aligned (win-win). In addition to financial motivators, non-financial motivators are necessary to achieve this, especially motivators such as the prospect of future work (continuity) and involvement with the business of the client (customer intimacy). For public clients, competition is the paradigm in force with regard to market engagement. However, competition impedes the development of long-term relationships, and as such, impedes partnering.

Finding 5: Interconnectedness leads to complexity of the system and consequently makes the system sensitive for disturbances, necessitating a more adaptive and cooperative management approach. Unambiguous governance is only possible in an environment of limited dynamics. As a result of societal demands, public networks are driven to a more industrial – centrally governed – management approach based on an integral network vision. The more goal-oriented the governance, the more adaptability and cooperation is needed in the management of the networks.

Finding 6: Added value and quality can only be delivered by the market if this is sufficiently reimbursed to allow for investments in distinctive competences. The higher the (required) quality of network interventions or (potentially delivered) added value to the network, the higher the (financial) valuation by the client to the supplier should be. This reimbursement is justified by increased efficiency or functionality of the network or environmental value for the benefit of the client (trade-off). In order to encourage the market companies to truly distinguish themselves from their competition, the client should connect value delivered by these companies to his true interest – that is, to the functional value of the infrastructure network – and appreciate the actual added value above the cost price which is provided in a project.



A market view on the construction sector

This Chapter examines the outcomes of the market interviews (see also Section 1.3). The purpose of the market interviews is to provide insight into the market dynamics within the construction sector, and more specifically, the way it is influenced by the transactions between market and (public) clients. The descriptions given have been taken from the 43 interviews held. In order to enrich the description to what was posited by the interviewee, (anonymous)⁶⁰ quotations from the interviews have been added to the text. Appendix 2 provides an overview of the interviewees. Appendix 5 provides an overview of the interview questions.

8.1 Current market dynamics

This Section discusses the perspectives of the interviewees on the current market dynamics in the construction sector.

The interviewees were unanimous in their view that the Parliamentary Inquiry into the Construction Industry resulted in a disruption of the construction sector. As stated by an interviewee (LCON): “looking back at the inquiry, it was a turning point, and a lot has changed since then. There had been consensus on the underlying system, ...there had been a certain way of collaborating, the market functioned in a certain way”. Companies felt accused of something that was perhaps not exactly lawful, but justifiable none the less. A number of interviewees were still indignant: they felt they had been treated as criminals, after functioning for years in a culture of close cooperation between market and government. As phrased by a interviewee (MCON): “I witnessed how parties were literally treated as criminal organizations. That is not a sound basis for cooperation. They did not trust any of our suggestions...Fortunately, from 2006 or 2007 onwards, we jointly decided to take a different approach”.

According to the interviewees, the Parliamentary Inquiry into the Construction Industry caused cracks in the existing regime of the construction sector. “The playing field changed, everyone had to become self-sufficient, everyone had to show their true colours, to show their qualities. There were new opportunities to distinguish yourself from others, too. Before, companies that did poorly had sometimes been kept afloat” (LCON). At the same time, the government introduced a new market policy: less government, more market (see Section 1.1). “As I see it, 2004 was a turning point. From that moment on, there were major changes in the market, resulting from a policy change at Rijkswaterstaat” (MCON). In addition, an interviewee said (MCON): “From that moment on, the focus was on ‘market, unless...’ it brought about major shifts, in my opinion. Firstly, because we were assigned new tasks. And secondly, because of the increase in scale. The market was given more responsibility with the new

60 These quotes were anonymised for the respective strategic groups, that is: large contractors (LCON), engineering firms (EF), consultants (CONS), international (INT), medium-sized contractors (MCON), technical installation contractors (INSTAL), investors/bankers (FIN), clients (COM), and experts (EXP).

tasks, and the increased scale of the contracts”. Projects became larger, more integrated⁶¹ and more responsibility was shifted to the market (through the use of design & construct, contracts, performance-led contracts for maintenance, and DBFM contracts).

Initially, the market viewed the integrated projects as a sum of the various disciplines, while ‘design & construct’ was considered as just adding ‘design’ to what had always been done: construct. As a large contractor phrased: “If you really want to integrate design and construction, the technical knowledge, design know-how, risk knowhow, etcetera, all have to be combined. In our first design & construct project, we carried out the design work, laid down the specifications, and moved on to construction. That’s not how we do it anymore. It would be an imitation of the old two-party situation”. In the years between 2002 and 2005, simply adding up the design and construct activities instead of integrating them resulted in a number of failures, primarily caused by poor risk assessment and a failure to come up with real integrated solutions. Some interviewees mentioned a repeating pattern: “in the period between 2002 to 2005, we all learned our lessons in design & construct. By now, they all think they’ve got it covered. And now they all take on integrated projects...Same story all over again” (LCON).

It took at least until 2006 before parties really understood what ‘integrated’ entailed and what ‘design & construct’ meant. An interviewee (LCON) indicated: “changes are slow. Builders respond slowly... That is because we only truly communicate via our contracts...If you expect anything to come from the market, you have to orchestrate the change, facilitate the switch, and create financial opportunities”. Parties started to focus on the actual organization of integration other than by merely combining different disciplines: “integration comes from being able to dynamically combine a variety of relevant disciplines” (INT). The large firms established special units, PPP departments, or integrated project departments. The tendering procedure, in particular, was adjusted as well. Rather than contracting out the engineering and design tasks to engineering firms, supervision of the engineering and the engineering of critical components were handled in-house. It required companies to make investments they could only afford with the prospect of acquiring major integrated projects. So, this was only taken on by the largest construction firms. As a result, medium-sized and smaller construction companies were forced in a position of sub-contracting or clustering. An international contractor stated: “One of the consequences of the construction fraud scandal was that a type of ‘bloc formation’ in the market (partly) disappeared. The ‘top 7’ contractors⁶² are still very large, but not to such an extent that they fully control the market. This has made it possible for slightly smaller companies to offer some resistance if they chose their partners wisely”. However some interviewees mentioned a repeating pattern again: “You can tell that the market does not have much experience with PPP. As a result, you get clusters of firms closely working together again” (INT).

61 In this context, ‘integrated’ is taken to mean that various disciplines are combined and that the responsibility shifts from delivering products (output) to delivering performance (outcome).

62 These are primarily BAM, Strukton, TBI, Volker Wessels, Ballast Nedam, Dura Vermeer and Heijmans. In this study, these companies are referred to as the ‘top 7’.

8.2 Strategy of (large) construction firms

This Section focusses on the various strategies large construction firms use in the market dynamics as described in Section 8.1.

Focus on generating turnover

Just when the sector was getting back on its feet, the financial economic crisis followed by the real estate crisis hit. Local authorities reduced their investments in area development and infrastructure development. Real estate, the cash generator of many large construction firms, was affected. The international market did suffer too. As a result, nearly all major Dutch construction firms gradually pulled out of other countries and focused on the domestic market as their home market. An interviewee indicated: "...to make sure that we get our house in order. Only then will we look for likely areas abroad again" (LCON). This increased the pressure on the large contractors to acquire large, integrated projects in The Netherlands. The interviewees confirmed this picture: "you can see the focus shifting to large-scale projects. This is partly caused by Rijkswaterstaat's policy of integration of activities in single contracts. In addition, the provinces are still okay for funding, but the municipalities are suffering...You can tell that these companies, the top 7 in particular, are shifting their focus to large, integrated projects" (LCON). The large construction companies that were interviewed confirmed this focus: "originally, we were a building contractor, and we are rapidly turning the early project stages into our primary process...we want to be able to handle the complete assignment...transitioning from builders to developers for now, to full-providers in the future". The strategy of these firms was to compensate decrease in turnover or profit in other sectors by increasing turnovers in the market segment of large integrated projects. "Our margins are under a great deal of pressure. We all have adopted the same strategy: growth" as stated by an interviewee (LCON). However, they are all similar fish in a pond, all looking for a bigger cut. A client added: "there is no room to increase turnover. We all compete for the same projects...we are all fishing the same narrow pond...And they all want to get a bigger share...which they can only get by lowering their prices".

The situation seemed to turn from 2013 onwards. The strategy adopted by the large construction companies was more and more shifting toward maintaining the turnover level and stabilising the margins instead of keep on growing. Regularly mentioned in the interviews was that (large) contractors had to make the decision, whether to further develop into an efficient production company and/or becoming a general contractor. As phrased by a middle-sized contractor: "Many building companies have grown by developing their building capacity. At this point, they are pondering whether to keep building or to start organising". How large do you have to be to remain a relevant player in this sector, when it comes to turnover and capital position? None of the companies that were interviewed indicated any ambition to grow into a pure general contractor⁶³, neither do they want to make an explicit

63 A general contractor earns by combining knowledge (low own capital) with the creation of value for a client. They are looking for smart price/value concepts by gearing their creativity to the clients's needs, combined with smart production purchasing. Many general contractors, like Fluor, Bechtel, Jacobs, Parsons-Brinkerhof, are geared to provide full-service solutions by managing the underlying supply chain.

choice. "You cannot focus on major projects alone! We feel that you cannot continue to be successful without holding on to both sides" as argued by an interviewee (MCON). However, production was considered to be the core activity: "we want to develop into an expert partner, but we want to remain contractors as well! It provides a basic turnover...So you build up your strength from a solid base...Even so, we can decide on the percentage of this type of work" (LCON). Contractors work out what the ideal production volume and essential components of the chain are to beat the competition. The large construction firms all indicated that they need the integrated projects for the continuation of their companies, but want to keep their basis in construction. This is exemplified by an interviewee, who said: "we share the same dilemma: should you forget about the small fry or do you need the know-how to be able to handle the big fish. We want to do the work, not just broker deals. Even so, we can't do it all, but we stay in control" (LCON).

The interviewees stressed the risk of failing to make an explicit choice for either integration or production ('stuck in the middle')⁶⁴. Failing to choose may mean that they eventually become too small, especially when it comes to their capital position, for truly integrated projects and too large for efficient production, compared to medium-sized specialised construction companies. As phrased by an interviewee: "internally, we are divided. You have to choose. However, we choose deliberately for both large and small projects. Our essence is integrating the supply chain... That's where we can make a difference" (LCON). In order to take part in integrated projects, companies have to invest in specialist knowledge and they have to set aside resources to cover potential risks. These projects extra burden the capital position of the large firms compared to contractors who make an explicit choice. However, in the interviews, medium-sized contractors also indicate that the effect of the financial economic crisis forces them to keep their sales up by participating in larger projects, which makes them (partially) dependent on the larger contractors.

The low returns in the construction sector were frequently cited: "as a firm, you run general risks in addition to technical risks. If you do your maths and compare the results with your returns, construction has become a marginal business...The margins in infrastructure are 3% at best" (LCON). When asked why their shareholders are still loyal to the construction firms, the response was not unequivocal. The interviewees mainly quoted 'soft' reasons, such as the social cohesion within the firm, its history, etcetera. "Sentiment, the emotion to hold on to your shares in a company, is a strong motive. As long as the company does not lose too much money, as long as you stay in the black, the returns may be a little lower, but they will remain our shareHOLDERS" (LCON).

Currently, there seems to be a sort of balance in the market for large infrastructure projects among the 'top 7' construction firms. An interviewee from an engineering firm said: "it is typical of the market mechanism that every project feels like a new competition. Today's situation may be completely different from tomorrow's. That's how it works and it explains part of this apparent balance" (EF). This balance does not appear to be based on a set of

64 See Porter (1996).

arrangements like the ones that were in place before 2002. Interviewees from both sides, market and government, indicated that the competition is real: “from the contractor side, I have noticed fierce competition. Demand-oriented with a risk profile to match. Not based on their own strengths. They still operate like they have always done” (EXP). Companies seem to be in a situation where they depend on large projects: “it means that they have to acquire one out of three large projects. The more tenders you lose, the larger your arrears, and the larger the hurdle to overcome if you still want to take part in this type of tenders” (EXP). As a result, from time to time firms have to go ‘all in’ for a project by coming up with a distinguishing bright idea or by sharp pricing. An interviewee (LCON) stated: “You are trapped. You have to participate. Give it your best to be selected. If you’re successful, you’ll have to give it your all for the appraisal. You are sucked in. You’re pulling your own noose tighter and tighter. If you win the tender, you have to operate very carefully to make sure that you make any money at all”.

The interviews confirmed the impression that the business model of the ‘top 7’ firms is still based on generating turnover. The quote of a large contractor is telling: “the construction firm business model is incredibly simple. You have turnover and overhead. If the turnover leaves something to be desired, you just reduce your overhead!”. As mentioned above, the tendency is to retain production as the in-house foundation of the firm. It keeps the ‘top 7’ firms from explicitly choosing what type of firm they want to be. As a result, the emphasis is on acquiring projects by winning tenders. As a large contractor indicated: “if you succeed in frequently acquiring new projects, you can make the margins that are required for investing in the early stages of the work, for the benefit of the firm’s continuity”. In this way, turnover generates margin, rather than creativity or other specific distinguishing features: “without extreme external pressure, there is no need to change, and firms will do whatever the client desires in order to secure their turnover” (EXP).

Standing out by making clever (re)combinations

Firms differ in their selection of their core expertise. A large contractor argued: “back to basics, concentrating on what is required for our continuation and be or become good at it. Trimming the fat. The trends are the same at every firm, but they make different choices”. The result is that firms differentiate through their combinations, eager to be able to offer the full package. The interviews show that their core expertise is usually production-related, complemented with know-how on organising integration. An interviewee from a large contractor stated this as: “in a healthy market, you can stand out by developing your strengths and clients who want you to distinguish yourself. How can (large) construction firms stand out? At the top, they all have the same strategies. They all wrestle with the same issue of having to acquire integrated projects, and becoming an organising integrator, while maintaining production...Our primary concern is that we want to build...Even so, we are moving up in the chain, for instance in management and maintenance. We want to expand our services in that field. Return-wise, it’s interesting, too. You keep the client closer and serve them better...We used to do production on demand, pure and simple. Now, we are moving towards the provision of services, meeting the client’s every need”. The companies differ in how they handle this dilemma. The truly distinctive character of a firm is primarily in its ability to organise its integration and win tenders as a result.

One of the interviewees maintained that the whole point of differentiation is to keep surprising clients with unique solutions: “...doing things just a little smarter and better than last time. That’s how you create a client base. Keep looking for added value for the client. Our strategy is to do it cheaper and more decisive than our competitors” (CONS). Many of the interviewees stressed that this calls for a specific investment in distinctive knowhow, and for clients who are willing to reward unique offers: “continuation is an important issue in this sector. It is almost impossible to counterbalance the ups and downs. You need a steady flow of revenue. A construction firm that achieves returns of 1% to 2% a year, cannot invest in knowledge. If your added value does not pay out, this development will not take off” (LCON). As long as the clients does not, or not sufficiently, appreciate the added value and does not demand it from the market, firms will keep their focus on the exploitation of their production units through smart (re)combinations. The pay-off mechanism in Dutch tendering is mostly based on MEAT. However, the interviews reveal that the MEAT criterion is not really distinctive when it comes to bringing in the companies own capabilities. As indicated by a large contractor: “All 7 of them are perfectly capable of organising the required knowledge in order to score well at MEAT quality at a competitive price...You organise your tender in such a way that you score on MEAT, and combine it with low pricing... the tenders may differ, but the result is price competition...and that’s how you win your projects”.

Limited use of networking

In the industry, (most) service providers have multiple clients. Through networking (see Section 5.1), companies invest in relationships, making them more adaptive and less dependent on the consistency of just one client for their investments. Based on how strongly market companies in the construction sector depend on a limited number of clients – and as such, on a limited number of tendering requests issued by those clients – one might expect that the market would make its organisation more adaptive through networking i.e. building smart portfolios of relationships with other actors to provide valuable knowledge and skills, and thus reducing its capital intensity. The interviews indicate that this process is indeed happening, albeit very slowly. The fact that companies are deeply rooted in the existing business, the current regime, and the (too low) external pressure appear to be the most important reasons why this process is happening so slowly.

8.3 Actors in the construction sector

This Section examines the results of the interviews concerning the various actors in the construction sector other than the large construction firms which were already described in the previous Section 8.2.

The small and medium-sized construction firms

In the interviews, the large contractors said that they need the small and medium-sized construction firms (SMEs) and specialists. Projects have become so large, integrated, and complex that they cannot be missed. “I think that it is an irreversible process that SMEs will find their new clients in the large enterprises...At some point, you become too big to do small projects. So, you either create a separate unit for that type of work, or you just specify it and contract it out to an outsider” (LCON). This dependency results in more and more steady work relationships throughout a number of projects: “the relationship with suppliers is

changing. More often a co-makership” (LCON). It signals a shift from incidental relationships to partnering. The interviews clearly indicate that the prize of deliveries is still the norm. It seems deeply ingrained in the culture. An interviewee from an engineering firm: “we need them, as we can’t do everything ourselves. But the tradition of main contractors exploiting subcontractors is still very much alive”. The large contractors, in particular, indicate that the government’s tendering mechanism reinforces this phenomenon. By tendering at low prices, the main contractors gain a reduced award amount at a higher risk. This leads to choking off subcontractors and suppliers: “the profits of the large contractor are in the fact that MEAT, regardless of the profits earned, is not passed on to the subcontractor. Right now, small and medium-sized companies are definitely in a bind” (EXP). Although main contractors often have a design & construct relationship with their clients, this type of relationship is usually dropped between main contractor and subcontractor.

Medium-sized contractors indicated in the interviews that they feel the effects of the reduced investing by local authorities: “The smallest firms are still doing well. They are lean and mean”, However, as an engineering firm interviewee argued: “...the medium-sized firms depend on a small number of regional clients⁶⁵. These clients become more and more demanding with new contracts and other risk allocations. It requires extensive investments. The firms can’t handle it. It’s almost as if they are forced back into a traditional role”. In the regional market segment, medium-sized companies are often the main contractors. The fact that this market has been reduced, forces these firms in the position of subcontractors for large contractors in a similar position. This forced shift is often coupled with emotions: “medium-sized contractors are not always happy about cooperating with the large contractors...Part of it is emotional, they want to see their own name up on the board. You cannot imagine contracting without these emotions. Another part is their fear of the general contracting system, where the bucket is always passed down the supply chain” (COM).

The medium-sized contractors indicated in the interviews that the trend for ever larger and more integrated projects influences the entire construction sector: “by selecting integrated projects, Rijkswaterstaat makes a conscious choice for large parties with integrating experience”. The main impediments for small and medium-sized enterprises for not entering into large, integrated projects are all mentioned in the interviews: a high risk profile in view of the capital position of the firms; a large financing component in view of the capital position of the firms; their relative inexperience in large-scale integrated management; high transaction costs; the level of expertise that is required for specific tender instruments (such as MEAT); and the strict selection criteria of the clients.

The clients

Rijkswaterstaat and ProRail are good for a large part of the turnover of the ‘top 7’ contractors. The large purchasing power of these clients was frequently mentioned in the interviews, as a result of which their market policy determines (to a large extent) how the market will develop. As a client said: “and so, the government determines how and when the market is called into

⁶⁵ The regional market contains projects of provinces and municipalities.

play. It also determines the development of the market” (COM). To illustrate, interviewees mentioned often the ‘market, unless...’ policy of Rijkswaterstaat. By applying this principle, the government is outsourcing what it does not want to do itself. Companies have no choice but to play along if they want to stay in the race. The result is that “[their role] is shifting to that of the general manager” (LCON). The ‘market, unless...’ policy was initially interpreted as a sign that the state was retreating from the entire chain. Sections 2.4 and 8.1, describe how the market initially just added disciplines to the work they were already doing. Growing towards an integrated combination of disciplines, complementary to the tasks handled by the client, was a process of trial and error.

The interviewees repeatedly spoke of the unilateral introduction of policies and the lack of coordination with the market, especially from the side of Rijkswaterstaat. This was illustrated by a large contractor: “clients are often quick to introduce new tools. There is hardly any time to get used to them. If you expect the market to do something, you have to manage and facilitate it”. With its policy of ‘market, unless...’, the government reoriented to an overall control function (see Section 1.1). The market players that were interviewed share the impression that as a result of this the government lost too much expertise at critical points in infrastructure network management. An overall controlling function means, according to the market players that were interviewed, that you have subject matter knowledge of the topics that are critical to functioning of the network. An expert indicated: “They have to be able to ask the right questions, to assess the tenders, and to manage the execution”.

The interviews reflect still a traditional relationship between client and contractor, regulated by the contract, despite the objectives of the new market policy. The idea that they need each other or complement each other does not radiate from the interviews. An interviewee (FIN) argued: “The construction firms have a hard time putting themselves in the position of the client, with the matching changes in attitude and behavior. The flipside is that the contracts are so rigid, with a high-risk profile for this type of contract parties, that you can imagine that they start to look for loopholes...It has to come from both sides. Such a change may take a few generations. But it is not influenced positively by this tenacity...It’s a matter of action and reaction”.

The engineering firms

The interviewees referred to a fundamental choice: should they opt for the government or for the market as their main clients, or aim to service both groups? Since the large clients have adopted a policy⁶⁶ (regarding conflict of interests) according to which parties that were involved in the preliminary stages of the tenders, and who therefore have insider knowledge, may not participate on the market side of the involved project, engineering firms are faced with a difficult choice. For contractors the added value of engineering firms is that they have knowledge about the government and its processes, and for the government, that they have knowledge about the market, which can be used outside of competition in the planning and decision-making processes. So to be of value for the government an engineering firm has to

⁶⁶ The basic policy of Rijkswaterstaat on conflict of interests in tendering has been laid down in the Policy Document on the Separation of Interests (Rijkswaterstaat, 2007).

have experience on the market side and vice versa. The above mentioned market policy is a huge obstacle in this. An additional development is that the large construction firms want to keep the control over their projects and related risks: “it’s our philosophy to put our own people in key positions, both for the tenders and for the projects! So we stay in control... In making choices and interpretations, too, I can tell that we, as contractors, are more alert than engineering firms” (LCON). Large contractors are setting up their own specific units for the purpose: “That is why we, as contractors, all have our own consultancy agencies, who know what is and what is not possible in design, and who receive feedback from the building as well”. This development makes it harder for engineering firms to become involved in the subject matter of the projects, other than by carrying out predefined tasks.

The interviewees pointed to the creation of more strategic cooperations between contractors and engineering firms (partnerships). Contractors understand the advantage of having seasoned partners. Since many large contractors handle their own management and only contract out specific tasks, strategic partnering seems to be the only way for engineering firms to gain actual and practical market knowledge. As a consequence, according to the interviewees, engineering firms have to accept more risks if they want to participate in projects. They have to make the fundamental choice of how to bear the risks linked to their participation in these projects. A client: “If your entire financing is based on your annual turnover in hours minus costs equals return, you will have to raise your rates in order to create savings to pay for it. That’s an awkward move and it makes change difficult”. However, some engineering firms are not able to make this change: “we will never be able to wager part of our balance sheet on this type of contracts. The balance sheet of a contractor may be 50 times bigger! It makes no sense to risk our company in such a way” (EF). In the interviews, the large contractors indicated that they increasingly apply the ‘cost plus success fee’ model in their cooperation with engineering firms. The basic costs are compensated and a bonus is paid in the case of success: “for the cost price in the tender, and a success fee if we’re successful. It stimulates us to do our best, to contribute smart solutions, etcetera” (EF). Other models that are quoted in the interviews are alliances⁶⁷ with incentives for value creation and the contribution of specific licences.

Regarding the strategic choice for engineering firms, the interviews reflected three different trends: firms that opt explicitly for participating on the market side; firms that opt for a comprehensive set of know-how and skills, mainly geared towards the international market, with The Netherlands as the domestic market where the knowledge is accumulated; firms that opt for a limited, specific field of knowledge with high-quality expert knowledge. It is noteworthy that there hardly seem to be foreign engineering firms active in the Netherlands. Other than Arup, a Danish firm, the interviewees did not mention any foreign firms. The Dutch tendering culture is mentioned as a possible cause. An international contractor stated: “the Dutch market does not have an international reputation for transparency, foreigners feel that the Dutch ‘poldermodel’ is quite complicated. You have to understand the client. You’ll need a partner that knows his way around...Some things cannot be read, cannot be understood. That’s something you don’t want to invest in”.

⁶⁷ See Section 4.5.

The installation sector

The interviews point to the growing share of installations and ICT in projects compared to civil engineering: “within the context of life cycle, this type of technology is becoming much more important than all civil construction combined” (INST). One of the main subjects in the interviews was how to integrate installations and ICT with civil construction. Especially interviewees from the installation sector reacted on the policy of Rijkswaterstaat to integrate these two disciplines. An interviewee (INST) said: “of course, they want to get rid of interface management...But it’s arguable whether integration is the only solution...The result is that parties such as ABB, Siemens, soon to be joined by Schneider, will become ever more powerful. They will install complete packages, which will make the government highly dependent on these parties”. In the interviews, the technical installation contractors indicated that by including installations and ICT in civil engineering contracts, they are made subordinate, while the installations and ICT are essential to the performance set out in performance contracts. “This integrality is putting us with our backs against the wall”.

The installation contractors further pointed out that opting for integrality requires expert clients, who are capable of assessing the quality of what is offered. As stated by an installer: “you need a competent client...Topspecialists, who can set preconditions and assess the price”. The installation contractors that were interviewed would prefer a situation in which installations and ICT and civil engineering were contracted out in two stages rather than through integrated tendering: “What they should do, is tender the technical installations first. Have them start six months before the other work. Select an installation firm and have them work with the winning civil engineering partner as the prescribed contractor”. This would allow for the possibility of developing new concepts geared towards an optimal installation concept for the service required. An interviewee referred to the UK: “look at the way the Highways Agency handles tolling in UK...They put out a development concession and selected two or three firms. They pay for research and development based on the invitation. The concept then becomes the property of the Highways Agency and can subsequently be tendered” (INST)⁶⁸.

The financers

Every project needs to be financed. Materials and semi-manufactured products have to be purchased before they can be used in a project. But, payment mostly follows after completion of (part of) the product. This is typical of ‘normal’ project financing and incorporated in the contract price. The interviewee indicated that when the contractor’s responsibility shifts from delivering products (output) to delivering performance (outcome), the share of financing increases. After all, (part of) the payment is only made after the performance has been delivered. With DBFM, for instance, payments are made after realisation during the maintenance period, based on the availability of the infrastructure. The capital required comes from the contractor’s own funds and/or borrowed capital (loans). Large contractors

⁶⁸ This is a reference to the European tendering method of pre-commercial procurement. This method may be used for innovative developments if there is a public need that is not automatically met by the market. In such a case, the public party can stimulate research & development through pre-commercial procurement. This development is always followed by a public tender for the actual application (see ec.europa.eu).

are currently dealing with decreasing own funds, and so the share of borrowed capital increases. Suppliers of loans are looking for long-time, guaranteed, competitive returns on their money. An expert argued that “the concessionaire is making a profit by negotiating the costs and securing the revenue flow, that’s his business. The builder is making a profit because he is spending slightly less than he contracted for. That’s a different business”. In order to maximise and guarantee these returns, they insert specific incentives or guarantees. Contractors often have to contribute a minimum percentage of own funds (in DBFM-contracts a common percentage 10%). As an interviewee (FIN) indicated: “projects of 500 to 600 million euros are perfect. You shouldn’t go bigger – impossible to finance. They are big enough for a share of say 10% own funds to leave enough for the investors...If a project is too small, you lose the institutional investors. You end up with the builders”.

The interviewees indicated that because the payment is related to performance, the construction planning is under pressure to achieve timely and/or early payment, or to at least to avoid delays. If payment is linked to quality, strict quality assurances are demanded. Because financiers want to maximise returns with minimal risks, whenever possible, risks are passed on to the contractors carrying out the work⁶⁹. As a result, contractors are likely to use tested construction methods and stay clear of innovation. Furthermore, as an additional guarantee, DBFM includes an exit arrangement for the suppliers of the borrowed capital as well as partial control of the projectmanagement. Finally, DBFM requires a government guarantee from the State of the Netherlands.

The interview results suggest that since there is only a limited amount of capital available, the companies’ capital that is tied up in big projects, which is not available for use in medium-sized or smaller projects, increases the dependency on large, riskier, projects. The flexibility of the order mix of large, medium-sized and smaller projects is then reduced, which in turn increases the firms’ sensitivity and exposure to changes in the financial economic climate. The interview outcomes covered a number of consequences of the financial economic crisis when it comes to project financing. Tightened regulations have made it harder for firms to use their own ‘house’ bankers. Projects show a shift from own funds to borrowed capital. This borrowed capital is supplied by general banks and (private) investors. The stricter rules regarding capital requirements and risk profiles (leverage) agreed upon by the banks in 2011 (the so-called Basel III agreement) force the banks to take on a shorter-term perspective. Private investors (funds) on the other hand, which traditionally focussed on short terms and high returns, seem to be accepting a longer-term perspective and lower returns.

The financiers who were interviewed stated that their primary interest is in securing their returns on investment. That is their core business. It is determined by the certainty of returns within the investor’s worldwide portfolio. An interviewee argued: “we have but a limited amount of money to invest. And so, we weigh the risks and returns per country.

69 In the interviews, the contractors stated that the (internal) design & construct contracts of DBFM place the burden of responsibility with the contractors to a larger extent than the design & construct contracts of large public clients such as Rijkswaterstaat and ProRail.

The Netherlands has to compete with other areas” (FIN). Investors (in PPP-projects) can achieve certainty of returns by passing the risks of construction and management & maintenance on to the builders and maintenance companies, usually the construction companies involved in the DBFM. It means that the financier’s only risk is in the solvency and the performance of the contractors: “the SPC⁷⁰ has no buffer. It makes the system vulnerable. It gives the financiers power. I feel that this contract formula is holding us hostage, much more so than in a regular design & construct situation” (INT).

In addition, a shift is observed to a larger share of borrowed capital in the projects. As phrased by an interviewee (FIN): “we can clearly see the shift from own funds to borrowed capital. Whereas two to three years ago, we often had the same share as the builders, we are now asked how much we would like to take on. We end up financing over 50%! In accommodation projects, such as schools, prisons, and state buildings, we are in for around 70%”. This shift is caused, on the one hand, by the fact that projects are becoming larger and more integrated, on the other hand by the poor investment position of the clients. Due to the present low interest rates, a higher financing share does not result in higher tenders yet. “We do see that the low interest rates compensate for the higher share of borrowed capital compared to own funds” (FIN). It is expected that the tenders will rise with the interest rates.

Due to the financial economic crisis, the loan conditions of the banks have been tightened and the capital position of construction firms has worsened. The financiers who were interviewed state that as a result, integrated projects have become more attractive to financially strong (foreign) firms and investors: “if you notice that the sector needs more institutional funds because the builders cannot deliver, the proposition must be as attractive or more attractive than in other countries” (FIN). Since firms cannot contribute more own capital and since the budgets will not increase, this trend means that the margins of these construction firms will suffer and that their risks will increase. An interviewee mentioned: “They will have to form consortia with parties that can finance them” (EF/INT). One possible consequence is that the number of interested parties for this type of projects will decrease: “the number of potential players decreases. Capital invested in one project means that your possibilities in other projects are reduced” (FIN).

The interview outcomes show that one of the consequences of the trend described above is that the traditional role of the construction firms in integrated projects is shifting. Interviewees indicated: “in the past, they were looking for a large share, just to be in control”, and “in practice, only the largest firms can handle an integrated project. The expertise is their core business. They focus increasingly on integrated concepts and hire more and more subcontractors to do the actual work” (FIN). As mentioned earlier, construction firms want to keep root in construction. This means that their role shifts after completion of a project. A large contractor said: “we do PPP because we want to build. We are not interested in the concessions market. As soon as things get going, we are reselling. However, we will make sure that our management & maintenance activities are kept on board”.

70 Special Purpose Company, a company that has been set up specifically for the realisation and control of the DBFM contract.

Foreign contractors in the Dutch construction market

Several foreign contractors are active in the Dutch infrastructure market. For instance, CFE Nederland, (part of CFE Europe⁷¹) and Besix have been active in the Netherlands for over 20 years as has been German enterprises such as Strabag, Züblin⁷², Dywidag, Hochtief and Bilfinger and Berger. A shift is noticeable, though, according to the interviewees. Züblin, in particular, is moving from non-residential construction, where it has a solid position, to infrastructure. Dywidag is a specialist and is securely positioned, especially in bridge building. Recently, there is more activity from Spanish contractors, FCC⁷³ in particular. Indirectly, Spanish contractors have been working here through the Austrian firm of Alpine and the German firm of Hochtief. The reason quoted is the poor infrastructure market in Spain: “Alpine and FCC need to increase their markets. These days, you see their names appear on smaller projects, too. Bouygues and Vinci don’t need to do that” (LCON). There are hardly any parties from the United Kingdom that are active in the Dutch infrastructure market. Moreover, the Dutch contractors are (partially) withdrawing from the United Kingdom. The French powerhouses Bouygues and Vinci have a limited independent presence. Vinci, however, is active in the Dutch market through CFE.

In the interviews, foreign contractors referred to the Dutch infrastructure market as an ‘island’ in Europe. A typical market, with its own types of contract, that are different from the international standards, and typically Dutch transaction tools. Often, communication is only in Dutch. An interviewee argued: “we have built a fence around ourselves. But it works both ways. The world outside is regulated by the large international companies, who have their own rules” (EF).

People speak of a controlling client (Rijkswaterstaat and ProRail) with limited room for conceptual creativity. The creativity that is required mainly concerns logistics and optimal production. As a result, main contractors are (partially) dependent on the local production market: “if we come here, we depend on local partners or subcontractors” (INT). They feel that the local production market is not readily accessible because the Dutch firms control essential supply chain capacities such as sand, asphalt, and concrete. The domestic competition on production is fierce, according to the Dutch contractors, which makes production relatively cheap: “whatever happens, they’ll always need reliable, professional, Dutch contractors...Those foreign firms realise that they need sufficient scale in contracting for their business...they will not do much in local production. So, there will always be room for firms that operate locally. But, they’ll have to excel in operational excellence in doing their jobs” (LCON).

Both Dutch and foreign contractors are of the opinion that you cannot enter the Dutch market on a one-off, it requires a considerable investment in continuity. A large contractor mentioned: “if a foreign firm decides to enter the Dutch markets because there are so many

71 The Vinci group is the main shareholder in CFE Europe.

72 Züblin and Dywidag are operating companies of the Strabag Group (www.strabag.com).

73 Alpine is part of the FCC group. The Spanish ACS is the principal shareholder in Hochtief.

interesting projects where you can put all of your competencies to use, part of you will have to become Dutch. You have to go all in. You can’t pick one project, build it, and get out again”. Another interviewee (INT) argued: “in order to get something done, you have to have been in the business or in the country for 10-15 years...That’s what you need to show that you can do the job”.

It is noteworthy that the interviewees frequently mentioned the relatively low returns achieved in the Netherlands, compared to the rest of Europe: “in many countries contractors realise 7 to 8%! It’s possible in our industry” (MCON). Why then come to The Netherlands? “As long as they have other options, they won’t come to the Netherlands. They compare returns first” (MCON). The investments that are required form an additional hurdle. As long as there are more attractive options outside of The Netherlands, there will not be any large-scale interest in the Netherlands. The interviewees confirmed that sales are often discussed in terms of returns. The picture that is painted of low returns shifts if the returns on capital invested is discussed. An expert indicated: “if we take a neutral look at the numbers, the profit margin is too small compared to the risk. Even so, this is a distorted picture. If you check the profit on turnover, it’s only a few percent. That’s because the companies have little capital. From an investment perspective, the margin is much higher!”.

In the interviews, the foreign contractors were asked whether they were interested in takeovers. In view of the relatively poor capital position of a number of Dutch contractors, this seems a likely scenario. The foreign firms generally stated that they are not interested in buying production capacity without turnover guarantee in a market where returns are low. They have their own production capacity or know where to get it. A large contractor said: “I don’t think that The Netherlands offers interesting options for takeovers for foreign companies. You’re buying construction capacity. Without market turnover guarantee”. They see a lack of long-term perspective here. The Netherlands moves from one project to the next when it comes to infrastructure: “the Dutch market is like a casino!” (INT). Even so, takeovers are not ruled out. “I personally think that you can only be successful if you control at least part of the local production. At least 25 to 40%. I think that it would be impossible for large foreign companies to conquer a market without takeovers” (INT).

What reasons could foreign companies have to focus on the Dutch market, in spite of the low returns? First, the poor market situation in the traditional domestic markets. As indicated by an interviewee “the Spaniards are in trouble. In 10 to 15 years, they have built their capital position with European money. Spain was a large part of their market. Over the last years, they have been looking around for where to create new market positions outside of Spain” (INT). The Dutch government has a good reputation for paying its bills: “a great advantage of the Netherlands is that foreign firms can be certain that they will be paid” (INT). The Netherlands is also considered legally secure: “when it comes to the law, there is legal certainty in The Netherlands. However, the concepts of reasonableness and fairness are sometimes considered a pain, though!” (INT). The prognosis for new projects over the next decennia is good and there is political investment security: “there are enough projects in the pipeline until 2028” (INT). The market approach in the public sector in the Netherlands is open and transparent. “The Netherlands is a country that you can build on. Because it is well-organised” (INT). The interviewees also mentioned the comfortable capital position of

some foreign firms compared to competing Dutch firms in relation to the growing capital requirement of projects: “projects are getting larger in The Netherlands, like everywhere else. You have to provide all kinds of guarantees before building. These weigh so heavily that Dutch construction companies are no longer able to give them” (FIN). As stated by an interviewee (FIN): “Dutch construction companies are builders, not bankers. They’ll look for a model that doesn’t force them to invest millions in every project. It’s not their core business and they don’t have the money for it”.

One of the reasons quoted in the interviews for the larger Dutch builders to explicitly maintain production as their core activity is to guarantee future turnover. They do not expect larger and financially stronger international construction companies to bring their production to The Netherlands. They will always want to cooperate with Dutch partners. An interviewee stated: “Foreigners have the advantage that they can prove that they can take on the whole project, from a to z, based on their experience in other markets and their financial position. But once they come here, though, they depend on their partners to handle production. They can’t do that themselves here” (LCON).

The special position of general contractors such as Fluor and Bechtel was mentioned as well. They mainly operate in the industry, where they can achieve relatively high returns: “the trick is to earn money with knowledge, rather than with money. The contracting business is a capital-intensive sector with low returns” (MCON). They nowadays incidentally operate in the infrastructure market, particularly with the concessions for the High-Speed Line and the Betuwe Freight Railway Line, and more recently in DBFM-contracts. They are especially looking for parts where they can add value. As an interviewee said: “Fluor works with a limited number of clients. That’s how they have gotten to know their customers so well. They are specialised in management, riskmanagement, things like that...It’s very specific knowledge” (INT). Since the client is very powerful in (Dutch) infrastructure and hardly allows general contracting, they are primarily looking for the larger concessions. They combine capital position with PPP and risk management to guarantee returns.

8.4 Relationships in the construction sector

This Section discusses the perspectives of interviewees on the relationships in their sector.

Cooperation and partnering

Cooperation was frequently mentioned by the interviewees as a tool for making relationships tighter. The fact that these relationships last longer, force partners to look for added value they can offer the other party: “cooperation must be based on lasting relationships” (INT).

Long and lasting relationships are considered to be a basis for mutual trust. Long relationships require flexibility, according to some interviewees: “in the construction sector, there are always new situations that require the understanding of the other party, instead of the letter of the contract” (MCON). And, “if it doesn’t work, there has to be a termination arrangement” (COM).

The interviewees stated that the basis for any cooperation is a fair compensation of expenses and the willingness to share profit and loss. Proper prior arrangements are required: “an alliance will only work with a prior agreed upon and shared process framework” (LCON). The ProRail model (a semi-public network manager) was frequently mentioned as a good example: after the design & construct contract has been granted, parties negotiate to explore the possibilities of cooperation (alliance) on certain elements. As a large contractor stated: “it is not a matter of cooperation, yes or no. Design & construct is the basis, and alliances are added for specific parts of the project”.

The strong focus on the contract as the basis of the relationship, particularly with Rijkswaterstaat, is considered a hindrance to real cooperation. According to a large contractor: “as long as the contract and competition form the basis of the relationship, there can be no cooperation”. Cooperation is about relationships, but the focus on the contract means that the relationships are juridified. A large contractor phrased this as “the relationship is formed under the contract. As a result, the contract becomes a perfect predictor of the future. Both the client and the contractor go on the defensive after the tender has been granted. The contract is not seen as a means to facilitate the relationship”.

The interviewees repeatedly referred to the importance of the people for cooperation. “Cooperation requires an openness and an interest in each other’s fields and processes” (LCON). According to the companies that were interviewed, the dynamics are different when working with your own people instead of externals. The fact that public clients often work with externals hinders the cooperation, they said. In the construction sector, cooperation often consists of (historically grown) private-private ad hoc partnerships. The focus of their aligned interests may be on risk sharing, rather than on the shared use of knowledge and skills. However, the trend towards integrality forces parties to cooperate in certain disciplines: “because of the continuing integration of certain disciplines, cooperation is unavoidable” (EXP).

The interviewees regularly mentioned the potential win-win situation as core of cooperation, the alignment of interest (see Section 4.4). The interviewees saw a paradox here: “the greater the interests, the harder the cooperation” (MCON). The challenge is to link the two worlds for the purpose of the win-win situation: “a government looks for solidity and makes cuts. A contractor eyes the competition and does the maths. Where is their joint comfort zone?” (LCON).

The difficulty of cooperation continues down the supply chain, according to interviewees. Not only does it affect the main contractors and their clients, but also the contractor and his co-contractors, subcontractors, and suppliers. A client stated: “in practice, hidden behind the main contract, you’ll find traditional contracts with subcontractors”.

Room for creativity through the use of Most Economically Advantageous Tender

Granting a project based on the Most Economically Advantageous Tender (MEAT, see also Appendix 6) is frequently quoted as a means to stimulate distinctiveness. The idea behind MEAT is that by giving the market room to design, companies will develop distinctive solutions based on their specific competencies. MEAT can only work if the invitation leaves

room for creativity. A large contractor stated: “within this room, competition is the best guarantee for quality. Freedom and room for creativity should only be granted if the market can deliver and the client will appreciate it”.

Do clients’ invitations leave room for creativity? The companies that were interviewed indicated that it is limited. Offering room for creativity requires letting go and trusting that the market will come up with high-quality solutions. In infrastructure, the planning and decision-making processes focus on security for the parties concerned and tend to provide a great many details. This leaves little room for creativity unless the companies are involved in the planning and decision-making process at an early stage. However, companies sense a cautious attitude, both in clients and in contractors, as the risks are higher earlier on in the process. A large contractor indicated: “you cannot involve companies early with an uncertain scope at a fixed price!”. Two-stage contracting, as used in the industry, the interviewees considered to be a suitable method for early market involvement, as it makes the most of the combined knowledge of client and market. The sooner the market is involved, the greater the efforts asked of the market, and the higher the transaction costs. An interviewee (LCON) argued: “MEAT implies increased transaction costs. That is one of the reasons that smaller contractors have a problem with it and, in general, do not participate as main contractors in MEAT-projects”.

The contractors that were interviewed stated that the starting point should be that transaction costs that are requested should be compensated fairly. If the transaction costs incurred by the market are not paid for in full, they will have to be earned in another way. An interviewee argued: “functional specifications require considerable efforts at an early stage, which have to be earned back at a later stage” (LCON). The general picture emerging from the interviews is that the tender costs of integrated contracts are too high. One of the solutions that were suggested is to narrow down the number of tenderers at an earlier stage and to limit the level of detail in the tendering by focusing on the elements that are really necessary and distinctive.

The clients indicated that providing room for creativity is not always desirable from the perspective of the network managers. For instance, when they want to standardise and uniformize certain aspects from the perspective of the entire system.

Do companies succeed in distinguishing themselves within the room provided? The large contractors indicated that they have the knowledge and skills required for organising large infrastructure projects: “the large contractors hardly differ in their knowledge and skills. They do differ, however, in the way in which they apply them in the projects” (LCON). Because of the emphasis on generating turnover, MEAT is used for turnover maximisation instead of value maximisation for the client. A large contractor: “the turnover and profits are under a great deal of pressure from the operating companies. It makes it harder to put in distinctive tenders. The tender is always a compromise between the optimal use of capacity and the maximum MEAT-score”. Parties focus on the optimal use of the available means. “The market position of (large) contractors is determined by the available portfolio of resources and their capacity to use it to the best effect” (LCON). According to some of the interviewees, MEAT does not stimulate innovation as much as competitive tenders. The client’s invitation

is leading. As a result, creativity is limited to the search for the optimal use of the means available to the firms, geared to the customer’s demand. A large contractor mentioned: “all large contractors are perfectly capable of organising their knowledge in such a way that they can score on MEAT at a good price. And so, MEAT has lost its distinctiveness. The tenders may differ, but the end result is still price competition”. Moreover, according to the interviewees, any advantage is soon known throughout the entire sector because of the open culture of the construction sector. As firms have essentially the same resources at their disposal, creativity is easily copied: “a clever solution is always a one off. The next time, it has become the norm. That’s why it doesn’t pay to invest in distinctiveness” (LCON).

The general picture emerging from the interviews was that the stimulus in MEAT to distinguish yourself is not very strong:

- The market policy and MEAT of the main clients is not consistent and will therefore not result in a change of long-term behavior;
- Extreme objectification has turned MEAT into an exercise in maths poor of creativity;
- Clients do not accept big surprises;
- Tenderers specialise in scoring on MEAT in the tender;
- Real creative freedom is usually limited;
- The quality demanded is mainly once-only and project-bound;
- As a result, the (lowest) price still seems to be the deciding factor.

If MEAT is not distinctive, the result of the price competition will manifest in part after the tender has been granted. A large contractor: “if they cannot distinguish themselves in the early stages, they can only earn money at a later stage”. As described in Section 8.3, contractors in the Dutch construction sector focus on generating turnover by means of their resources, in response to the client’s invitation. “Companies are hopping from one project to the next” (LCON). If the invitations become more uniform and there are fewer surprises, it will force the market towards price competition. “Creativity will only be stimulated if the customer keeps surprising the market with its invitations” (LCON). The interviewees pointed out that both the contractors and the client value creativity on cost base, rather than on the surplus value that is created. This means that there is little additional investment room for new, distinctive competencies. An interviewee (LCON) said: “the market has adopted the cost-plus method: a smart design at low cost, adding what is required for the MEAT. As a result of this cost-plus state of mind, both for the client and in the tenderer, there is hardly any room for investment beyond the measures that were tendered”. The companies in particular note that MEAT has been reduced to a unit of account that may stimulate companies to move in a certain direction, but is unrelated to any interpretation of the intended surplus value. As said by an interviewee (LCON): “the unit of account for value in MEAT is unrelated to the actual costs or revenues, as it has been dictated by the assessment system”.

The focus on the project, both on the side of the clients and on the side of the contractors, is noteworthy. The project is seldom linked to the functionality of the infrastructure network. This is noteworthy, as the projects supply added value to the network and should logically be valued through the network. Differentiation should focus on the provision of services

rather than on the realisation of the project: “value should be a function of the quality of the network in use... Differentiation should manifest in the provision of services, rather than in the realisation” (COM). The interviewees felt that MEAT is often geared to the specific project: “rather than to the network it’s part of” (LCON). The focus of the contractors is on the project as well. Once the tender has been won, all efforts go towards realising the project margins. In a market where margins are low, there is not much investment room left for the parent companies. Since the MEAT profits of the main contractor are not always passed on to subcontractors and suppliers, the creativity of the underlying chain is stifled. An interviewee (MCON) argued: “The profits that are derived from MEAT are not passed on to the sub-contractors. This effectively blocks the input of their creativity”.

8.5 Resume and findings

In this Section the results as discussed in the previous Sections are integrated, starting with the dominant actors and relationships that emerged from the interviews by using the schematic representation of the construction sector as described in Section 6.1 (Figure 6.1). Next, the results are integrated using the perspectives of system evolution, system ordering by means of tight and less tight relationships and sustainable market dynamics as described in Sections 6.2, 6.3 and 6.4. This Section ends with main findings which summarize the market view on the construction sector.

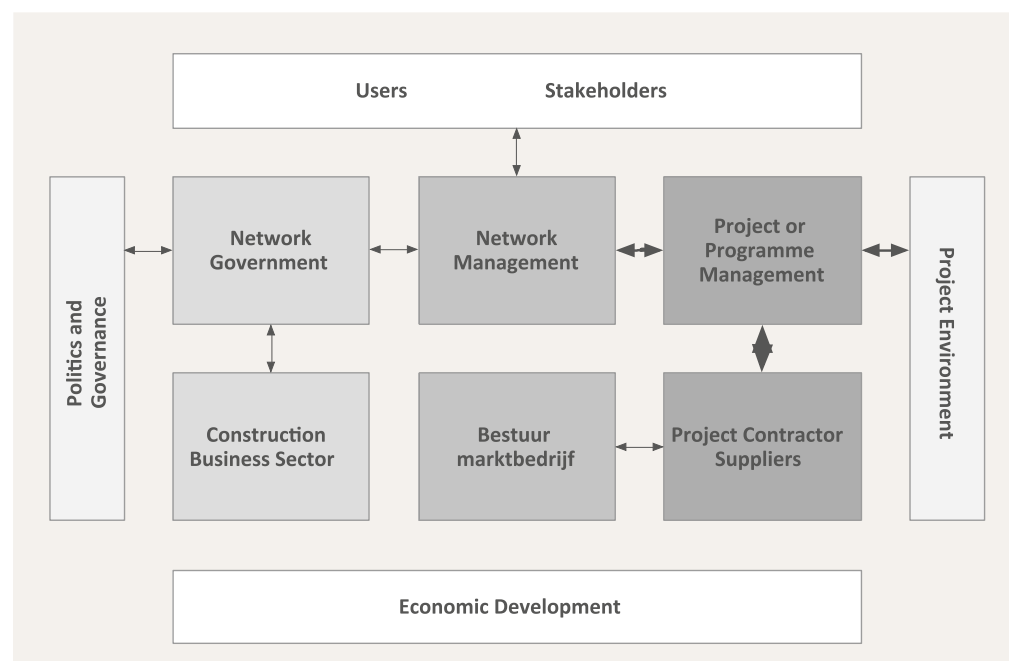


Figure 8.1: Relative focus on actors and relationships in the market interviews

Dominant actors and relationships

A notable result from the market interviews, is the predominant focus on projects. Value creation, interpretation of the tender, and partnering are all project-related elements. The market dynamics is aimed at creating turnover by acquiring projects. The network interest is mentioned, but always in relation to the specific request for a project. This description applies to the interviewed clients as well as to the interviewed market parties. When the image from the market interviews is fitted into the schematic representation of the construction sector (see Figure 6.1), this leads to Figure 8.1. The thickness of the arrow indicates how much emphasis the interviewees put on each relationship. If the arrow has been omitted, that means the relationship was not or hardly mentioned by the interviewees. The thickness of the arrows and darkness of the shades are based on the degree to which an actor, group of actors or relationship was mentioned and emphasized in the interviews.

Comparing Figure 8.1 to Figures 7.1 and 7.2 – based on the network managers perspective (see Section 7.7) – the difference is striking. The industrial network managers predominantly focus on network management, and from there on the market involvement through service partnering and programmed and defined interventions in the network. The public infrastructure network managers do emphasize projects, however, related to the network management. The construction market seems to focus mainly on project.

System evolution

The results from the interviews show that the construction sector has most certainly evolved after the construction fraud. Before the construction fraud (see Section 1.1), the sector’s main focus was construction. Political pressure led to a different market policy for public administrators (‘market, unless...’)⁷⁴, which gave creative room and accompanying responsibility to the market through design & construct. At first, the market responded by recombining the design and construct disciplines into ‘design + construct’. Companies simply hired an engineering firm to do the work the client used to do (design and specification). However, the engineering firms did not bear any responsibility for the design, which led to mistakes and failure expenses. Having learnt from their mistakes, from 2005 on, contractors once more started organizing integrality, by way of specialist units within the company.

Design & construct implies that the client allows the market room for (creative) design, by way of functional specification. Traditionally, the client made the design (assisted by engineering firms), and would then provide the specifications for contract purposes. The transition from engineering in-company to specifying the functional space and developing the expertise necessary for evaluating of the offered solutions is still evolving on the side

⁷⁴ It is interesting to note that the Netherlands focused on examples from the UK, where the liberal political climate (especially during the Thatcher administrations) had led to privatization and the introduction of public-private partnerships such as PFI (which is comparable to DBFM). The aim was mainly to bring in the market in order to reduce the size of the public authorities involved. Partnering models such as those introduced in Australia and New Zealand (alliances) did not (or hardly) take root in the Netherlands at all. The PPP-models, which were based on Anglo-Saxon legislation, were introduced into Dutch legislation and culture without any significant changes (Eversdijk, 2013).

of the large public clients. This has taken much time (regime change), because on the one hand, it requires a shift of quality within the organization (new disciplines), and on the other hand, many institutional frameworks (such as decision-making procedures) are based on the preparation of detailed designs.

The described evolution is not a single transition, but a sequence of several mutually impacting transitions (see also Section 2.4). In 2008, the market policy of Rijkswaterstaat changed, which greatly impacted the large contractors. During the same time, the financial economic crisis hit, followed shortly by the real estate crisis. The construction sector's regime experienced several consecutive waves of pressure, forcing adaptation. It is striking that, despite the ongoing strong focus on projects, market organizations and clients have been evolving with regard to structure and culture since the construction fraud. This process has mainly been initiated by external pressure (politics, economy), and involves a relatively slow adjustment of the existing regimes of both the market and the client.

System ordering by means of tight and less tight relationships

The theory of 'loosely coupled systems' indicates that actors can be linked by tight and less tight relationships within a system. The literature specifically points out the often loose relationship between projects and market parties (see Section 4.2). As a result, the market company's learning from the generated variation in the projects comes to a standstill. However, the relationship between network manager and the project was hardly mentioned in the interviews. This could lead to the conclusion that this relationship is also quite loose in nature, so that the network managers' learning cycle generated from the variation in the projects also comes to a standstill.

The interviewees provided a number of reasons for the presence of these loose couplings. First, the valuation of creativity through MEAT is largely focused on the project interest. When both the valuation and the quotation are based on the cost price, there is no margin left for investments outside the project. After all, the market has to pay for what must be supplied, and the client compensates what is supplied.

Second, after allocation, the market sees the project as an economic transaction that has to yield the estimated returns. The revenue from the project is used for the project's financial balance (costs, hedging). If there is a positive balance, this is distributed evenly across all operating companies and associate contracts in the project.

Thirdly, creativity by the market should generate added value for the network. After all, the project is not an entity in itself; it provides value to the network. However, in general this network value generally has not been accounted for by the client in his project tenders, other than the specific value allocated to the project itself. The network manager budgets for (normal) operation and projects only, not for (extra) added value for the network. Therefore, the market does not invest in value that exceeds the requested project value. For generating extra network value, added value has to exceed the project value and the compensation has to be higher than the cost of the measures used in that project. Otherwise, there is no margin for investments.

Fourth, market companies are organized as turnover holdings, focused on an optimal turnover of capital that has been invested in production (exploitation). The large contractors have neither chosen a clear strategy to focus on service provision and integration of disciplines, nor production alone. And it is this 'stuck-in-the-middle' attitude that seems to keep the large contractors 'stucked' in being focused on demand and turnover, linked to projects.

Partnering is frequently mentioned in the interviews as a tool for making relationships tighter. Long-term relationships last longer, forcing partners to look for what added value they can offer the other party beyond an individual project. The interviewees are unanimous in their opinion that partnering should be based on a clear foundation:

- The responsibilities of both parties should be clearly defined in advance;
- A clear process framework should be in place in advance;
- The compensation for the efforts made should be based on actual costs plus an extra for generated added value;
- There should be agreements in place regarding how to split profits and losses, especially when profits do not occur in the same place as the losses;
- It should be possible to terminate or adjust the agreement if it does not function as intended;
- The collaboration is focussed on managing the risks that do not clearly belong to either client or contractor (where parties are dependent on each other) and opportunities.

The market parties, in particular, feel that the current contract types and way of tendering through competition do not encourage collaboration: "They are aimed at control. The adage seems to be that division must come before collaboration. But we should be looking for things we can improve together, and divide and allocate responsibilities after that" (EXP).

In the market interviews, system integration in the construction sector was mainly considered as forward and backward integration in the production chain (supply chain) and demand chain. The large contractors move forwards in the chain as discipline integrators, while at the same time, the governmental authorities draw back into a directing role. Here, interviewees considered the concept of integrality often as a coupling of disciplines (general contracting) rather than a new type of service providing (general service providing). On the one hand, this is caused by the fact that the large contractors choose a strategy of maintaining production, and often see forward integration as generating turnover for the production units. As a result of this, the large contractors create new units near the head of the chain as 'integrators', however, subcontractors and suppliers are still often employed in a traditional way. Nevertheless, a trend towards collaboration in more long-term relationships can be seen here. On the other hand, the tendering requests made by large clients such as Rijkswaterstaat and ProRail do not yet allow for 'general service providing'.⁷⁵ This is one reason why general service providers from the industry have difficulty to enter

⁷⁵ See also statements about general contractors such as Fluor and Bechtel in Section 8.3.

the infrastructure construction. Furthermore, the relatively low yields in the sector are an additional inhibiting factor. An additional hindering factor is that the tendering requests are project-focused, based on construction with limited added value to be generated and captured. The request do usually not provide a challenge to improving the functionality of the network. In essence, DBFM does provide this by way of the life-cycle approach and payment based on availability. However, the interpretation is mainly project-focused and linked to the network by way of requirements that have been pre-defined by the client. Therefore, after allocation, the market (and the client, too) considers DBFM to be just a project transaction, that not results in a partial responsibility for the network.

Sustainable market dynamics

As described Chapters 5 and 6, the differentiation cycle is based on the creation of added value by the market, which is then valued by the client. The captured value allows the market to invest in the development of specific, distinctive competencies.

In the interviews, the clients indicated the importance of a creative, developing market. However, neither the market parties nor the interviewed clients expressed a particular vision of how the market should further develop toward a sustainable market dynamics. Instead, they proved to focus on exploiting the existing market. Allowing for room for design and evaluation based on value for money (MEAT) are mentioned as essential instruments for development. The clients felt that competition is an important foundation in this process. The interviewees from the market regularly mentioned that there is competition, but they also mention that the market segment for the large projects is relatively closed. Competition was seen by the clients as encouraging creativity and as a means for obtaining good value for money. It is noteworthy that the interviewees considered it a given that there is competition, and that competition is a sign of a healthy market. But they also saw that price-based competition does not benefit the market in the long term. Assessing tenders on price/quality through for example MEAT is seen as a solution. The policy of public network managers such as Rijkswaterstaat and ProRail is to increasingly connect quality to the functioning of the network, that is to say, to define quality as added value for the network, of which the project is a part. However, this link, or coupling, is not obviously evident from the interviews yet.

In the interviews, both the clients and the large market companies indicated that the valuation of quality or added value is calculated based on cost price, not based on value. The market develops something to match the client's specifications at the lowest possible cost, than adds value to score on the evaluation mechanism (MEAT). Market parties stated that when MEAT is used, price is still (often) the deciding factor. Creativity is approached as a recombination of existing and available resources. This is recognisable from the point of view of production (turnover) as the foundation of market companies. Clients indicated that it is difficult to rightfully justify the valuation of non-material value. This means that the market must always contribute something tangible to the specific project in exchange for compensation. This leaves very little room for investments outside the specific project.

Market interviewees mentioned the differentiation cycle more explicitly than the clients. They often addressed the necessity of valuing added value and the possibility of capturing that value. However, it does not become clear how this captured value is to be invested in specific knowledge and skills of the parent companies. The focus is mainly on the project (loose coupling with parent company).

Networking as a means of efficiently mobilizing creative resources is not mentioned either. Through networking (see Section 5.2), companies invest in relationships, making them more adaptive and less dependent on the consistency of the client for their investments. Service provision is more universal than production. In that sense, the service providers can 'network' by deploying their resources in multiple ways. Since market companies in the construction sector strongly depend on a limited number of clients – and as such, on a limited number of tendering requests issued by those clients – one might expect that this market would make its organization more adaptive through networking, and through reducing its capital intensity. The interviewees indicated that this process is indeed happening, albeit very slowly. The fact that companies are deeply rooted in the existing business, the current regime, and the (too low) external pressure appear to be the most important reasons why this process is happening so slowly.

The interviewees indicated the following contributing factors to the working of the differentiation cycle:

- The offering of sufficient creative room by clients to the market;
- Presenting the market with challenging, surprising tendering requests;
- Connecting the value supplied by the market in projects to the client's real business i.e. the functioning of the network;
- Valuing by the client of added value above the cost price of the concrete measures to be delivered by the market;
- Defining by the client a consistent, long-term network and market policy.

The interviews suggest the following aspects that could be used to improve MEAT:

- Giving significantly more importance to quality than to price (70% or more is mentioned);
- Assessment should contain a certain degree of subjectivity (should not simply be a calculation);
- Criteria should provide a balance between network quality and project quality;
- Variation in criteria across projects (element of surprise).

With regard to variation and consistency of MEAT-criteria, the interviews show a paradox. On the one hand, the interviewees indicated that the element of surprise provides interesting challenges, because predictability leads to calculated behavior. The market interviewees in particular argued that MEAT-criteria should not be copied from one project to the next, but should be consciously defined for each separate project. On the other hand, the criteria are used to value companies' unique skills. The differentiation cycle is a cycle of investment in the development of skills and competencies. Investments require time, and as such, they require a consistent market policy. Considering the high dynamics of the market

segment caused by its strong political and administrative context, it is problematic to come to a long-term (10+ years) consistent network and market policy. Furthermore, the large contractors usually work with a strategic planning for at maximum the next 5-7 years, as a result of their dependence on the business cycle. This makes long-term investments difficult. The theory presents networking as a tool for investing in flexible relationships (see Section 5.1), rather than only investing in – partly inert – internal knowledge and skills. For the construction sector in particular, networking appears to be just right as a tool for creating flexible, adaptive organizations. It is striking that this phenomenon of networking was hardly brought up in the interviews.

Main findings from the market interviews

On basis of the previous discussion of the market interviews results we can formulate the following main findings (in addition to the findings already presented in Section 7.6):

Finding 7: The construction sector only reluctantly wants to change. The pressure of the construction fraud has led to a (partly and incremental) reorganization of the construction sector. However, the sector has not structurally changed concerning market dynamics. Parties still want to maximally exploit existing assets, and only adjust those elements that are necessary to adapt to the 'outside world'. Market dynamics is still predominantly based on price competition and process optimization and has not yet radically evolved to a market dynamics based on differentiation.

Finding 8: In the short term, MEAT leads to differentiation. However, in the long term, as a result of predictability⁷⁶, it may lead to uniformity of the offered value. Distinction in the construction sector is mainly achieved by smart recombination of existing assets or capabilities. Innovation is predominantly focused on process improvement and chain optimization, and as such, on lowering the price. Giving significantly more importance to quality than to price, incorporating a certain degree of subjectivity and provide a balance between network quality and project quality in the criteria are means to improve MEAT.

Finding 9: The current market policy (of Rijkswaterstaat) will lead to a fundamental decrease of the number of large contractors in the infrastructure market. Fewer players means less competition, and thus less need for true differentiation. A decrease of players who bid for the large infrastructure projects will lead to (even more) intensified competition for medium-sized projects. As a result, price-based competition for these projects will get even fiercer.

⁷⁶ Predictability is a result of the fact that clients are making MEAT more objective for accountability reasons. Moreover, companies learn to work with MEAT.



Combining network management and market views

Chapters 7 and 8 resulted in findings based on the network management interviews (Findings 1 through 6), and additional findings based on the market interviews (Findings 7 through 10). These findings were subsequently discussed in four different focus groups consisting of combined network management and market participants (see Appendix 3). This Chapter discusses the outcomes of these discussions following the subsequent interview findings.

9.1 The construction sector does not structurally evolve

The focus groups remarked that Finding 1 (see Section 7.6) is strongly related to the definition of the system of the construction sector. Demarcation of the system allows for definition of the system integrator, the function of the system, the specific market, and the concept of added value. This study focuses on physical infrastructure networks as systems which main function is availability of infrastructure network components. The focus groups participants argue that this seems to be a rather narrow demarcation. Together, the different infrastructure networks make up a system aimed at delivering mobility. As a focus group participant stated: “Use does not adhere to modalities. The point is to satisfy a demand for mobility. Physical networks are just a part of that”. Additionally, the mobility system operates in an area in which several spatial functions are combined. The system demarcation, therefore, must be linked to the chosen system level, and as such to the functions that have to be integrated. Infrastructure networks are not autonomous; they interact.

By choosing the system level, the concept of added value is also defined (see Table 9.1). The provided added value for a physical infrastructure network contributes to availability and reliability of infrastructure network components. This is a different kind of added value than improvement of mobility through integration with adjacent networks and/or modalities (connectivity), or synergy with spatial functions (accessibility)⁷⁷. The system definition also defines the concept ‘market’. The market that is involved in projects is not the same market as the market on the network level, and the market for mobility or area development are different still. This study focuses on the construction sector, the network managers and the market parties that are important to maintaining and optimizing the functions of an infrastructure network. This demarcation is based on current practice as described in Chapter 3. The focus groups participants posed the question whether, in the long term, holding on to physical infrastructure alone could serve as a basis for a sustainable market development in the construction sector.

From the demarcation of the infrastructure network system as a physical system, the study especially focusses on the connection between projects and network. As a result, the concept of added value from a project is only linked to the specific network the project is part of. However, added value can also be linked to ‘higher’ functionalities, such as area optimization through combining area functions with the function of the infrastructure

77 Straatemeier and Bertolini (2019) argue that the real social aim of infrastructure is to provide connectivity and accessibility, rather than mobility.

network, stimulating a different market as well.⁷⁸ As suggested by a participant: “Make the network part of another system, so that the other system determines what value the network will get...This way, the project will not be linked to the network, but to the user and the area”.⁷⁹

Table 9.1: Hierarchy and characterization of infrastructure network systems

| System hierarchy | Infrastructure project | Infrastructure network | Combination of infrastructure networks | Combination of modalities | Area |
|--------------------|--|---|--|--|---|
| System function | Availability of defined components of the infrastructure network | Availability of (parts of the) infrastructure network | Guaranteed traffic flow | Mobility from A to B | Accessibility and connectivity through optimal function combination |
| System integration | Project management | Network management | Collaboration between network managers | Integral transport policy, Traffic information integration, collaboration between transport operators mobility providers | Joint Venture |
| Relevant market | Construction sector (design and built) | Construction sector (design, built and maintain) | Construction sector (design, built, maintain and operate) | Transport operators Mobility providers | Area developers together with transport operators mobility providers |

78 This relates not only to infrastructure network quality but also environmental and spatial quality and the socio-economic development potential of areas etetera. (see Arts et al., 2016a).

79 The A2-project in the city of Maastricht was mentioned as an example. This project integrates infrastructure and the development of the adjacent area. The assessment of the offers that were submitted was linked to the added value for the whole (see Verhees, 2013 and Heeres, 2017).

The focus groups participants confirmed the idea that, as a result of the loose coupling between infrastructure network and project, the market is narrowing down to a project-focused market where added value is mainly project-focused: “The value for the network has disappeared from the projects”. In general, the participants of the focus groups did not think that the current construction market as defined by this study will develop into a market for mobility. Once network managers start relating the tendering requests to a ‘higher’ system level, a new market will emerge – one that will determine the position of the (current) construction market. As stated by a participant: “the constructor’s market has remained too traditional... Contractors are returning to their trade, and other markets are taking over certain functions. These markets will use the contractors as subcontractors”. Also, this new market can bridge the loose coupling between the network managers at the psychological network level, characterized in the focus groups as “several network managers who cannot share value with each other”. The focus groups participants argued that this market will come up with various initiatives that will lead to action: “Various initiatives start emerging bottom-up, this will lead to a better use of the network...this means that value will flow into the network. This also implicitly links the projects to the network with regard to value”.

The focus groups participants added the following elaborations to interview Finding 1, assuming that preserving the (current) construction sector and making it sustainable is taken as the starting point:

- In addition to the relationship between the project and the physical infrastructure network, it is also possible to look at the ‘higher’ system perspective. This provides different interpretations of the concepts of system, system integration, market, and added value;
- When considered from the perspective of a ‘higher’ system (see Table 9.1), projects are not the only niches that allow innovation. (System) innovation can be defined as an innovative contribution to the functioning of the system, depending on the definition of the system;
- The focus on a ‘higher’ system level will lead to the emergence of new markets;
- The role of the network managers is determined by the system level that is selected. The more inclusive the system, the more the (traditional) infrastructure network manager shifts from just a system integrator focussing on its own infrastructure network to a (joint) system director or partner.

9.2 System responsibility can only be outsourced if parts can be functionally separated

The focus groups participants indicated that system integrators are present within the singular infrastructure networks, such as Rijkswaterstaat for the main roads infrastructure. But, since there are several infrastructure managers, who owns the function of integrated mobility? As a focus group participant stated: “There is never a single owner of integrated mobility. The problem is always owned by more than one owner”. Participants mentioned airline company KLM/Air France as an example of a system integrator that holds responsibility for the final functioning, and yet outsources practically all of its functionalities (maintenance, baggage handling, aeroplanes, etcetera). They do this by taking on a strong integrating and directing role. As stated by a focus group participant: “This is possible if you

have a stable vision for the entire system, which can be used as a framework for outsourcing functionalities”. The focus groups results suggest that the stability of the vision and the uniformity of the interests are key when it comes to outsourcing of responsibilities. As an example IHC was also mentioned⁸⁰, a worldwide operating ship builder. The construction of ships used to be organized as a chain, where all the transitions within the chain were tightly managed. Now, construction is organized as a network, with (partially) parallel development of partial functionalities. The collaborative relationships with inherent incentives are the core of the network’s cohesion. Coordination within the network takes place through these relationships. IHC’s role has shifted from monitoring partial products to a directing role that focuses on relationships and monitoring a uniformly defined integrality. As stated by a participant: “Network management is organized through the transactions”. A next step would be to consider the relationship network itself – the alliance – to be the system integrator. Referring to what the focus groups participants said about system integration on mobility level, this may come about, for example, as a result of the collaboration between public network managers (see Table 9.1). In this alliance, there is no overarching system integrator. The parties integrate the system together, based on their mutual relationships and shared objectives.

The focus groups participants believed that collaboration between different infrastructure network managers, for instance in the form of an alliance, would be a better system integrator than appointing a ‘super’ network manager (see the above mentioned remarks about the owners of mobility). The fact that the user greatly impacts the network management makes a relatively short distance between network manager and user important. An alliance between different network managers will encourage them to use their specific, user-focused knowledge and skills to come to an integral result. However, the focus groups results suggest that it will be difficult to find a suitable (integral) performance incentive for public network managers. The discussion in the focus groups did not touch upon the question of how this collaboration should position the transaction to the market. In general, the market will then be engaged to provide added value for a higher system than the physical network, focusing on the function of mobility for the users, instead of existence or availability of physical infrastructure alone.

The focus groups participants stressed that public networks are influenced by many different interests: “it seems that the direction spreads out more and more as a system becomes more public”. Public network managers try to manage these by defining a so-called ‘common or public interest’. However, it is difficult to capture the different interests in a uniform vision and to outsource them from there. Consequently, public responsibility implies that network management should be adaptive.

⁸⁰ Royal IHC Merwede (IHC) specializes in design and construction for the maritime sector (www.ichmerwede.com).

The focus groups participants argue that the allocation of public responsibility to an authority is a societal and political choice. For example, Rijkswaterstaat has been given the system responsibility for the main road network. This is a political choice, which gives Rijkswaterstaat the right to exist. As a participant argued: “Once you make this choice, you have to look at the system that way, too. It is a purely normative matter”. The essence of public infrastructure network managers is to deal with these different interests ‘from some distance’, away from the issues of the day, and to optimally manage the network that was paid for by taxpayers. The paradox is that the network manager needs to be adaptive in order to follow societal developments, but at the same time, he or she needs to be predictable, because the public’s confidence in the network manager is based on predictability. As focus groups participants stated: “You have to be adaptable if you want to stay as predictable as you were before”.

One of the discussions focused on the question what the exact responsibility of a public infrastructure network manager entails. Is it a performance obligation of just having infrastructure elements and linking them in the best possible way for providing maximum availability? Or is it a performance obligation relating to traffic flow or accessibility? (see also Table 9.1) As a participant stated: “When Rijkswaterstaat has to provide traffic flow, they will have to enter into transactions with municipalities and such. They will have to make smart investments in the elements that determine traffic flow”. The assumed responsibility (partially) determines what can be outsourced to the market: “The public interest is determined by politics, so politics also determines what can be left to the market” (focus group quote). Components and the coordination between components can be outsourced based on an integrated vision. Traffic flow can only be outsourced to the market on elements that can also be ‘controlled’ by that market. After all, as a focus group participant argued: “you need a healthy business case to determine whether or not responsibility can be outsourced. Or whether an outsourced responsibility can be taken”.

The following elaborations were added by the focus groups participants to Finding 2:

- The essence of outsourcing is the alignment of the market interests with the societal interests for the duration of the outsourcing;
- Outsourcing of partial responsibility is only possible based on a stable, integral vision;
- Public infrastructure networks are influenced by many different interests. It is difficult to capture these interests in a uniform vision and to outsource these from there;
- The essence of public infrastructure network managers is to deal with these different interests ‘from some distance’, away from daily issues, and to optimally manage the network. This distance can create partial stability, which makes it possible to outsource partial responsibility;
- Components and the coordination between components can be outsourced based on an integrated stable vision. Traffic flow and accessibility can only be outsourced to the market on elements that can also be ‘controlled’ by that market.

9.3 System responsibility can only be taken on with in-depth knowledge of the system

Finding 3 was only shortly discussed in the focus groups. The focus groups participants acknowledged that system integration requires knowledge of the system, the system’s operation, and the system’s critical components. They argued that the functioning of the system is at the heart of the business of network management and the knowledge of critical components provides the basis for programming, preparation and supervision of interventions in the system. Therefore, it is undesirable to outsource this critical knowledge. However, support services can be outsourced by attaching a service provider to one’s own organization. As this concerns critical knowledge, outsourcing will then have to take place within a long-term partnership (see also the discussion of finding 4 in this Chapter).

The focus groups indicated that the public infrastructure network managers and market companies have lost (much of) their knowledge of integral design due to the changing role of the government in relation to the market (see also Section 2.4). “Before the construction fraud, we had builders, designers, and the government. Now, there’s only two left” (focus group quote). It was argued that the public client is withdrawing into directing and supervising only, and that the builders are slowly becoming more integral service suppliers. This has created a gap regarding skills and knowledge. Public clients have rapidly scaled down its own knowledge, without simultaneously allowing the market to build up this knowledge. As a participant indicated: “What you see now, is that there is a procurement machine on the one side, and a supplier on the other side. And neither knows anything about the real business let alone each others business... That goes for the builders as well as for the client”. Especially the integral design skills and knowledge are disappearing in particular on both the market and the client side (see also the discussion in this Section about interview finding 4).

As a consequence of the withdrawal of public clients into directing and supervising, the market started to (partially) build up internal knowledge through their own engineering firms. However, this knowledge is mainly based on and directed to the realization and risk control of projects. As a participant stated: “Integral project design requires the integration of knowledge of planning and decision making processes, operational knowledge, knowledge of management and maintenance, and execution knowledge”. Engineering firms have (or had) integral knowledge as a result of their acting on both the side of the network managers and clients, and the side of the market. As a result, they are valuable to the network manager, the client and the market. However, the focus groups participants observed that as a result of policies such as ‘separation of interests’, the upcoming of specialist consultants and the market policies of contractors, this integral knowledge is also disappearing. The focus groups participants argued that as a result of this the risks (for both the network manager and the market companies) are increasing, particularly at the interface of these areas of knowledge.

9.4 Partnering is a long-term relationship based on financial and non-financial motivators

Partnering between network managers and market companies is based on alignment of goals (see Section 4.4). It is difficult to bring and keep the commercial interests of a market company in line with the societal objectives that the public network manager is trying to attain. The focus groups participants stressed that public objectives are volatile, and as such require a dynamic incentive agreement in the transaction between market and network manager.

The focus groups participants believed that the construction sector in essence works with a restricted group of preferred contractors. The sector is so capital-intensive, that the main clients such as Rijkswaterstaat and ProRail always have to work with the same group of contractors. A preferred contractor focuses on continuity, expecting to achieve a positive result based on a long-term relationship. It is this paradox that forces contractors into (project-focused) short-term strategies, despite the long-term interdependence. “Parties choose to live together without getting married” (focus group quote). According to participants collaboration is impeded by the focus on competition and outsourcing by the clients. Competition and outsourcing seems to have become goals in itself. However, according to the focus groups, true value creation depends on collaboration, the exchange of knowledge and ideas. After all, parties are looking for the value that is more than the sum of its parts, and for this, both parties need to make a contribution.

The question was asked whether tightening the relationship between project and network manager and/or market company for example through partnering is a necessary condition for the development of a sustainable construction sector. The focus groups participants recognized the loose coupling between projects and network management or market parties and its associated effects. However, they also stated that linking the added value to a ‘higher’ system level (from availability to accessibility / connectivity) in particular is what leads to differentiation – and as such – to a healthy, sustainable market (see also the discussion of Findings 1 and 2 in this Chapter) and not partnering in itself. It is the continuation of the (current) construction sector as a kind of ‘internal, standard market’ that is considered ‘a threat’ to a sustainable development of the construction sector.

The focus groups participants added the following elaborations to Finding 4:

- Holding on to the system perspective of the (current) construction market as the market for infrastructure network management is too limited, and will impede a sustainable market development;
- When the system perspective shifts from availability to accessibility/connectivity this will offer much creativity room to the market and strongly encourage differentiation;
- Added value can only be generated as a result of collaboration, using both parties’ knowledge and skills;
- Essentially, the relationship between clients and market parties in the (current) construction sector resembles working with preferred or “in-house” contractors. If the market is to be developed in a sustainable way, the client will have to establish more long-term collaboration relationships rather than short-term project-based relationships.

9.5 Strong goal-oriented governance needs adaptability and cooperation

The focus groups addressed the difference between public and industrial networks. They especially discussed the role of the user, who is both buyer and influencer of the functionality of the network. Contrary to a production network in the industry, the users of a public infrastructure networks use the networks themselves. Because they have freedom of choice, they (can) directly influence the (perceived) functionality of the system. But, in public networks, there is no direct financial relationship with the buyer of the functionality; the user. As a result, the transaction with the market is not directly related to the users: “The optimization function of the network is not linked to individual users” (quote of focus group participant). The question is whether, in public infrastructure networks, the transaction with the market can be brought closer to the interface between user and network manager, and whether added value can be linked to the perceptions of both network manager and user by way of (financial) incentives. In the focus groups some examples of this linkage were mentioned such as toll, when a driver directly pays the supplier for provided availability of infrastructure or virtual tolls based on the degree of usage.

The hierarchical way of governing of public infrastructure networks was confirmed by the participants and they argued that this mostly determines the way of acting of network managers: “In politics, the problem and direction are mostly determined in advance. This requires a uniform governance from problem to solution. In a complex system, however, that’s an unpleasant way of working. It forces you to set and defend boundaries”. Public networks are influenced by many different interests. As stated by a participant: “You face all sorts of problems from society, called societal interests. You start out with one problem, and the subsequent process means you end up in a whole tangle of problems”. The participants suggested that the complexity of the mobility system and the dynamics of society require adaptive network management. ProRail’s portfolio management was mentioned as an example. This type of governance, representing operation, management, maintenance, and projects, offers a means for (re-)prioritization, should this be necessary as a result of changing societal interests.

During the focus groups also the difference in goal and objective setting between public network managers and industrial network managers was discussed. An industrial company can on its own choose which goals and objectives to pursue. This promotes uniformity. However, goals and objectives are imposed on public organizations by politics. These objectives are always compromises, which are never stable over time. As a result, it is practically impossible for a public party to have and keep a uniform objective. A participant argued: “You’re always working in an environment with constantly changing objectives”. Furthermore, a company is able to adjust when the uniformity of the objective decreases: “if a company does not agree with something, it can always pull out” (focus group quote). This is impossible for a public network manager. As a participant phrased: it cannot create ‘Rijkswaterstaat 1’ and ‘Rijkswaterstaat 2’, and give each branch a different objective... They are there to carry out the goals and objectives our democratic system has assigned to them”.

The following elaborations were added by the focus groups participants to Finding 5:

- Public networks always operate in a volatile environment with many changing interests;
- Portfolio management is a potential model for adaptive network management;
- The most important difference between industrial and public networks, is the role of the buyer or user. In a public infrastructure network, the user is both buyer, user and influencer of the system;
- In public networks, the transaction is not linked to usage, but to a ‘translation’ of politics and administration of societal interests.

9.6 Clients should value added value to the infrastructure network over project value

In response to the differentiation cycle of sustainable market dynamics (Chapter 5, Figure 5.1), the focus groups participants stated that value need not always have to be linked to compensation. As discussed in the focus groups, businesses are increasingly run in a societal context, in which business are aware of their social responsibility: “Running a business is not the same as making money”.⁸¹

The focus groups participants argued that it is important for the client to formulate a clear request for the market to respond to. What are they trying to achieve, what is the goal, what are the conditions? A participant phrased this as: “based on a best-value procurement concept, to deliver the best that is possible based on the objectives”. Subsequently, MEAT is a tool to entice parties to make the offered additional value explicitly visible. It is important to link the desired added value to the system for which it may have added value ((see the discussion of finding 1 in this Chapter). The focus groups results indicate that currently the project interests are given too much focus. A first step should be to create the link to the network, by linking the development of added value in the project’s tender to the functionality of the network. But even then, there is still no connection to the use of the network. Real optimization is created when the added value of the market can be linked to the benefit of the users or the environment of the network. These users may be users of the specific physical network (from availability to traffic flow) or users of mobility (optimally travelling from A to B) – see also Table 9.1.

The focus groups participants indicated that projects should not be a goal in themselves. Projects should improve the functionality of the network in which they are being realized. Therefore, the added value of an intervention in the network should be related to the functionality of that network. By making this connection, optimization is taking place at the network level, whereas optimization currently mostly takes place on the project level. As a participant stated: “The intervention should benefit the network, that is value for money. But that is not the way it works now. We are optimizing a tiny network within a network”. DBFM

⁸¹ Corporate Social Responsibility (CSR) refers to the way in which a business carries out its core activities and takes responsibility with regard to the environment and the social context when carrying out these core activities.

was mentioned as an example of an optimized partial network within a network. The network has a societal function and exists for the benefit of the users and areas it connects. The focus groups discussed whether or not added value can be defined on the user level. According to a participant: “The road network is the circulatory system of our society. The profit is not in the existence of the network, but in the way the network benefits our society. But that profit is not flowing back directly into the network or the project”. This would only be possible if usage is linked to network management, and subsequently to the projects. “What you really want is that the entire chain delivers added value, all the way down to the end user” (focus group quote). An example of this is to have users pay for their use of the network, for example by levying tolls, or by contracting network availability to transport operators in the way that ProRail does. It was remarked that in industrial networks, the direct connection to the client is the most important stimulus for optimization of production.

In order to encourage market creativity or innovation, the market has to have a business case. Optimal deployment of means should lead to a profit and means to invest in new capabilities. In itself, a network never has an internal business case for the market. Instead, a business case has to be created through sources of income that are linked to the required performance. The market should be able to deliver this performance based on their specific knowledge and skills...If this connection is not made by the client and the market has limited possibilities to optimize the performance based on their strengths in knowledge and skills, efficiency and austerity to optimize a detailed predefined performance is the only business that remains. After all, that is the only possible way to distinguish oneself from then the competition: “the market is trying to make a profit through efficiency with as little disturbance as possible” (focus group quote).

The following elaborations were added by the focus groups participants to Finding 6:

- The stimulus for creating added value is not just compensation. Companies are becoming ever more aware of their social responsibility;
- The added value of an intervention in the network should be related to the functionality of the network. By making this connection, optimization is taking place on the network level, whereas optimization currently mostly takes place on the project level;
- If the expected (network) performance is not linked to a source of income, a business will optimize a defined performance by way of efficiency and austerity.

9.7 Market dynamics is still based on price competition and not on differentiation

The focus groups participants believed that many things have changed, but not always for the better. As a consequence of external pressure – induced by the contract fraud in the construction sector – the environment has changed, and the system has changed as well. However, not all the causes of change can be traced back to the construction fraud as was pointed out. Other causes that have led to change that were mentioned are: the decrease in the number of government officials; increased use of market dynamics; increased process management; and the economic recession. Despite the changes of the system as noticed, the basic way of working – especially competition and client contractor relationships – is

essentially still the same for the last decennium. As a participant indicated: “The sector has not truly been restructured. They’ve just given it a lick of paint and some new curtains”. The perception that the sector is not willing to radically change was confirmed by the focus groups participants. As participants argued: “Deep down, people simply do not want the unknown unknown... Predictability and reliability...with an extra layer for adaptivity”, and “being distinctive is not seen as an opportunity, but as an additional expenditure”. The focus groups believed that the change will come from what was called ‘breeding grounds’, at the hands of groups of people who look at the business differently, and who are prepared to work together in different ways. This is often seen in situations in which the old way of working creates a lot of mishaps, and people feel the need to start doing things differently (see also Section 2.3). To induce change, creating these ‘breeding grounds’ might be of interest, as a way of stimulating and keeping control of the changes. However, it is important to realize that it will never be possible to completely control this process. As suggested by the focus groups participants, for public organizations – which are focused on control and predictability – this conclusion may be a tricky one to accept. However, creating breeding grounds alone is not enough. In addition, flexibility has to be added to the traditional frameworks, because that is where much attempted change gets bogged down. As stated by a participant: “Change is created bottom-up, but then it gets bogged down in the framework that is imposed top-down”.

The focus groups considered the demand-driven way of working used by the public clients as the main reason why price-based competition is still the norm: “If a party proposes something that was not asked for, you still have to work based on predefined criteria – no matter how brilliant the idea may be” (focus group quote). Furthermore, the mechanism of selection and assessment is strongly focused on equality and objectivity. Objectivity is interpreted by way of a transparent method of valuation announced to the market, for example MEAT. According to a participant: “Why shouldn’t you judge based on beauty... it is all about equality and transparency”. What it comes down to, is that the client should use selection and assessment to find the party that is the best match, given the particular question. Selection should thus be based on a transparent assessment of dissimilarity and distinction that best fits the challenges as presented in the request.

However, the focus groups participants mentioned also turnover-driven business model of the large contractors as a reason why price-based competition is still the norm. The large contractors are organized as holdings of production-driven operating companies. Their priority is to generate turnover by acquiring projects. Creativity is aimed at smartly combining existing resources: “...Value creation results from turnover...” (focus group quote). In this area, a distinction between the various contractors can be made in the way they combine their resources to deliver value and generate turnover. “...It is obvious to me that different contractors prepare the work in different ways...” (focus group quote).

The focus groups participants also pointed out that the market dynamics is still primarily based on promises of ‘value for money’ based on predictions of the (unknown) future. Public clients do not have a mechanisms for valuing actual realized value⁸² or the valuation of past realized promises for example based on past performance: As a participant stated: “Value should be given meaning in the assessment of satisfaction with work already done”. Making promises without running the risk of being held accountable does not encourage a change in behavior. “If value for money is truly important, you should be selecting based on value at the front line” (focus group quote).

An observation of the focus groups participants was that the attitude in the relationships between clients and market in the construction sector is shifting from taking responsibility, being accountable and taking ownership, to holding the other party responsible. This is mainly caused by the increased legalization of the relationship. A participant argued: “Every inch of the relationship is defined in contracts specifying exactly who is responsible for what”. Another cause can be found in the introduction of Anglo-Saxon contracts, such as DBFM. “As a result, everybody is liable, but nobody is accountable” (focus group quote). Further, as a result of projects’ increasingly risk profiles, market parties have started spreading risks by way of contracts as well. According to a participant: “Spreading the responsibility over a large number of players means that, in the end, nobody is responsible”. In this way, accountability is translated into a sum of smaller responsibilities that has been allocated to different parties by contracts.

The following elaborations were added by the focus groups to interview Finding 7:

- Many things have changed since the construction fraud, however, the basic market dynamics appears unchanged;
- It is not possible to point to a single, unambiguous cause for why the sector has changed. The effect of construction fraud on change in the construction sector cannot be separated from the other possible causes, such as the financial and economic crisis and the real estate crisis;
- Change will come from breeding grounds, from people who look at the current business in a different way. By creating these breeding grounds yourself, you can keep some level of control over the changes. In addition, it is important to add flexibility to the existing frameworks, the old regime;
- In the (current) construction market, the purpose of value creation is to generate turnover. Creativity is predominantly aimed at smartly recombining existing resources;
- Relating the valuation of actual value to the delivered value in the past (for example based on past performance instruments) or valuing actually delivered value (for example through DBFM contracts or performance based contracts) is crucial for encouraging a change in behavior of the construction sector;
- Relationships in the construction sector including contracts are more and more based on the division of responsibilities, rather than on working together and taking ownership.

⁸² Only in DBFM contracts the delivered availability of a part of the network is valued.

9.8 In the long term the use of MEAT leads to uniformity

On the basis of the focus groups it can be concluded that, in current construction sector practice, the client's request determines what the market parties offer. In light of the competition, the detailed requests for tender invite the deployment of existing resources: "It is impossible to organize a radical jump in scale. How do you get everybody to jump at the same time? It pays off to be the last one to jump" (focus group quote). Focus group members observed there are most certainly differences between businesses in the sector. Therefore, client-oriented service can be provided in different ways. If this is not rewarded in the request, however, it will not be offered. The focus groups participants suggested that creativity can be encouraged by providing an adequate reward: "In order to think creatively, you need a little more financial room to move".

The focus groups participants indicated the desire to limit transaction costs by uniformization and standardization leads to non-distinctive behavior. Clients can encourage distinction by valuing dissimilarity: "Offers that cannot be compared to each other should be encouraged. Businesses should show their unique qualities. Uniformity suppresses innovation and creativity" (focus group quote). Attention is drawn to MEAT, where objectification has led to calculated behavior. As a participant argued: "The more subjective the assessment, the more you are forced to present and stress your particular strengths". However, the focus groups participants mentioned that real differentiation is hampered by the fact that the construction sector has a very open culture, making differentiation short-lived. "It's just a village, really. Everybody knows everything about everyone" (focus group quote).

It was further noted that competition is still mainly price-based, and that further process optimization is used to create a margin for profit. However, projects are becoming increasingly complex, involve more risks, and increasingly interface with other projects or areas. A lot of factored-in efficiency is lost on these interfaces. As a participant indicated: "Projects are brownfields with lots of interaction. The efficiency you were counting on is lost there. And not just on interfaces outside of the consortium, but particularly within the consortium itself".

The following elaborations were added by the focus groups to Finding 8:

- Detailed requests for tendering that do not reward creativity or innovation lead to demand-driven, resources-based bids. As a result, the market is focused on process optimization and price-based competition;
- The objectification of MEAT leads to calculated behavior. Subjectivity in the assessment and surprising elements in the requests can encourage creativity;
- Equality and transparency should be about the methods of selection and assessment, not about equality of parties and solutions. For differentiation, dissimilarity should be encouraged;

- Differentiation basically means unequal competition. To stimulate differentiation, selection and assessment should value these distinctions. Equality and transparency should be about the methods of selection and assessment, not about equality of parties and solutions;
- The close relationship culture of the construction sector makes unique differentiation practically impossible.

9.9 Current policies lead to a decrease of contractors

A focus group participant argued that "The number of players will decrease. I think we will end up with three at most – and neither of them will do as much as pour a cubic metre of concrete any more. They will start acting as clients, higher up in the column. Everything will be subcontracted. The risks in the large projects will be spread using combinations. If you are left with just three parties, they either have to be able to bear the risk, or transfer the risk to subcontractors. And the latter is what I expect will happen".⁸³

In the focus groups it was noted that the decrease in the number of players could also lead to more differentiation. "Whenever there are many players, a lot of them simply swim with the tide. But if you are left with the extremes, they may be truly differentiated" was put forward in the focus groups. The question was asked why few parties from abroad enter the market. The focus groups believed this is due to the fact that the requests are often aimed at the familiar (Dutch) market, that the requests are often production-oriented, and that the projects entail relatively low yields connected to high risks. This does not appeal to foreign parties as long as higher profits can be made outside of the Netherlands.

The focus groups participants also expected that the number of players in the market of large infrastructure projects will decrease. They also added the following elaborations to Finding 9:

- The large players will develop into general contractors for subcontracting;
- This will lead to increased risk allocation downstream in the supply chain and to fragmented responsibility;
- The requests for tenders from the large clients are a key element in this development.

⁸³ Interestingly, this trend is confirmed by current developments in the Netherlands (see the opening quote from Cobouw for this study at the beginning of Section 1.1).



Public-private interaction in infrastructure networks

This study started with the question how (public) managers of infrastructure networks can link network management to a market approach that will both promote solutions that contribute to their network management (added network value) and promote a sustainable market dynamic in the construction sector (Section 1.2). The study aimed to get a deeper understanding of the performance of the transaction between the (public) manager of an infrastructure network and the market. The transaction in this study encompassed everything that shapes the relationship between these parties. This deeper understanding (1) helps to explain observed behavior of the construction sector, (2) offers the possibility of evaluating intended change in the infrastructure network and/or market policies, and (3) provides a basis for recommendations for planners of infrastructure networks, (public) managers of infrastructure networks and (public and private) professionals in the construction sector to improve market involvement and thereby the planning and development of infrastructure networks.

After presenting the outcomes of the network management and market interviews in Chapters 7 and 8, Chapter 9 presented the results of the discussions in focus groups of the findings from these interviews. This Chapter discusses and concludes the outcomes of both the interviews and the focus groups based on the framework for analysis as presented in Chapter 6, following the three main processes of the framework: system evolution, system ordering by means of tight and less tight relationships and sustainable market dynamics. Per process dominant themes that emerged from the interviews and focus groups are presented and concluded. Based on the conclusions practical recommendations are formulated for (public and semi-public) infrastructure network managers and market companies.

10.1 Discussing system evolution

A construction sector in transition

This study's findings identify the fraudulent practices in the Dutch construction industry of 2002 as a landmark in the relationship between government and market. The general picture that emerges from the interviews and focus groups, is that the construction sector has changed since the construction fraud, but it has not changed in a structural way. There is a recognizable pattern of pressure on the actors, the occurrence of instability, adaptation of the system and restructuring of the system, in accordance with the model of system evolution as described in the framework for analysis (see Section 6.2). The interviewees do see that the construction fraud has led to change. The government has moved upward in the supply chain (relatively quickly and rigorously from 2004 onwards). This created a vacuum that was not immediately filled by the market. In turn, this led to instability, both for the market and the government. Initiatives for developing new instruments unfolded. The market and the network managers learned from developments in other countries (mainly from the UK and US), and through their own experiences. Engineering firms reoriented and partly shifted their activities from services for the government to services for the market. A number of foreign market parties contributed new experience, mainly through DBFM. The 'old' market and the clients transformed to reach a new balance. However, it appears that the desired shift from market dynamics based on price-based competition to differentiation-based competition has not been (structurally) made. It is difficult to separate the effects of

the construction fraud from other major influences, such as the financial and economic crisis and the real estate crisis. However, the large shocks caused by these crises seem to have had such impact that a relapse occurred after 2008. All kinds of factors forced the market (partially) back into price-based competition.

So, after a period of re-alignment and transformation (2004–2008), a period of de-alignment of market interests and network management interests seems to set in from 2008 on. Within the regime of network management and market, there seems to be a number of transition paths, which are not or not completely aligned. The government, as a network manager, has developed in accordance with a specific network policy focusing on network management as the core business. As a client of the market, the government has transformed in accordance with a specific market policy to involve the market more often and earlier in the planning process of projects ('market, unless...'). The market has gone through its own development, (in part) to align with the government market policy, but also strongly influenced by other factors such as international and economic developments, developments in the business of area development, and the fact that different clients have different market policies

The study shows that the construction sector displays characteristics of a complex adaptive social system. In the described system evolution model (Section 2.3, Figure 2.2), radical evolution of the system occurs as a result of a combination of external pressure on the prevailing regime, and the availability of variation. Variation is necessary to achieve evolution. As described, the construction sector has seen its share of external pressures in the last two decades. The findings prove that the pressure of the construction fraud, the financial and economic crisis and the real estate crisis has led to a (incremental) reorganization of the (Dutch) construction sector. Many (partial) transitions can be identified, however, these do not reinforce each other into a particular direction to develop a more radical transition. The sector has not structurally changed for example concerning the market dynamics which is still predominantly based in price competition instead of differentiation.

Eminent from the findings is that a system evolution of the construction sector as a complex adaptive social system cannot be engineered or steered. However, conditions can be created that make it possible to influence a potential direction for development. Conditions that emerge from the study are: consciously creating breeding grounds for innovation for example in the projects, actively adopting innovative ideas from the projects into the organization of the network manager and parent market companies, and tightening the relationships between market companies and (public and semi-public) network managers, facilitating the exchange of new ideas.

Projects are unique breeding grounds for innovation

In the framework for analysis (Chapter 6), projects are considered breeding grounds for variation (niches) for the benefit of the regime of network managers and market companies in the construction sector. The interviews and focus groups confirm that (most of) the variation is created in the projects. Projects are unique incubators for renewal, however, tenders and contracts largely determine the available room and incentives for creative development in the projects.

Projects are however only temporary arrangements. The permanent part of the construction sector consists of the (regime of) network managers and market companies. The connections between the (temporary) projects and the (permanent) regime (should) ensure that innovation is retained (see Chapter 2) in the regime. As it were, these connections are the arteries that provide oxygen to the evolution of the construction sector. The interviews and focus groups show that in the construction sector, the connection between projects and regime appears relatively loose in practice, so that projects operate relatively autonomously from the network and the (parent) market companies. The result is that innovation is mainly used for the balance of the project itself, and only makes a limited contribution to the sustainability of the construction sector as a whole.

The interviewees and focus groups consider that – for the development and innovation of the construction sector – it is essential that the relationship between projects (as breeding grounds for innovation) and the regime (consisting of the network managers and the market parties) has to become tighter. A first step would be for network managers to integrate their network policy and market policy, and for market parties to integrate their tendering and project policy and their company strategy. It appears that, until now, public and semi-public infrastructure network managers (such as Rijkswaterstaat and ProRail) have been developing their network and market policies independently of each other. And, from the moment the contract has been signed, market parties seem to consider projects as separate entities with their own profit targets. However, projects are not and should not be a goal in itself.

Connecting projects to the infrastructure network and parent companies

Projects have value because they fulfil a function in a network. Networks are, in turn, not goals in themselves. Infrastructure networks have value because they offer opportunities to facilitate mobility in combination with adjacent networks or because they provide accessibility to and connectivity between functional areas. The choice of the function of the network and thus the role of the network manager is decisive for what market companies to involve, what mode of market involvement, and what form of transaction. So, the choice of the network management business strongly determines the interpretation of sustainable market market dynamics. As the function of the network is shifting from availability by supplying physical components to for example (facilitating) mobility and/or enhancing accessibility (see also Table 9.1), the possibility of value creation increases and the tasks and responsibilities, which can be outsourced to the market, shift along with it.

The findings show that most clients' requests do not or hardly encourage differentiation in the current practice of the construction sector. Especially the focus groups results indicate that in order to initiate the differentiation cycle, it is important to link added value from projects to the function of the network. The revenue of this added value can then be used to compensate project costs to deliver this added value. Moreover, projects are temporary arrangements, so project-focused knowledge and skills are also in danger of being temporary. The network, however, is permanent. Therefore, it may be profitable to invest in specific knowledge and skills related to the network. With the exception of DBFM, the contracts in projects are not or hardly linked to the network. DBFM-contracts do contain such a link, by way of payment received for infrastructure availability. However, there is no reward for added network value, but rather a penalty for not meeting the requirements. The

link for valuation of added value can only come about when the project is considered based on its function in the network, and if the network has (financial) room for (valuation of) added value (i.e. improve the functionality or environmental effects) created from a project contract. Based on this study, tightening the relationship between network management and project is essential. In addition, the relationship between the market parent company and the participating part of the company in a project should also be tightened. In current practice, however, the project often proves to become (largely) autonomous once the tender has been won. Projects become independent enterprises within the holding, rather than integrated elements that help innovation and renewal to take root in the company.

Figure 10.1 schematically represents the linking of added value generation and valuation by a market company to the network management by way of projects.

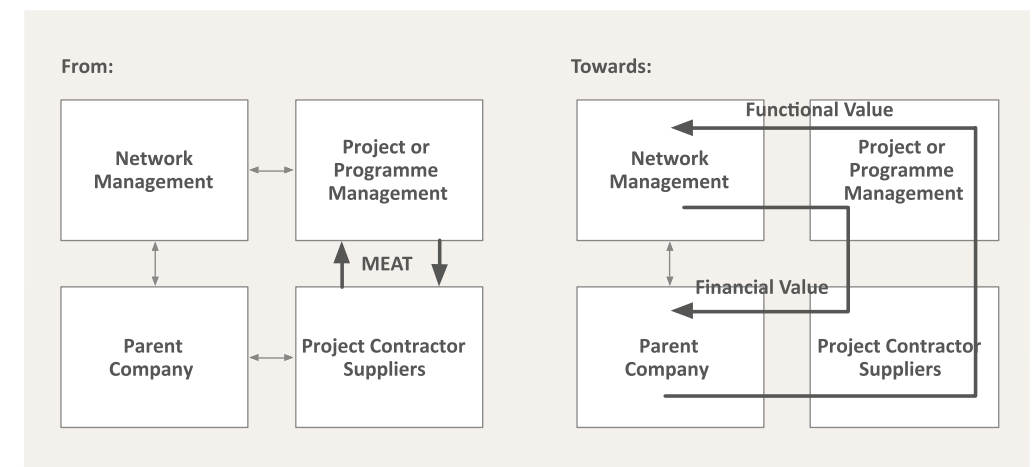


Figure 10.1: From generating project value to generating network value

Shifting responsibilities and keeping the system integrated

In this study we compared the (semi-) public network managers with industrial network managers. The results indicate that outsourcing of (partial) responsibility of the network performance is only possible based on a stable, integral network management vision and a uniform interest that serves as the basis for the governance of the network. However, public infrastructure networks seem to be influenced by many different interests. It is difficult to capture these interests in a uniform vision. The focus groups discussions indicate that the essence of public infrastructure network management is to optimally manage the network 'from some distance', away from these partial interests. Such distance may create relative (partial) stability and, with that, the possibility of outsourcing (partial) responsibility.

The focus groups findings indicate that integral system responsibility cannot be outsourced by public infrastructure network managers, because that responsibility determines the *raison d'être* of the network manager. Responsibility can be partially outsourced when parts

of the system can be functionally separated from the entire system⁸⁴, for example through DBFM. A stable integral network vision and uniform governance should form the basis for this outsourcing. System integration is then retained by interaction between the outsourced sub-systems which has to be organized and managed by and under the responsibility of the infrastructure network manager.

Complete system integration becomes difficult when there is (much) functional interaction between the outsourced parts, influencing the overall behavior of the system. The number of parts, the connectivity and the nature of the interaction then determine whether or not the overall system can still be managed as a whole. Industrial parties choose not to outsource partial responsibility. ProRail, too, only outsources partial responsibility in very limited ways. Public network managers, such as Rijkswaterstaat outsource performance responsibility on a larger scale, through for example performance contracts and DBFM. DBFM places responsibility for the functioning of part of the network in the hands of a market party. The market party optimizes the functionality of that component from the point of view of the existing contract. If the component functions relatively independently from the overall system, the network manager (as integral system integrator) will still have sufficient options for managing the network as a whole. It becomes difficult when there is functional interaction between the outsourced system components, influencing the overall (emergent) behavior of the system. When that happens, system integration no longer consists of 'adding up' relatively independent components, but of organizing interaction between the components in such a way that the overall functionality of the network is optimized. For such interaction, continuous dialogue between the system integrator (the network manager) and the contracted market is required during the term of the contract for example by way of partnerships. The current contract relations of public network managers, which are mostly based on a client-contractor relationship, are considered less suitable for dialogue. A relationship based on partnering – as applied in the industry – seems more suitable to keep the system integrated when parts of the system are outsourced.

Last but not least, system integration requires knowledge of the system, the system's operation, and the system's critical components. The functioning of the system is at the heart of the business of network management, so system knowledge and operational knowledge are unlikely to be outsourced. The knowledge of critical components provides the basis for the visioning, programming, preparation and supervision of the interventions in the system. This knowledge is also unlikely to be outsourced. Support can be outsourced by attaching a service provider to one's own organization. As this concerns critical knowledge, industrial network managers deliberately choose to outsource this knowledge through long-term partnerships.

84 Privatization is what occurs when the responsibility (including financing) of the functioning of the entire system or separated parts of the system are outsourced to the market.

10.2 Discussing system ordering by means of tight and less tight relationships

Project contracts are just one relationship in the transaction

This study reveals a multitude of relationships within the construction sector. The set of relationships on the interface of network management and market is what this study calls the transaction. A change in one of those relationships affects the entire transaction, thereby changing the relationship between network managers and the market. As a result, the transaction is what (also) determines the behavior of the regime in the construction sector.

The findings from the interviews and focus groups show that the construction sector places a strong focus on the relationship between client and contractor, usually a project contract (see Figure 7.2 and Figure 8.1). The contract is considered to be the core of the relationship. This contract is agreed upon at a certain point in time, is based on promises made to each other, and comprises the entire future development of the (project) relationship. As discussed in Chapters 1 and 4, we defined the transaction in this study as the (changing) set of relationships between the network manager and the market, to show that a number of relationships take place at this interface. Chapter 6 and the interview findings, however, indicate that it is impossible to manage and control all relationships of the transaction – which also vary over time – through the contract alone.

The relationships between project and network management and between market companies involved in projects and their parent organizations (the arteries for innovation) seem relatively loose in the construction sector, as are the relationships between network management and these parent organizations (see again Figures 7.2 and 8.1). The relationships can be made tighter by aligning mutual interests (for example through partnering), encouraged by incentives. The findings of this study show that this lack of (tight) relationships impedes a learning cycle between projects and regime, and as such, impedes a radical adaptation of the construction sector. In the industry (as considered in this study) the relationship between network managers and (parent) market companies is considered the main relationship for network and market development (see Figure 7.1). Partnering between a network manager and a market company is usually seen as a long-term service relationship and is relatively independent of specific projects. The projects in the network are derived from this partnering. To keep this relationship aligned, non-financial motivators prove to be especially essential, in addition to financial incentives. Theory and the findings of this study revealed potential future work (continuity) and involvement in the business of the client (customer intimacy) as main non-financial motivators for the market. Both motivators are intensely used in the industry, but seem to be absent in the way public infrastructure network managers involve the market in their business. As a result, the market focuses (or is forced to focus) on (once-only) demand-driven offers, often based on a recombination of existing resources.

From a project relationship to an inter-company (service) partnership

The study shows that market companies and clients in the construction sector focus on (temporary) projects particularly as a result of the current contract types and ways of tendering used by public infrastructure network managers. In their role as clients for the

market, public infrastructure network managers prove to institutionalize competition as the basis of market involvement. If competition were to be based on differentiation, the client would give the market creative space to distinguish from competitors through unique capabilities and the client would value the added value that results from creativity. This study suggests that if this added value is not valued, a tenderer will use efficiency and austerity to optimize a pre-defined (by the client) performance. After all, that is the only possible way to distinguish oneself from competition. The findings show that public network managers' requests are currently relatively specified in detail, allowing limited creative space. Also, the valuation of distinction (e.g. through MEAT) is limited, and mostly related to the costs of the offered measures instead of the (functional) added value. As a result, there is hardly any possibility for the market to invest in new and unique capabilities and competencies. This forces market companies even more into efficiency and austerity (i.e. price-based competition). Another consequence is that the public client's interest of a sustainable market and the market's interest of continuation become de-aligned. The findings from the interviews and the focus groups confirm that it is the public infrastructure network manager who has to take the lead to break this locked-in, by offering opportunity space.

Most large contractors prove to be organized as holdings of operating units or companies. For most of them, the purpose of projects is to generate turnover for these operating units or companies. This turnover is considered necessary, since contractors possess production capacity (which they want to retain in the future). Offers prove to be often smart (re-) combinations of existing resources deployed at the lowest possible costs (exploitation). This way, company turnover is created by project turnover and costs in the projects are reduced to create a margin for profit. Cost reduction is achieved by process optimization, purchasing at competitive prices, minimizing quality, reducing overhead, and limit the pricing of risks. Wherever this touches upon the contract requirements, this may lead to fierce discussions within the projects. The findings of this study indicate that the market is forced to work in this way if it is to guarantee its targeted profit. In the meantime, the client seems to be forced to be working within an (often strictly) defined framework of time and budget.

Both ways of working offer only a (very) limited overlap of interests, and therefore, a little basis for partnering. This effect is increased by the government's reduced current investment in construction projects. On the one hand, this reduces the turnover potential, leading to increased competition for the remaining part. On the other hand, projects are breeding grounds for variation and, as such, for differentiation. When these breeding grounds are lost, alternatives for creating variation are needed, for example through partnerships. However, the interviewees and focus groups stated that the institutionalized competition clause impedes public network managers from entering into these kinds of relationships.

In the industry (as considered in this study), it is the relationship between a network manager and a market party in particular that is considered to be the sustainable connection. Collaboration between a network manager and a market company is often a long-term (service) relationships, which is relatively independent from specific projects. These partnerships are based on combining internal knowledge and knowledge provided by the market. As a result, the business of the network manager is directly linked to the business of the market company. The projects or interventions in the network follow from this

co-creation and are mostly predefined with regard to budget, scope, quality and planning. Because the partnering puts the market very close to the business of the client, added network value can be generated instead of solely project value.

Figure 10.2 below shows the differences found between public infrastructure network managers and industrial network managers with regard to market involvement, as indicated by the interviews and focus groups.

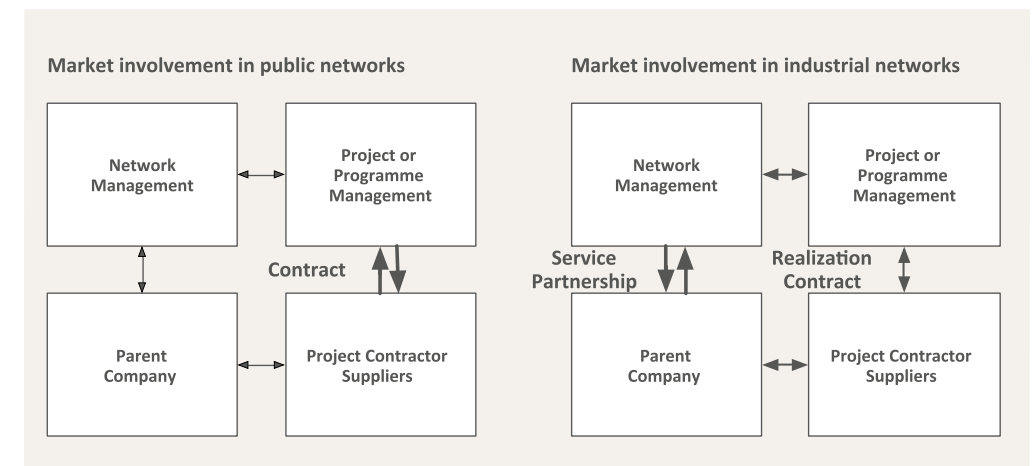


Figure 10.2: Difference between public and industrial network managers with regard to market involvement.

Alignment of interests determines the tightness of the relationship

The study indicates that the tightness of the relationship is (partially) determined by the alignment of interests in that relationship. Interests can be directed through incentives, motivators for delivering certain results, or to (repeatedly) show certain behaviors. Theory indicates the following main (non-financial) motivators for market parties in the construction sector (see Section 4.4): a clear risk allocation that is manageable for the market party; being involved in the design so as to be able to deliver added value; selection based on added value to the project; future work with the prospect of continuation and teaming with the client.

The interview findings indicate that industrial network managers use all incentives mentioned in their transaction with the market. The findings also show that the incentives used by public infrastructure network managers are strongly focused on their own (short-term) interests. Incentives are mainly focused on generating 'value for money' for the client, not on encouraging future behaviors and, with that, a change of regime in the construction sector. As mentioned before, the public infrastructure network managers seem to score particularly low on the long-term motivator (business continuation). Consequently, the market focuses on (once-only) demand-driven offers, often by way of recombination of existing resources.

The functioning of the network is the core, not the projects in that network

The study suggests that industrial network managers explicitly opt for reliable production. An industrial network manager's drive for optimization is predominantly determined by the relationship with a contracted buyer of products or services. The interview and focus groups findings indicate that (semi-) public infrastructure networks (with the exception of ProRail) normally do not have a direct contractual relationship with buyers or end users. Moreover, in a public infrastructure network, users prove to be not only buyers of functionality, but also influencers of that functionality through using the infrastructure. It is a mutual relationship, which differs from the characteristic of an industrial network where the flow of elements is mostly defined and stable. As a result, the industrial network manager can focus mainly on the logistic optimization and reliability of the physical network.

The findings suggest that high network reliability is achieved by the industry (as considered in this study) through risk reduction and centralization of control. System governance and the programming of management, maintenance and projects prove to be the core of the business. Programming is risk-driven, which requires explicit (internal) knowledge of the system and its components (knowledge of assets). Optimization of the network (lean) leads to reduced redundancy and thereby to reduced room for variation in the network. In order to be able to guarantee reliability, the quality of the interventions (by market parties) is maximized and the freedom of variation in the interventions in the network is limited. As a consequence, industrial network managers often separate creativity from the actual interventions in the network. They usually pre-define interventions in the network in terms of budget, scope, risks, quality, and planning and variation is developed separately from the network, e.g. through service partnerships. Through these partnerships the market is closely linked to the business of the client and this provides the opportunity to generate real added value (customer intimacy, see also Section 5.2) for the network.

Eminent from the interviews is that quality has its price. The market will only provide quality if it is compensated. The rationale for this compensation lies in the added value the offered quality brings to the network. According to the focus groups participants this requires a valuation mechanism that links the offers of the market to the (functionality of) the network, for example through most economically advantageous tender (MEAT).

A semi-public network manager such as ProRail proves to opt for reliable functionality, comparable to the industry. However, ProRail uses competition as the basis for the tendering process, but intentionally keeps the options for partnering (alliance) open in the tender. In the case of a public network manager such as Rijkswaterstaat, this option does not appear to be explicitly defined. The market policy of Rijkswaterstaat seems being aimed at competition, rather than being aimed at collaboration. Nevertheless, the infrastructure network policy is focussed on achieving further optimization of the network (making better use of it) and on achieving higher reliability. Both the interviews and focus groups signalled that this results in tension between network management policy and market policy, which combined with the policy of construction contractors to maintain their production capacities (see also next Section) seem to hinder the aligned evolution of a sustainable market dynamics.

10.3 Discussing sustainable market dynamics

This study shows that differentiation is a strong foundation for a sustainable market development. Differentiation is considered to be based on having and developing distinctive knowledge and skills that are valuable for a client. It is based on a cycle of investing in specific capabilities and competencies by the market company, creating competitively distinctive offers and capturing value from the valuation of these offers, which is then used to invest in the further development of distinctive capabilities and competencies. This investment can be made only if the client compensates offered value. If value is not compensated, a company will optimize a (pre)defined performance by the client through efficiency and quality minimalization.

Behavior of construction companies is (short-term) turnover-driven

The results show that large contractors prove to be organized as holdings of operating companies aimed at guaranteeing turnover and profit through the orders on hand. In the construction sector, differentiation is often based on a smart (re-)combination of existing (production) capacity, tailored to the client's request. Structural differentiation based on the development of specific, distinctive core competencies proves to be limited. With limited structural differentiation, price-based competition is still the prevailing market dynamics. This results in a strong focus on the price of the offers, which in turn results in a strong focus on the prices in the production chain (subcontractors) and possible tension in the relationship with the client during realization.

Being turnover-driven makes the companies dependent on clients and vulnerable for economic fluctuation. After all, in the case of decreased turnover, the only thing that remains for market companies is to further optimize the process and to further reduce overhead. Furthermore, a decrease in turnover 'forces' the large contractors forwards in the supply chain as 'organizing' contractors, while simultaneously transferring part of the production and responsibilities to subcontractors, mostly through price competition and dedicated (i.e. specified) contracts. The construction market as discussed in this study can be considered as a kind of 'private' market for ProRail and Rijkswaterstaat. Again and again, these network managers seem to do business with the same (combinations of) market companies. In this kind of market, the main motivators for market companies prove to be business continuation and customer intimacy. Long-term collaborative relationships in close proximity to the client, offering the possibility to build up specific knowledge in interaction with the client, and cost-plus-based compensation are considered important elements for profit and continuation of the business.

Industrial network managers seem to consciously choose to work with preferred suppliers and service providers. They are aware of the market's complimentary knowledge, which is indispensable for reliable and optimal network management. ProRail and Rijkswaterstaat approach their preferred, 'private' market, as they would a competitive market. The market is asked to compete for every project, so there is no investment incentive to secure knowledge for the long term. Furthermore, competition makes it difficult to combine knowledge in co-creation.

The function of the network determines added value

The interviews and focus groups findings stress the importance to link the compensation of added value from projects to the contribution of this added value to the functioning of the network the projects are part of (e.g. by way of MEAT). Related to this, an important question for (public) infrastructure network managers appears to be what their function as network manager consists of. Does the network manager just provide the existence or availability of a physical network, or is the network manager responsible for providing accessibility and connectivity? The choice of the function determines the demarcation of the network (system), the form of system integration, and with that, the roles of both the network manager and the market. The shift in function from providing physical components to providing mobility means that the market involvement shifts from providing products to providing integral services. This choice (partly) determines the added value that the market can supply. The question is whether the companies in the current construction sector are willing or able to deliver this kind of added value. The interviews findings indicate that the current (large) market parties in the construction sector explicitly opt to maintain production, combined with moving forwards in the production chain. As a result of this choice, they have to excel in the segment of integral service provision as well as in the segment of production in order to remain competitive. It is doubtful if this strategy of 'stuck in the middle' will sustain.

A further question is to what extent societal developments will force public infrastructure network managers to make certain choices. In the light of the developing 'information society', it seems that the current situation, in which every network manager optimizes its network separately, is not sustainable. It is to be expected that societal pressure will force infrastructure network managers to integrate their systems (for example by public-public partnerships) and to focus more on offering mobility to the users and accessibility to and connectivity of the surrounding areas. This does not mean moving further forwards in the production chain, but making a shift to a different knowledge field. According to the focus groups this implies a different market than the current construction market.

As the business of the network management is shifting to a 'higher' system level⁸⁵, the responsibility for the contribution to the functioning of the system that is given to the market also shifts. In the case of an engineer & construct contract, only product responsibility is placed in the market. In the case of design & construct, both design and product responsibility are placed in the market. In the case of DBFM, the responsibility for the design, product, maintenance and availability, and performance are all placed in the market. When the responsibility for mobility is placed in the market, that means that the risk of user behavior and the behavior of (multiple) network managers is placed in the market as well. From the point of view that only that responsibilities that can be managed and controlled by the market should be outsourced to the market, this seems a step too far. However, the focus

⁸⁵ In this context, a higher system level means the shift from supplying physical components as a product to supplying availability, to mobility as a service, or to creating accessibility and connectivity. See Chapter 9, Table 9.1.

groups indicate that the market can also take on risks that are partly outside its control, provided that the potential yields are proportional to the risks. Both the interviews and the focus groups participants characterize the current yields in the construction sector as low when compared to the risks and not sufficient for the described shift.

Differentiation implies inequality

Differentiation implies inequality of market parties, and with that, of the offers made by market companies. This study suggests that in a sustainable market, this inequality is based on specific, distinctive knowledge and skills. If this inequality is to be profitable for the market parties, the requests for tender, the selection of bidders and the assessment of offers will have to value this inequality. In the interviews, the market parties in particular put forward that the public clients are increasingly striving for transparent equality as their interpretation of the principle of equal treatment of bidders. This is expressed by non-discerning selection criteria and objectification of MEAT. However, the findings indicate that as MEAT is becoming more objective, the score of a bid is becoming more predictable, and the (necessary) discerning creativity will decrease. The interviews mention that surprise is a prerequisite for creativity. Therefore, more subjectivity in the assessment should be seriously considered (for example by jury assessments) in order to encourage creativity. However, this reveals a paradox, as predictability is considered a prerequisite for investment and creativity based on one's distinctive resources is considered a prerequisite for differentiation.

The opportunities of networking under-used

Networking i.e. building smart portfolios of relationships with other actors to share resources, knowledge and skills, allows businesses to build up unique competencies without having to make large in-house investments. By entering into smart relationships, external resources, knowledge and skills can be linked to internal resources, knowledge and skills which allows for the creation of distinctive combinations. Through networking the own investment can be limited, while the differentiation possibilities are increased at the same time. Moreover, smartly combining of own capabilities and competencies with knowledge and skills from outside through a network of relationships provides a huge potential for variation. As a result, the companies become more flexible and less dependent on a single client. In many business sectors, networking is an essential core competency. It provides an opportunity to generate unique value for the client and thus adaptability of the company and the sector.

It is striking that networking is hardly used for this aim in the current construction sector, even though the ability to network is an important competency for dealing with the paradox mentioned above. A reason may be that networking relies on other capabilities than the generation of turnover through production. The large market companies in the construction sector focus on generating revenue by way of their own and affiliated operating companies. Projects seem to be considered as means for generating turnover. Networking is mostly fixed relationships based on missing skills for a specific client's request or risk distribution. Moreover, the current requests for tender as issued by the large clients in the construction sector facilitate this choice. As long as there is sufficient potential for turnover, this study suggests that the large market companies are not about to change their structure. Only

external pressure put on the construction sector (for example by politics or the economy) will encourage change. But, the construction sector being a system, change will only come about in combination with available variation. Networking may offer an opportunity to generate this variation and, with that, to fundamentally increase the construction sector's adaptivity.

10.4 Concluding on public-private interaction in infrastructure networks

Based on the discussion in the previous sections about public-private interaction in infrastructure networks, the following conclusions are drawn. These conclusions are based on our study of the Dutch construction sector but are considered to be also relevant to other countries as they have experienced similar developments (see Chapter 1).

Conclusion 1: The pressure of the construction fraud and the financial economic crisis has led to an incremental reorganization of the (Dutch) construction sector. Public infrastructure network managers and the market have followed different, not entirely aligned, transition paths. As a result, gaps arose at the interfaces implying increased risks and failure costs for both the network managers and the market. The main change observed concerns more market involvement in public business ('market, unless...') facilitated by new contract forms such as D&C and DBFM. However, the sector has not structurally changed where the market dynamics is concerned, which is still predominantly based on price competition instead of differentiation.

Conclusion 2: Having projects as breeding grounds for innovation is a unique facility for the construction sector. Innovation from projects can only take root if the connections between projects and the network management and the parent companies of the market parties are made tighter. This connection is now relatively loose, so that projects operate relatively autonomously from the network and the market (parent) companies. As a result innovation is mainly used to balance costs and revenues of the projects at hand.

Conclusion 3: Infrastructure networks obtain value by offering accessibility to the user, in combination with adjacent networks or other modalities, and/or mobility in combination with other modalities, and/or by offering accessibility to areas. The selection of the function of the network and, with that, the role of the network manager, determines the configuration of the market that is to be involved in that network, the way the market is involved, the form of the transaction and the interpretation of sustainable market mechanism.

Conclusion 4: Integral system responsibility can not be outsourced. Partial responsibility can be outsourced if parts of the system can be functionally separated from the whole, based on a stable, integral vision and consistent governance with regard to network management. Having a long-term network vision is necessary for programming and for a stable market policy of clients. Subsequently, programming is the basis for network management and market involvement. System integration can be maintained through interactive dialogue between and across outsourced parts based on a relationship of collaboration (partnering). This requires knowledge of the system, the system's operation, the system's critical components which – because these are the heart of network management – are unlikely to be outsourced.

Conclusion 5: The relationships between project and network management, and between market companies involved in projects and their parent organizations are relatively loose in the construction sector. These loose relationships impede a learning cycle between projects and regime of the construction sector, and as such, impede a radical adaptation or development of the sector.

Conclusion 6: In the industry, co-development based on partnerships between the network manager and the market has proven to be a driver for sustainable development of both the network manager and the market. This partnership is often based on long-term (service) relationships, which are relatively independent of specific projects. Contrary to the industry, collaboration in the construction sector is mainly short-term, project-focused.

Conclusion 7: Collaboration can be strengthened by way of incentives. In addition to financial incentives, non-financial incentives are necessary to strengthen collaboration, especially the prospect of future work (continuity) and involvement in the business of the client (customer intimacy). Both motivators are largely lacking in the market involvement by public network managers in the construction sector.

Conclusion 8: High functionality of the network requires high quality interventions or projects by the market. However, quality has its price. As such, value generated by the project is related to the functionality of the network. Responsibility for supplying reliable quality can only be transferred to the market if the extra costs involved are compensated. The ratio for valuation of this high quality is the trade-off for the increased reliability of the functioning of the network, allowing for improved exploitation and functioning of the network. A sustainable market mechanism can only be encouraged through the projects by explicitly linking the valuation mechanism to the functioning of the network.

Conclusion 9: Differentiation is a strong basis for sustainable market development. Differentiation is based on having and developing discerning (competitive) knowledge and skills that are of value to a client. Differentiation can only be created when the request by clients to the market, the selection of bidders and the assessment of offers all value distinctiveness, as well as the market policy of clients is consistent over a longer period of time, relatively unconnected to the separate projects. Investing pays off if the delivered value is reimbursed over the cost of the bid, and if the market policy of potential customers is consistent over a longer period of time. Consistency in the network and market policy and/or clustering projects, e.g. in programs is essential to achieve this.

Conclusion 10: In the practice of the construction sector the differentiation cycle works mainly within the project relationship. However, projects are not objectives in themselves. Projects have value, because they fulfil a function for network management. It is especially the added value that projects can give to the functionality of infrastructure networks what encourages a sustainable market dynamics.

Conclusion 11: Differentiation is about differences between providers and thus implies inequality of market parties, and with that, of the offers made by market companies. If this inequality is to be profitable for the market parties, the requests for tender by the client, the selection of bidders and the assessment of offers will have to value this inequality.

Conclusion 12: Through networking – organizing smart relationships that connect resources, knowledge and skills from outside the organization to your own means through a dedicated portfolio of relationships – market parties can limit their own investments, while the differentiation possibilities for the offers are increased at the same time. As a result, the companies become more flexible and less dependent on a single client. Within the construction sector, networking is mainly project-related.

10.5 Towards valuable market involvement in infrastructure networks

In this study, we have looked at how the relationship between (public end semi-public) network managers and market parties can be shaped, taking the best advantage of what the (construction) market and (public) infrastructure network managers can offer to each other now and in the future.

We started in Chapter 1 with the question of how public network managers can link optimal network management to a market approach that generates solutions which contribute to an optimal network management (added value), while at the same time stimulating a sustainable market dynamics in the construction sector. The study shows that, both from the perspective of the system and the perspective of the market dynamics, the relationship between network manager and project, the relationship between market company and project, and the relationship between network management and market company are all essential for a sustainable development of the construction sector. If the sector is to develop in a sustainable way, it is these relationships in particular that need to be strengthened compared to the current situation. The framework we constructed in Chapter 6 consisted of a (single) differentiation cycle connecting the market to the client. In fact, the study shows that two connected cycles of development in the system of the construction sector can and should be discerned. On the one hand, there is the cycle of network value creation based on differentiation. Connecting projects to network managers and market companies is key in this cycle. A second cycle can or should be connected to the first cycle for the purpose of creating sustainable retention of innovation in the system of the construction sector. This cycle is represented on the left, in Figure 10.3. Both cycles are linked through the network managers and the market companies. Therefore, the (collaborative) relationship between these actors is essential and both cycles are necessary for optimal network management and at the same time the development of sustainable market dynamics.

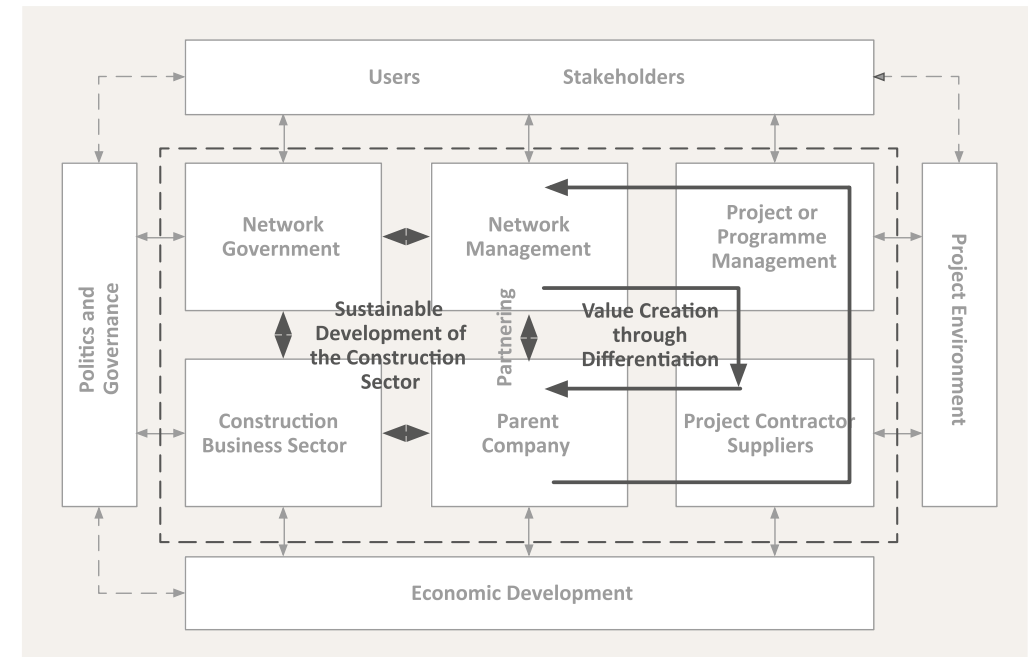


Figure 10.3: The transaction as two connected cycles of relationships

Based on the study, the following recommendations for (public) infrastructure network managers can be made for enhancing sustainable market involvement in infrastructure networks:

Recommendation 1: As reliable functionality of the network is the main objective of (public) network managers, the following aspects should be considered based on the findings from the industry: central governance with a uniform prioritization and programming of operation, maintenance and projects, portfolio management of operation, maintenance, and projects, a long-term network vision as a base for market involvement, risk-driven programming of interventions and the use of projects to create innovation and variation in parts of the network where functionality is least impacted.

Recommendation 2: In principle, system knowledge, operational knowledge and knowledge of critical system components (assets) for the functionality of the network should not be outsourced, unless certain components of the system can be functionally separated from the overall system.

Recommendation 3: With regard to the focus of the (large) market parties in the construction sector on turnover, the customers' turnover potential has become a determining factor in the development of a sustainable market. It is up to the client to use the tendering process to encourage the market to change for example by shifting the character of requests for tender from supplying physical components and availability, to mobility and accessibility (functional shift). A possible consequence would be the emergence of new market parties.

Recommendation 4: Through partnering the relationship between public clients and market parties can be strengthened. Building a good relationship as partners takes time. Because partnering is founded in trust it should be based on longer lasting relationships. Partnering should be based on clear process agreements that clearly define accountability and specify grounds for termination of the collaboration. Funding, division of responsibility and risk allocation should be specified and taken care of in advance. Benchmarking can be used to challenge the value for money (price/quality) of the market contribution to the collaboration. Partnering is based on an overlap of interests so both parties' activities and contributions should be required to achieve the desired outcome. Partnering with a market party does not mean that the collaboration is continued into the underlying chain. The most important incentive for the market to invest in partnering is the foresight of continuity of the collaboration.

Recommendation 5: A system evolution of the construction sector as a complex adaptive social system cannot be strictly managed. However, conditions can be created with which a possible development may be affected, like the creation of breeding grounds for innovation (for example in projects), organizing the implementation of innovative ideas into the existing organization, encouraging innovation of network management and development (through for example projects) as core businesses of network management, and encouraging the market through a valuation mechanism that both encourages creativity in projects and long-term behavior, making use of the motivators of continuity and customer intimacy.

To conclude, in this study we provided insight into the performance of the relationship (the transaction) between the (public) manager of an infrastructure network and the market. Apart from the (project) contract other relationships proved to be important for this transaction. As such, the transaction contains several 'control switches' that regulates the connection. It is not only the market policy and the way market parties are involved in projects. Also important are the network policies of the network management and the market policies of (parent) market companies. Through the practice following from these policies network management affects the behavior and development of the market and vice versa. Here the double role of the network manager as both client for the market and manager of the infrastructure network proves to be important. Related to this dual role the study shows that two connected cycles of development in the system of the construction sector can and should be discerned. A cycle of network value creation from projects based on differentiation. And a cycle creating sustainable retention of innovation in the system of the construction sector. In these cycles, especially the relationship between projects and network management, and the relationship between network managers and (parent) market companies prove to be vital for both optimal network management as the development of sustainable market dynamics.

Appendices

Appendix 1: List of network management interviews

| No. | Position | Company | Business | Network |
|-----|------------------------------------|-------------------------------|---|-------------|
| 01 | Plant Manager | Akzo-Nobel | Producer of specialty chemicals | Industrial |
| 02 | Plant Manager | Delamine | Ethylene amine manufacturer and production plant | Industrial |
| 03 | Program Manager | Delamine | See above | Industrial |
| 04 | Procurement Manager | Delamine | See above | Industrial |
| 05 | Program Manager | Stork | Industrial operation, maintenance and asset management service provider | Industrial |
| 06 | Production Manager | Scania Trucks the Netherlands | Scania truck assemblage factory (Zwolle) | Industrial |
| 07 | Purchasing Manager | Scania Trucks the Netherlands | See above | Industrial |
| 08 | Purchasing Manager | Chemelot/DSM | Producer of specialty chemicals | Industrial |
| 09 | Senior Consultant Infrastructure | Rijkswaterstaat | Main road and waterways network operator and manager, NL | Public |
| 10 | Senior Consultant Infrastructure | Rijkswaterstaat | See above | Public |
| 11 | Infra Provider | Rijkswaterstaat | See above | Public |
| 12 | Infra Provider | Rijkswaterstaat | See above | Public |
| 13 | Senior Consultant Market | Rijkswaterstaat | See above | Public |
| 14 | Infra Provider | ProRail | Main railroad network operator and manager, NL | Public |
| 15 | Project Manager | ProRail | See above | Public |
| 16 | Manager Tendering and Purchasing | ProRail | See above | Public |
| 17 | Network Manager | TenneT | Main (electricity)energy network operator and manager, NL | Semi-public |
| 18 | Network Manager | TenneT | See above | Semi-public |
| 19 | General Director | Highways Agency UK | Main road and waterways network operator and manager, UK | Public |
| 20 | Senior Advisor Infrastructure | Highways Agency UK | See above | Public |
| 21 | Director of Projects & Engineering | Schiphol Airport | Main airport operator and manager | Semi-public |
| 22 | Senior Consultant | Schiphol Airport | See above | Semi-public |

Appendix 2: List of market interviews

| No. | Strategic Group | Company | Position |
|-----|------------------------------------|------------------------|---|
| 01 | Large contractors | BAM | Innovation manager, infra consultancy |
| 02 | | Strukton | Manager of public-private partnering |
| 03 | | Strukton | General manager / CEO |
| 04 | | Strukton | Marketing manager |
| 05 | | Strukton | Project manager |
| 06 | | TBI/Mobilis | Director |
| 07 | | Volker Wessels | Senior tendering manager |
| 08 | | Dura Vermeer | CEO |
| 09 | | Dura Vermeer | Tender manager |
| 10 | | Dura Vermeer | Consultant to Board of Directors |
| 11 | | Ballast Nedam | General manager / CEO |
| 12 | | Heijmans | Tender manager |
| 13 | | Heijmans | CEO |
| 14 | Medium-sized contractors | CFE Nederland | CEO |
| 15 | Technical installation contractors | Imtech Infra | CEO |
| 16 | | Cofely | General manager / CEO |
| 17 | Specialist contractors | Boskalis | CEO |
| 18 | | Van Oord | CEO |
| 19 | Engineering firms | Movares | Senior Consultant |
| 20 | | Movares | Manager rail |
| 21 | | Movares | Account manager market |
| 22 | | RoyalHaskoning DHVP152 | Board of Directors |
| 23 | | Consultants | Rebelgroup Advisory |
| 24 | Consultants | Rebelgroup Advisory | Financial Consultant |
| 25 | Financers | John Laing | International operations director |
| 26 | | John Laing | International operations director |
| 27 | Clients | Rijkswaterstaat | Strategic advisor market |
| 28 | | Rijkswaterstaat | Manager / senior consultant Market and Purchasing |
| 29 | | Havenbedrijf Rotterdam | Managing Director Project Organization Maasvlakte 2 |
| 30 | | ProRail | Manager AKI |
| 31 | | ProRail | Network management director |
| 32 | | ProRail | Project manager |
| 33 | | Highway A2 Maastricht | Project director |
| 34 | | Highway A2 Maastricht | Planning manager |

| | | | |
|----|---------------|--------------------|-----------------------------------|
| 35 | International | Arup Europe | Director |
| 36 | | CFE Europe | Manager |
| 37 | | CFE/Vinci | Manager |
| 38 | | CFE/Vinci | Manager |
| 39 | | CFE/Vinci | Director CFE Europe |
| 40 | | Vinci | Director of concessions CFE/Vinci |
| 41 | | Vinci | Board of Directors CFE/Vinci |
| 42 | Experts | IMG Consult | CEO |
| 43 | | WB ConsultingP153F | Consultant /partner |

Appendix 3: List of focus group participants

| Focus group 1 (network) | | |
|-------------------------|---|-------------------------------|
| No. | Position | Company |
| 01 | Manager financing and public-private partnering | Rebelgroup Advisory Rotterdam |
| 02 | Manager contracting and market approach | Rebelgroup Advisory Rotterdam |
| 03 | Manager DBFMO and financing | Rebelgroup Advisory Rotterdam |
| 04 | Manager of public-private partnering | Rebelgroup Advisory Rotterdam |

| Focus group 2 (market) | | |
|------------------------|---|-------------------------------|
| No. | Position | Company |
| 05 | Manager financing and public-private partnering | Rebelgroup Advisory Rotterdam |
| 06 | Manager economics and public transactions | Rebelgroup Advisory Rotterdam |
| 07 | Manager legal aspects and transactions | Rebelgroup Advisory Rotterdam |
| 08 | Senior consultant PPP | Rebelgroup Advisory Rotterdam |
| 09 | Manager of public-private partnering | Rebelgroup Advisory Rotterdam |

| Focus group 3 (market) | | |
|------------------------|--|-----------------|
| No. | Name | Company |
| 10 | Business manager infrastructure | Arup |
| 11 | Contract manager project Schiphol-Amsterdam-Almere | Rijkswaterstaat |
| 12 | Rijkswaterstaat infrastructure consultant | Rijkswaterstaat |
| 13 | Manager civil engineering | Strukton |
| 14 | Contracting consultant | WB De Ruimte |

| Focus group 4 (network) | | |
|-------------------------|--|--------------------------------|
| No. | Name | Company |
| 15 | Manager network development Rijkswaterstaat West Netherlands South | Rijkswaterstaat |
| 16 | Strategic advisor construction and maintenance | Rijkswaterstaat |
| 17 | Assistant professor asset management | Delft University of Technology |
| 18 | Founding director | Rebelgroup Advisory Rotterdam |
| 19 | CEO | WB De Ruimte |
| 20 | Director of traffic management | Goudappel Coffeng |

Appendix 4: Network management interview questions

The central research question of the study is defined as follows:

How can (public) managers of infrastructure networks link network management to a market approach that will both promote solutions that contribute to their network management (added customer value), and promote a sustainable market dynamic in the construction sector?

The key aspects in this question were translated into interview topics and questions for industrial, semi-public and public network managers:

- Infrastructure network: How is it defined and perceived by the interviewee?
- Network management: What does network management mean for the interviewee and how is it elaborated in the business of the interviewee?
- Market and market approach: What does the interviewee perceive as his/her market and what instruments are used to involve the market in the business?
- Added (customer) value: What does the interviewee consider added value and how does he/she generate added value in the business through market involvement?

Consequently, the following (main) questions were asked during the interviews:

1. What is the characterization of the network regarding content and context?
 - What are the elements that make up the network?
 - What is the characterization of the network?
 - What is the specific context of the network?
2. What is the philosophy with regard to value preservation and value increase of the network?
 - What is the specific added value of the network?
 - What is the philosophy regarding value preservation or value increase?
3. How is the network managed?
 - What tools and control variables are used to manage the network?
 - What is the scope of projects for management and maintenance and for expansion and renewal?
 - How are the projects managed?
 - How is the relationship between projects and the functioning of the network managed?
4. What is the market? How is this market involved in the network management?
 - Who or what is the market?
 - What is the prevailing market policy?
 - How is the market policy aligned to the way the network is managed?

5. Which forms of market relationships and transaction structures are used when involving the market with the network management, and why?
6. Did you miss any issues in this interview that you would like to mention?
7. In your opinion, which people or organizations could be of interest or should be included in this research?

Appendix 5: Market interview questions

The central research question of the study is defined as follows:

How can (public) managers of infrastructure networks link network management to a market approach that will both promote solutions that contribute to their network management (added customer value), and promote a sustainable market dynamic in the construction sector?

The key aspects in this question are translated to interview topics and questions for the representatives of commercial firms working in the preparation, realization, management, maintenance, exploitation and financing of infrastructure projects:

- Market mechanism and added value: What are the main transaction instruments and how does interviewee evaluate these?
- Network management: How is the market involved in the network management of major clients?
- Construction sector: What does the interviewee perceive as the construction market and how does the interviewee evaluate the development of the sector in hindsight and foresight?

Consequently, the following questions were asked during the interviews:

1. What is your opinion about the current market dynamics in the construction sector for large infrastructural projects?
 - How is the construction sector for major infrastructural projects set up when it comes to players and relationships?
 - How does the market dynamics work?
 - How do you position your company in this game?
 - What is your opinion about the current market dynamics in the construction sector as a whole, and for large infrastructural projects in particular?
 - Has the market dynamics changed since the 2002 construction fraud scandal? And how?
2. What market strategy does your company employ?
3. How is the construction sector for major infrastructural projects set up with respect to players and relationships?
 - What is the role of large public clients, such as Rijkswaterstaat and ProRail?
 - In your opinion, what are the positive and negative aspects of the way these clients perform their roles?
 - Do you see any differences between the various clients in this respect?
 - What is the role of engineering firms and financiers in the market?

4. What forms of transaction are used? How do you assess the relationship between the transactions and the market dynamics and the market development in the sector?
5. Which trends do you expect to see in the construction sector within the next five to ten years?
 - Which trends do you expect to see in the construction sector within the next five to ten years?
 - What are the opportunities and threats that will come with these trends, in your opinion?
6. Did you miss any issues in this interview that you would like to mention?
7. In your opinion, which people or organizations could be of interest or should be included in this research?

Appendix 6: Tendering procedures and contract forms

Public contracting authorities in the EU have to tender according to European public procurement rules for services and works as given in the EU Directives 2014/23, 2014/24 and 2014/25. Contracting authorities are in the EU directive defined as all bodies governed by public law or more specifically any body established for the specific purpose of meeting needs in the general interest and not having an industrial or commercial character, which has legal personality and is financed for the most part by the state or is subject to management supervision by the latter. The EU Directives have to be ‘translated’ in national laws. In The Netherlands, the so-called ‘Aanbestedingswet 2012’ (‘Procurement Law 2012’) encompasses the conversion of the EU Directives into Dutch law. As of 1 July 2016, the revised Aanbestedingswet 2012 came into effect and by this it provides the legal framework for public contracting authorities in The Netherlands⁸⁶.

The European public procurement rules for services and works offer (public) contracting authorities the choice between different tendering procedures (Dutch Government, 2014). The standard procedures are the *open* and the *restricted* procedure.

In the *open procedure* any interested market party can, as reaction on an announcement, request the tender documents and register. The registrations are then tested for exclusion criteria, suitability requirements, terms of reference and awarding criteria. The tender proceeds in one phase and end with a winner who is awarded the contract.

The *restricted procedure* is a two-stage public procedure (preselection and selection). After the announcement, all interested market parties can register via a request to participate, which is tested on exclusion criteria, suitability requirements and/or selection criteria. The contracting authority then invites a limited, predetermined number of applicants who have reached the highest level after evaluating the pre-selection criteria. These tenderers can submit a tender. The tenders are then tested against the terms of reference and the award criteria.

A number of additional procurement procedures can only be used in special cases in combination with the previous procedures, such as the *negotiated procedure*, in which after tendering the contracting authority can negotiate with one or more tenderers and/or the *competitive dialogue*, in which before the registration a dialogue is held with the candidates on the framework of the tender. A special procedure is the *prize competition*, which may be an open or restricted procedure with award by means of judging by a jury instead of pre-specified award criteria.

⁸⁶ For further information see www.PIANOo.nl.

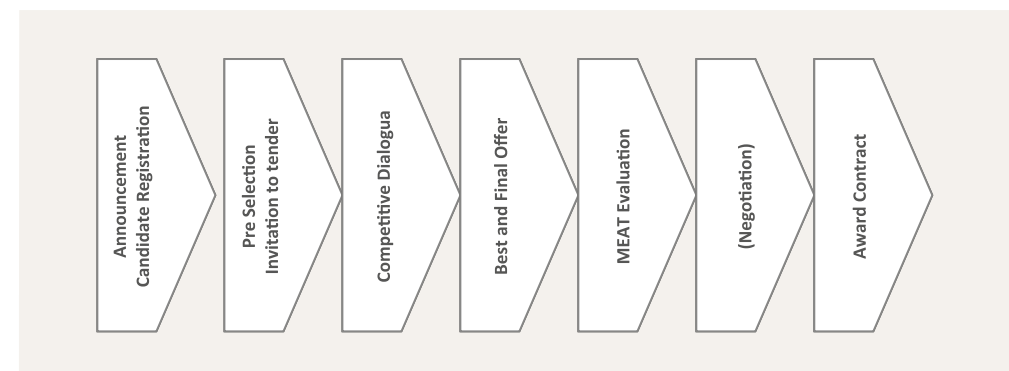


Figure A6-1: European public procurement procedures

In The Netherlands recently a novel procurement method was introduced, Performance Information Procurement (PIP) or Best Value Procurement (BVP). The method was developed by Dean T. Kashiwagi, director of the Performance Based Studies Research Group of the Arizona State University. The essence of PIP or BVP is that the role of the client changes, from expert (with regard to all content) to the role of recognizing and effectively bringing in specific expertise through best value procurement. The client gets ‘best value’ when the right (market) experts are carrying out the task, the expectations of the outcome have been agreed upon by both client and contractor, and the risks have been correctly allocated. In this philosophy, the client’s role is limited to describing what he thinks he wants (expectation), selecting the right experts, and making decisions, providing that decisions are only necessary in case there is doubt with regard to future conditions. PIP tries to minimize client functions during design, construction and maintenance and optimize market expert involvement. The core of the method is the effective selection of the right experts, which is totally based on verifiable performance information to be delivered by the tendering expert. The way to cultivate performance is to hire contractors that can prove previous performance and then let do their job. For more information see Morledge et al. (2006) and Van de Rijt and Santema (2013).

In addition to the various procurement procedures, also various contract forms are used in the building sector. The *build* contract is the traditional method of tendering for construction projects. The responsibility of a contractor is solely to build in accordance with the specifications of the request. In the specifications the design, as developed by the client, is fully specified. The client translates the design into quantities, on which the contractor only has to deliver unit prices. In addition to the design risk, the client also bears the risk of quantity deviations.

A variant is the *engineer & build* contract (E&C), where the contractor has to do the translation from design to quantity. This does place this responsibility on the market, however, not the design responsibility. In a *design & build* contract⁸⁷ (D&B) no specified

⁸⁷ In this study, the term design & construct (D&C) for this type of contract is used.

design is provided by the client, only a desired outcome is presented. This allows contractors to include more creativity in their proposed tender bids, as they can propose their own design to achieve the desired. This type of contract is ideally suited for projects with a strong relationship between design and execution. As a result, the additional design risk that is pushed towards the contractor can be compensated by creative solutions in design and execution.

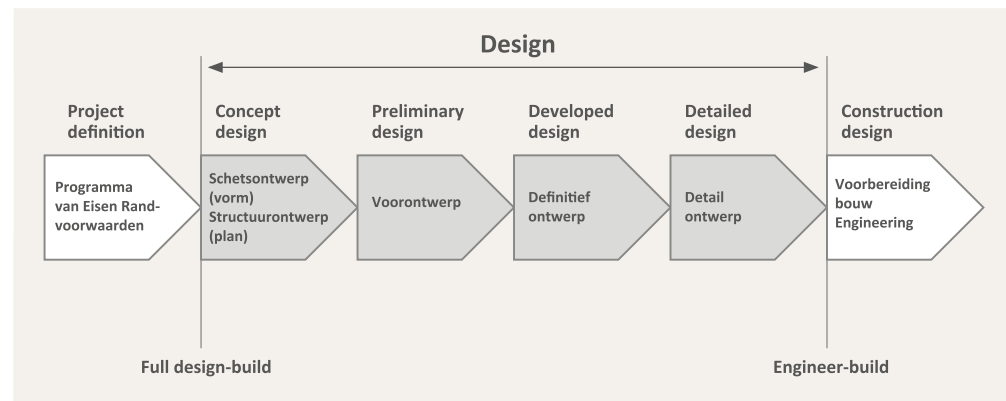


Figure A6-2: Design phases (taken www.AIA.org)

The design process goes through a number of phases (see Figure A6-2) and the design & build contract may have various gradations linked to the degree of detail of the design, which is given by the client as the basis for the contract. The lower limit is engineer & build, where the (detailed) design is determined by the client in a detailed specification. The upper limit is a fully functional specification with an indicative (concept) design of the client as basis. The essence of design & build is that in addition to a minimum quality level, a 'functional space' is provided, within which market parties are allowed to search for solutions. The solutions must meet the minimum quality level and must deliver the requested functions as specified by the functional specifications. Often within the functional space direction is given through an incentive scheme such as Most Economical Advantageous Tender (MEAT). The economically most advantageous tender criterion enables the contracting authority to take account of criteria that reflect qualitative, technical and sustainable aspects of the tender submission as well as price when reaching an award decision. Design & build can be regarded as a continuum from detailed prescribed design to maximum functional space. The larger the space, the more room for creativity, however, the greater the chance of surprises. The fear of excessive surprises often drives the contracting authority to more detailed demand specifications. Through competitive dialogue, a dialogue between the contracting authority and the market party, the development of a solution direction can be followed prior to awarding of the contract.

Management and maintenance can be put on the market as a service, separate from the above mentioned contract forms. The specification of the request determines the responsibility of the contractor after award. This can also vary from fully specified to functionally specified (*maintenance performance contract*). In a *design-build-maintain*

contract (DBM) the maintenance phase is integrated in a design & build contract. This provides an extra synergy possibility through combination of design, construction and maintenance. Design and construction errors often occur during the first years of use, i.e. during the maintenance phase. The combination with maintain offers an extra incentive on the robustness of the design and construction.

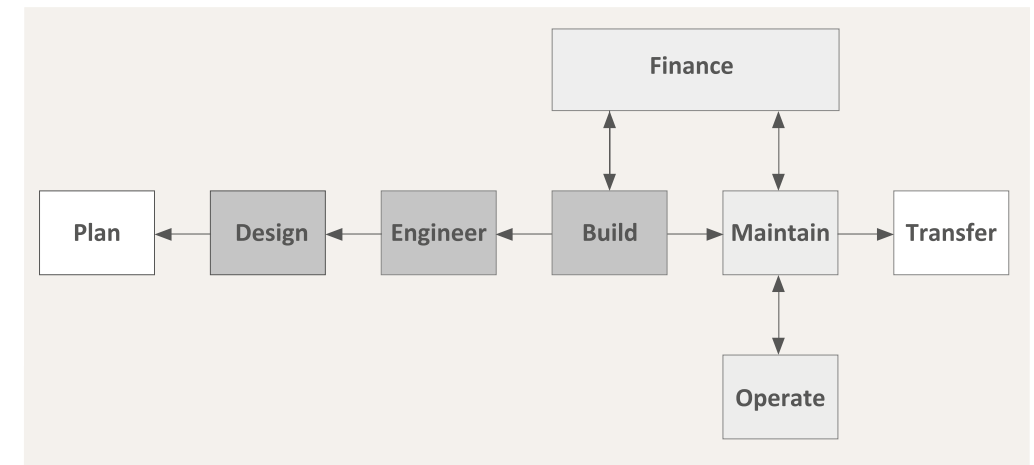


Figure A6-3: Vertical and horizontal integration (taken from www.AIA.org)

The integration of design and construct, whether or not in combination with maintain, is a vertical integration seen from perspective of a building contractor⁸⁸. It is an integration of subsequent activities. Horizontal integration involves combining parallel activities. Practically this involves the combination with, for example, financing and / or operation (management). In a *design-build-finance-maintain* (DBFM) contract, the contractor also bears, beside the design-build-maintain responsibility, the responsibility for (part of) the financing of the project. This is a vertically integrated contract, which is further horizontally integrated with financing. Via the combination with financing, the contract is directed through a payment incentive, linked to the functional availability and performance of the project. In a *design-build-finance-maintain-operate* (DBFMO) contract also operation is included.

A policy of the EU is to stimulate (commercial) innovation. Therefore, specific procurement rules were added in the EU Directives. *Innovation Partnership* is a new procedure in European Directive 2014/24 and in the revised *Aanbestedingswet 2012*. This procedure can be used to purchase products, works and services that are not yet available on the market (or in any case not with the desired performance level). The innovation partnership consists of three phases, a competition phase, a research and development phase and a commercial

⁸⁸ Vertical integration involves the combination of multiple steps or functions in the supply chain to a client. Horizontal integration involves the combining of main activities in the supply chain with parallel activities. Note that the vertical integration is schematized horizontally in Figure A6-3.

phase. In every phase the number of participants can be reduced. An innovation partnership can be concluded with one or more companies. The competition phase is broadly the same as the above mentioned negotiated procedure. In the tender documents the problem or need is defined and the purpose for which the innovative solution is desired and the minimum requirements that the innovative solution must meet. The innovation partnership must be awarded on the basis of MEAT. The research and development phase includes the development of the innovative solution, such as the development of a prototype, the production of a test series or the execution of a pilot project. In the commercial phase, the purchase of the developed products, services or works takes place. If several parties have successfully completed the innovation partnership, the remaining partners can make a commercial offer, which can be awarded based on predefined MEAT criteria.

- Actor*: The system agent that 'acts'. His or her acting influences other actors in the system or the system environment through ties or relationships.
- Adaptation*: Using the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (taken from Folke, 2006).
- Alliance*: A collaborative partnership between two or more independent firms, with a shared goal/objective and overlapping interests. Risks, costs and yields are shared, with the latter two proportionally divided based on said costs and risks. The collaboration implies joint activities and the necessary input of both parties, as well as a joint decision making process. An alliance is a developed form of collaboration or partnering.
- Business sector or industry*: A collection of businesses or business subsidiaries which produce similar products based on similar technology.
- Competitive dialogue*: A competitive dialogue entails bi-lateral exchange of information through rounds of dialogue between contracting authority and bidder prior to the tender. This allows the contracting authority to investigate which of the solutions offered by the bidders best meets his needs. The competitive dialogue is mostly used when, given the context of the project, the contracting authority is not objectively able to perfectly specify his request or contract conditions relating to the project in advance.
- Complex system*: A system of two or more elements that are connected through mutually dependent relationships. In a complex system, the interaction between the elements of the system and between the system and its environment cannot be understood through analysis of those elements and their relationships. When a system with many elements and relationships can be described in terms of the individual elements and relationships (and can be decomposed), the system is not complex, but complicated.
- Complex adaptive system*: Entity consisting of many diverse and autonomous components or parts which are interrelated, interdependent, linked through many interconnections, and behave as a unified whole in learning from experience and in adjusting (not just reacting) to changes in the environment.
- Complex adaptive social system*: A complex adaptive system develops into a social system, through the fact that shared routines, patterns and norms and values are developed by way of interaction of actors within the system. In a socially adaptive system, the actors learn through experience. As such, they can anticipate a possible future during selection (taken from Miller & Page, 2007).
- Construction sector*: The part of the construction industry that is involved with (large) infrastructure projects. This relates to all managers, clients and market firms working in the preparation, realization, management, maintenance and financing of the (large) infrastructure.
- Contract*: A balance in the relationships between a client and a contractor, congealed at a certain moment (as a result of a tendering process) and focused on future task fulfilment (division of tasks with responsibilities and role fulfilment) with flexibility to counter any disruption to the balance during the period in which the contract is effective.
- Core competency*: Core competencies are unique, hard to imitate skills. They are unique when compared to the competition's skills (distinctive capabilities). A core competency produces a sustainable competitive advantage if it is valuable (provides customer value), rare, costly to imitate and hard to replace (taken from Barney, 2011).

Customer intimacy: Development of a long-term, intimate relationship with the customer or client in order to be able to meet this customer's needs (taken from Treacy & Wiersema, 2007).

Customer value: Customer value is a subjective opinion of the producer about his product, or of the customer or client about that which is offered to him. Value is the outcome of a process of creation by the producer, expectation and valuation by the customer or client, and capturing by the creating producer.

Design Build Finance Maintain (DBFM): A contract form in which the contractor bears responsibility for the design, construction, (partial) financing and maintenance of a project. The contract contains compensation stimuli which are linked to project availability.

Design & construct: A contract form in which the contractor bears responsibility for the design and construction of the project within the requested functional specifications.

Differentiation: Market dynamics based on offering solutions that are distinctive from those of the competition, based on a company's distinctive competencies.

Engineer & construct: A contract form in which the contractor, in addition to construction, bears responsibility for translating the requested design into the necessary quantities, without taking over responsibility for the design.

Exploitation: Consumption of available resources by an organization for the benefit of its daily operation.

Exploration: Looking for new resources by an organization for the benefit of its daily operation.

Hierarchy: A hierarchy is a collaboration of parties, organised as a logical chain of efficiently organised input-throughput-output-relationships, directed at a clearly defined, common goal.

Industrial network: A production network that is managed and developed by a private network manager.

Infrastructure network: Cohesive, physical main network of roads, railways, waterways and/or energy network components.

Innovation: The creative process used to turn ideas into processes, products and/or services that generate value for a client and for which a client is willing to pay. The OECD defines innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (taken from OECD, 2005, p.46).

Innovative capacity: A company's ability to continually renew its process and product, thus distinguishing itself from the competition.

Institution: The frameworks within which actors operate. These frameworks includes for example cultures, norms and values, laws, agreements and technical possibilities. Actors include individuals, associations, organizations, companies, departments etcetera. The actors are continuously making changes to these institutions while at the same time being subjected to their influence (taken from Kooiman et al., 2008).

Loosely coupled system: System ordering by considering the system as groups of tightly coupled actors with their own discernible functions, which are more loosely coupled between themselves (taken from Weick, 1976).

Market (construction): The construction market encompasses all firms working in the preparation, realization, management, maintenance, exploitation and financing of large infrastructure projects.

MEAT: The most economically advantageous tender (MEAT) criterion enables the contracting authority to take account of criteria that reflect qualitative, technical and sustainable aspects of the tender submission as well as price when reaching an award decision.

MIRT: Dutch national long-term program for infrastructure, spatial planning and transport. The MIRT describes the background, state of affairs and planning for physical spatial government projects and programs carried out under the responsibility of the Ministries of Infrastructure and Water Management and the Ministry of the Interior. The MIRT rules are a set of formal administrative institutions structuring the procedure of decision-making. The MIRT works as a funnel by closing different decision-making phases with formal agreements and thereby incrementally limiting the scope of decision-making (taken from Van Geet et al., 2019).

Network (of actors): An interactive relationship between multiple actors with different objectives, interests and resources, who depend on each other to reach their goals (taken from De Bruijn & Ten Heuvelhof, 2008).

Networking: Management aimed at development and adjustment of the organizational interactions and relationships with others (taken from Ford et al., 2011).

Network management: Process aimed at maximizing the network functionality, given the necessary and desired intervention in the network for management and maintenance, replacement and extensions.

Partnering: A relationship between two or more organizations aimed at achieving mutual goals and objectives by making optimal use of each other's resources, knowledge and skills. A relationship based on mutual trust, open communication, achieving mutual goals, and understanding of each other's values, interests, expectations and problems. (taken from the US Construction Industry Institute, 1999).

Performance contract: A contract form in which the contractor bears responsibility for providing a requested performance.

Portfolio management: Managing a changing set of activities, projects and programs in order to achieve an organization's strategic goals. In this context, portfolio management is concerned with prioritization in line with the current context (taken from the Project Management Institute, 2008).

PPP: Public-private partnership is a collaborative process between a public and a private organization, based on mutual goals, aimed at partnership, interactive governance, added value for all partners, and sharing risks and yields between partners (taken from Eversdijk, 2013).

Price-based competition: Market dynamics based on quoting a price that is lower than the competition's.

Project: A temporary association between actors aimed at creating a unique product and/or service (or a combination of both) (taken from (taken from the Project Management Institute, 2001).

Public infrastructure network: Infrastructure network that is managed and developed by a public network manager.

Redundancy: The ability to absorb a disruption of the functionality, without reducing said functionality, by having a functional reserve on critical components of sub-systems.

Regime, or 'community of practice': The whole of both implicit and explicit rules and thinking patterns, which gives direction to the practical actions of organizations, and which in its turn is shaped and reconfirmed by these actions. Regimes secure experience, however, at the same time they make the system inert to change (taken from Rip & Kemp, 1998).

Relationship: The interaction between organization which impacts mutual behavior.

Semi-public network: A network with a (partly) public function that is managed and developed by a private network manager.

Service Level Agreement (SLA): A service level agreement is a bilateral agreement between a client and a supplier that defines the level of service that will be supplied.

Strategic group: A group of companies within a sector that employ a similar strategy (taken from Porter, 1980).

Sustainable market dynamics: Market based on competencies that distinguish a firm from its competitors (differentiation), with which the firm creates value for a client. The valuation by the client provides the firm with the necessary means to further develop, build up or renew distinctive competencies, so that the firm can continue to exist (sustainable).

System: A system of interrelated elements that is considered to be a whole, and which, depending on the way in which the elements influence each other, is working in a certain direction. In so far as this is unintentional, this is a matter of autonomous development, and in so far as there is conscious manipulation towards a chosen direction (goal), this is a matter of steering and policy, respectively (taken from Rotmans et al., 2002).

System evolution: A shift from one socio-technical system to another (taken from Geels, 2005).

System integration: Systems integration can be seen as a clustering of a part of the network of actors. Systems integration can also be seen as generating integral solutions, geared toward the client's specific needs and wishes, by means of a combination of design, supply, financing, maintenance, support, management and operation throughout the entire life cycle.

System transition: A jump in scale in the development of a system's regime, resulting from the fact that developments from its environment, technological innovation and development of the regime are reinforcing each other in the same direction (taken from Geels, 2005).

Tendering (contracting): A transparent procedure through which the client makes it known that he has a commission and is asking market parties to submit a tender (bid). Based on assessment of the various bids, the client will allocate (award) the commission to a bidder.

Tight or loose coupling: The terms tight and loose coupling refer to the nature of a relationship (relative). A tight coupling has more interdependence, tighter coordination and a larger flow of information between the parties than a loose coupling.

Transaction: The (continuously changing) set of relationships between the manager of an infrastructure network and the market parties involved in the network development, on an operational, tactical and strategic level.

Transaction costs: Transaction costs are all ex ante costs made by client and contractor for the purpose of drawing up a contract, as well as all ex-post costs for correcting mistakes and omissions in the contract and unanticipated interventions (taken from Williamson, 2007).

Two-stage tendering: Way of tendering in which concept development and realization are separated into two connected stages. The concept development takes place through a dialogue between client and market party in competition (competitive dialogue) or one-on-one through partnering. Once the parties agree on the concept, it is fixed and priced in accordance with a method of calculation that has been previously agreed upon. Only after complete agreement on the intervention has been reached is the tender awarded.

Value chain: A stream of linked activities (of a public infrastructure network manager) with corresponding actors and their mutual relationships that add value to each subsequent step of the product and/or service delivered.

Value management: Value management is a structured approach to establish what value means to a client, to clearly define and agree project objectives and to establish how objectives can best be achieved (taken from constructionexcellence.org.uk).

- Abrahamson, E. (2004). *Change Without Pain. How Managers Can Overcome Initiative Overload, Organizational Chaos, and Employee Burnout*. Boston, USA: Harvard Business School Press.
- Aldrich, H. (2008). *Organizations and Environment*. Stanford, USA: Stanford Business Books.
- Argote, L. & Ingram, P. (2000). Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organizational Behavior and Human Decision Processes*, 82(1), 150–169.
- Arts, J. (2007). *Nieuwe Wegen? Planningsbenaderingen voor duurzame infrastructuur (New Roads? Planning for sustainable infrastructure)*. Groningen The Netherlands: University of Groningen.
- Arts, J. (2010). Streamlining Infrastructure Planning and Impact Assessment in the Netherlands. *Proceedings IAIA South-Africa 2010 National Conference*, 22–25 August 2010, Pretoria, South-Africa.
- Arts, J., Hanekamp, T., Linssen, R. & Snippe, J. (2016a). Benchmarking integrated infrastructure planning across Europe –moving forward to vital infrastructure networks and urban region. *Transportation Research Procedia*, 14(2016), 303–312.
- Arts, J., Filarski, R., Jeekel, H. & Toussaint, B. (eds.) (2016b). *Builders and Planners. A history of land-use and infrastructure planning in the Netherlands*. Delft, The Netherlands: Eburon.
- Ashby, W. (1956). *An Introduction to Cybernetics*. New York: Wiley.
- Axelrod, R. & Cohen, M. (2000). *Harnessing Complexity. Organizational Implications of a Scientific Frontier*. New York: Basic Books.
- Bajari, P. & Tadelis, S. (2006). Incentives and Award Procedures: Competitive Tendering vs. Negotiations in Procurement. In D. Nicola, G. Piga & G. Spagnolo (Eds.), *Handbook of Procurement*. Cambridge, UK: Cambridge University Press.
- Bannister, D., Anderson, K., Bonilla, D., Givoni, M. & Schwanen, T. (2011). Transportation and the Environment. *Annual Review of Environment and Resources*, 36, 247–270.
- Barney, J. (2011). *Gaining and Sustaining Competitive Advantage*. Saddle River, USA: Pearson Education.
- Barringer, B. & Harrison, J. (2000). Walking a Tightrope: Creating Value Through Interorganizational Relationships. *Journal of Management*, 26(3), 367–403.
- Beach, R., Webster, M. & Campbell, K. (2005). An evaluation of partnership development in the construction industry. *International Journal of Project Management*, 23(2005), 611–621.
- Becker, M. & Zirpoli, F. (2008). Applying organizational routines in analyzing the behavior of organizations. *Journal of Economic Behavior & Organization*, 66(2008), 128–148.
- Berkhout, F., Smith, A. & Stirling, A. (2003). *Socio-Technological Regimes and Transition Contexts*. Brighton, UK: Science & Technology Policy Research Unit, University of Sussex.
- Besanko, D. (2004). *Economics of Strategy*. Hoboken, USA: Wiley.
- PIANOo (2017). *Gezamenlijke Marktvisie Rijkswaterstaat (Joint Market Vision Rijkswaterstaat and Dutch Construction Market)*. The Hague, The Netherlands: PIANOo, (www.pianoo.nl).
- Borzel, T. (2011). Networks: Reified Metaphor or Governance Panacea? *Public Administration*, 89, 49–63.
- Bourne, L., & Walker, D. H. (2005). The paradox of project control. *Team Performance Management: An International Journal*, 11(5/6), 157–178.
- Bower, D. (2003). *Management of procurement*. London, UK: Thomas Telford.
- Bower, D., Ashby, G., Gerald, K. & Smyk, W. (2002). Incentive mechanisms for project success. *Journal of Management in Engineering*, 18(1), 37–43.

- Bresnen, M. (2009). Living the dream? Understanding partnering as emergent practice. *Construction Management and Economics*, 27(10), 923-933.
- Bresnen, M. & Marshall, N. (2000). Motivation, commitment and the use of incentives in partnerships and alliances. *Construction Management and Economics*, 18(5), 587-598.
- Broadbent, J. & Laughlin, R. (2003). Public private partnerships: an introduction. *Accounting, Auditing & Accountability Journal*, 16(3), 332-341.
- Bryman, A. (2008). *Social Research Methods*. Oxford, UK: Oxford University Press.
- Busscher, T. (2014). *Towards a programme-oriented planning approach. Linking strategies and projects for adaptive infrastructure planning*. Groningen, The Netherlands: University of Groningen.
- Bygballe, L., Jahre, M. & Swärd, A. (2010). Partnering relationships in construction: A literature review. *Journal of Purchasing and Supply Management*, 16(2010), 239-253.
- Camarinha-Matos, L. & Afsarmanesh, H. (2006). *Collaborative Networks. Value creation in a knowledge society*. Proceedings PROLAMAT '06 Shanghai, China.
- Campbell, J., Jardine, A. & McGlynn, J. (2011). *Asset Management Excellence*. Boca Raton, USA: CRC Press.
- Carlile, P. (2004). Transferring, Translating and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries. *Organization Science*, 15(5), 555-568.
- Cheung, Y. & Rowlinson, S. (2011). Supply Chain Sustainability: a relationship management approach. *International Journal of Managing Projects in Business*, 4(3), 480-497.
- Construction Industry Institute (1999). *In Search of Partnering Excellence*. London, UK: Construction Industry Institute.
- Cyert, R. & March, J. (1992). *A behavioral Theory of the Firm (second edition ed.)*. Malden, USA: Blackwell Business.
- Dale, B., Van der Wiele, T. & Iwaarden, J. (2007). *Managing Quality*. Oxford, UK: Blackwell Publishing.
- Darwin, C. (1859). *On the Origin of Species. By means of natural selection*. London: Arcturus Publishing (2012).
- Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management*, 32, 189-201.
- Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13(5), 727-756.
- Davies, A. (2007). Organising for solutions: System seller versus system integrator. *Industrial Marketing Management*, 36(2007), 183-193.
- De Bruijn, J. & Ten Heuvelhof, E. (2008). *Management in Networks. On multi-actor decision making*. London, UK: Routledge.
- De Bruijn, P. & Jonkhoff, W. (2006). Bouwstenen voor Innovatiekracht (Building blocks for Innovation). *Cobouw*, October-November 2006.
- De Bruijn, P. & Maas, N. (2005). *Innovatie in de Bouw (Innovation in the Dutch construction sector)*. Delft, The Netherlands: TNO-report EPS 2005-13.
- De Bruijne, M. (2006). *Networked reliability. Institutional fragmentation and the reliability of service provision in critical infrastructures*. Delft, The Netherlands: University of Delft.
- De Ridder, H. (2011). *Legoliseren van de bouw. Industrieel maatwerk in een snel veranderende wereld (Legolizing Construction)*. Haarlem, The Netherlands: Maurits Groen.
- De Roo, G. & Silva, E. (2010). *A Planner's Encounter With Complexity*. Farnham, UK: Ashgate Publishing Group (Routledge).

- Debackere, K. (2006). Competitie leidt tot innovatie, innovatie leidt tot competitie. *West-Vlaanderen Werkt*, 4(2006), 5-7.
- Denise, L. (2005). Collaboration versus C-Three (Cooperation, Coordination, and Communication). *Innovating Reprint, The Rensselaerville Institute*, 7 (3).
- Dorée, A. (2004). Collusion in the Dutch construction industry: an industrial organization perspective. *Building Research & Information*, 32(2), 146-156.
- Dorée, A. & Holmen, E. (2004). Achieving the unlikely: innovating in the loosely coupled construction system. *Construction Management and Economics*, 22(2004), 827-838.
- Drechsler, M. (2009). *Fair Competition: How to apply the "Most Economic Advantageous Tender (MEAT)" award mechanism in the Dutch construction industry*. Delft, The Netherlands: University of Delft.
- Dubois, A. & Gadde, L. (2002). The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management and Economics*, 20(2002), 621-631.
- Dutch Government (2002). *De bouw uit de schaduw (Final Report Parliamentary Enquiry into the Dutch Construction Fraud)*. The Hague, The Netherlands: Ministry of the Interior.
- Dutch Government (2003). *Toekomstperspectief Bouwsector (The future of Construction in The Netherlands)*. The Hague, The Netherlands: Ministry of the Interior.
- Dutch Government (2014). *Gewijzigde Aanbestedingswet 2012 (Changed Procurement Law 2012)*. The Hague, The Netherlands: Ministry of the Interior.
- Dutch Government (2016). *Spelregels van het Meerjarenprogramma Infrastructuur, Ruimte en Transport (MIRT)*. The Hague, The Netherlands: Ministry of Infrastructure and Water Management.
- Egan, J. (1998). *Rethinking Construction: The report of the Construction Task Force to the Deputy Prime Minister, John Prescott, on the scope for improving the quality and efficiency of UK construction*. London: UK Ministry of the Interior.
- Egan, J. (2002). *Accelerating Change. A report by the Strategic Forum for Construction*. London: UK Ministry of the Interior.
- Eisenhardt, K. & Galunic, C. (2001). *Co-evolving. At last a way to make synergies work*. Boston, USA: Harvard Business School Press, Harvard Business Review.
- Eriksson, P-E., Atkin, B. & Nilsson, T. (2009). Overcoming barriers to partnering through cooperative procurement procedures. *Engineering, Construction and Architectural Management*, 16(6), 598-611.
- Eriksson, P-E., Larsson, J., & Pesämaa, O. (2017). Managing complex projects in the infrastructure sector. A structural equation model for flexibility-focused project management. *International Journal of Project Management*, 35(8), 1512-1523.
- Eversdijk, A. (2013). *Kiezen voor publiek-private samenwerking (Choosing for public-private Partnering)*. Maastricht, The Netherlands: University of Maastricht.
- Flint, D., Woodruff, R. & Gardial, S. (2002). Exploring the Phenomenon of Customers Desired Value Change in business-to-business Context. *Journal of marketing*, 6 (2002), 102-117.
- Flyvbjerg, B. (2001). *Making Social Science Matter. Why Social Inquiry Fails And How It Can Succeed Again*. Cambridge, UK: Cambridge University Press.
- Flyvbjerg, B. (2004). Phronetic Planning Research: Theoretical and Methodological Reflections. *Planning Theory & Practice*, 5(3), 283-306.
- Flyvbjerg, B., Bruzelius, N. & Rothengatter, W. (2012). *Megaprojects and Riks. An Anatomy of Ambition*. Cambridge, UK: Cambridge University Press.

- Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16(2006) 253–267
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T. & Rockström, J. (2010). Resilience thinking: Integrating Resilience, Adaptability and Transformability, *Ecology & Society*, 15(4), article 20 (online).
- Ford, D., Gadde, L., Håkansson, H. & Snehota, I. (2011). *Managing Business Relationships*. Chichester, UK: Wiley.
- Geels, F. (2002). *Understanding the dynamics of technological transitions*. Enschede, The Netherlands: Universiteit of Twente.
- Geels, F. (2005). Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective. *Technological Forecasting & Social Change*, 72(2005), 681–696.
- Geels, F. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(2011), 24–40.
- Geels, F. (2014). Reconceptualising the co-evolution of firms-in-industries and their environments: Developing an inter-disciplinary Triple Embeddedness Framework. *Research Policy*, 43(2014), 261–277.
- Geels, F. & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36, 399–417.
- Genus, A. & Coles, A. (2008). Rethinking the multi-level perspective of technological transitions. *Research Policy*, 37(2008), 1436–1445.
- Gibbons, R. (2010). Transaction-Cost Economics: Past, Present, and Future? *Scandinavian Journal of Economics*, 2(2010), 263–288.
- Graf, A. & Maas, P. (2008). *Customer value from a customer perspective: a comprehensive review*. Vienna, Austria: Wirtschaftsuniversität Wien.
- Granovetter, M. (1973). The Strength of Weak Ties. *American Journal of Sociology*, 78(6), 1360–1380.
- Gunderson, L. & Holling, C. (2002). *Panarchy. Understanding Transformations In Human And Natural Systems*. Washington DC, USA: Island Press.
- Håkansson, H. & Ford, D. (2002). How should companies interact in business networks? *Journal of Business Research*, 55(2002), 133–139.
- Helfat, C., & Peteraf, M. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, 24, 997–1010.
- Hansen, M. (1999). The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits. *Administrative Science Quarterly*, 44, 82–111.
- Healy, P. (2006). *Collaborative Planning. Shaping Places in Fragmented Societies*. New York: Palgrave MacMillan.
- Heene, A. (2010). *Enhancing Competences For Competitive Advantage*. Bingley, UK: Emerald Group Publishing.
- Heeres, N. (2017). *Towards area-oriented approaches in infrastructure planning. Development of national highway networks in a local context*. Groningen, The Netherlands: University of Groningen.
- Heeres, N., Tillema, T. & Arts, J. (2012). Integration in Dutch Planning of Motorways: From line towards area-oriented approaches. *Transport Policy*, 24(11), 148–158.
- Hennink, M., Hutter, I & Bailey, A. (2011). *Qualitative Research Methods*. London: Sage Publications.

- Hertogh, M. & Westerveld, E. (2010). *Playing with Complexity. Management and organisation of large infrastructural projects*. Delft, The Netherlands: University of Delft.
- Heylighen, F. (1989). Self-organization, Emergence and the Architecture of Complexity. *Proceedings of the 1st European Conference on System Science*, 23–33.
- Heylighen, F. (2008). *Five Questions on Complexity, in: Complexity: 5 Questions by C. Gershenson (ed.)*. Copenhagen, Denmark: Automatic Press.
- Hofman, E. (2010). *Modular and Architectural Innovation in Loosely Coupled Networks. Matching customer requirements, product architecture and supplier networks*. Enschede, The Netherlands: University of Twente.
- Hosseinian, S. & Carmichael, D. (2013). Optimal gainshare/painshare in alliance projects, *Journal of the Operational Research Society*, 64(8), 1269–1278.
- Hunt, M. (1972). *Competition in the major home appliance industry 1960–1970*. Boston, USA: Harvard University.
- Iossa, E., Spangnolo, G. & Velez, M. (2007). *Contract Design in Public-Private Partnerships*. Washington DC, USA: Report prepared for the World Bank, September 2007.
- Järvensivu, T. & Möller, K. (2008). *Metatheory of network management: A contingency perspective*. Helsinki: Helsinki School of Economics.
- Kadefors, A. (1995). Institutions in building projects: implications for flexibility and change. *Scandinavian Journal of Management*, 11(4), 395–408.
- Kadefors, A. (2004). Trust in project relationships- Inside the black box. *International Journal of Project Management*, 22, 175–182.
- Kadefors, A. (2005). Fairness in interorganizational project relations: norms and strategies. *Construction Management and Economics*, 23(8), 871–878.
- Kadefors, A., Björklinson, E. & Karlsson, A. (2007). Procuring service innovations: contractor selection for partnering projects. *International Journal of Project Management*, 25(4), 375–385.
- Kelly, J., Male, S. & Graham, D. (2004). *Value Management of Construction Projects*. Malden, USA: Blackwell Science Publishing.
- Kemp, R., Loorbach, D. & Rotmans, J. (2005). Transition management as a model for managing processes of co-evolution towards sustainable development. *The International Journal of Sustainable Development and World Ecology*, 14(1), 78–91.
- Kim, W. & Mauborgne, R. (2005). *Blue Ocean Strategy. How to Create Uncontested Market Space and Make the Competition Irrelevant*. Boston, USA: Harvard Business School Press.
- Kitzi, J. (2002). *Cooperative strategy: building networks, partnerships, and alliances*. In: Strategic tools for social entrepreneurs by Dees, J., Emerson, J. and Economy, P. (ed.). New York: John Wiley & Sons.
- Klakegg, O.J., Williams, T., Shiferaw, A.T. (2016). Taming the ‘trolls’: Major public projects in the making. *International Journal of Project Management*, 34(2), 282–296.
- Klijin, E. & Teisman, G. (2000). *Governing public-private partnerships: analyzing and managing the processes and institutional characteristics of public-private partnerships*. In Public-private Partnerships: Theory and Practice in International Perspective, S. Osborne (ed.). London: Routledge.
- Klijin, E. & van Twist, M. (2007). Publiek-Private Samenwerking in Nederland (Public-private partnering in The Netherlands). *Management & Organisatie*, 3/4(2007), 156–170.
- Kooiman, J. (2008). Exploring the Concept of Governability. *Journal of Comparative Policy Analysis*, 10(2), 171–190.

- Koops, L. (2017). *Creating Public Value. Optimizing cooperation between public and private partners in infrastructure projects*. Delft, The Netherlands: University of Delft.
- Kraaijenbrink, J., Spender, J-C. & Groen, a. (2010). The Resource-Based View: A Review and Assessment of Its Critiques, *Journal of Management*, 32(1), 349-372.
- Latham, M. (1994). *Constructing the team. Joint review of procurement and contractual arrangements in the United Kingdom Construction Industry*. London: UK, Ministry of the Interior.
- Lahdenperä, P. (2012). Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery, *Construction Management and Economics*, 30(1), 57-79.
- Leendertse, W., Arts, J. & de Ridder, H. (2012). How can procurement contribute to network performance? Streamlining network, project and procurement objectives. *Elsevier Procedia Social and Behavioral Sciences*, 48, 2950-2966.
- Leendertse, W. & Arts, J. (2013). *Managing Public Infrastructure Networks. On the Horns of Several Dilemmas: Proceedings from 7th Nordic Conference on Construction Economics and Organisation 2013*, Akademika Forlag, 191-202.
- Leendertse, W. (2015). *Publiek-Private Interactie in Infrastructuurnetwerken (Public-private Interaction in Infrastructure Networks)*: Groningen, The Netherlands: University of Groningen.
- Lenferink, S. (2013). *Market Involvement throughout the Planning Lifecycle Public and private experiences with evolving approaches integrating the road infrastructure planning process*. Groningen, The Netherlands: University of Groningen.
- Lenferink, S., J. Arts & T. Tillema (2011). Ongoing public-private interaction in infrastructure planning: an evaluation of Dutch competitive dialogue projects, in *Towards new horizons in public procurement*, K. Thai (ed.). Boca Raton: PrAcademics Press.
- Lenferink, S., Leendertse, W., Arts, J. & Tillema, T. (2012). Public-private plan development: Can early private involvement strengthen infrastructure planning? *European Planning Studies*, 22(2), 323-344.
- Lenferink, S., T. Tillema & J. Arts (2013). Public-private interaction in contracting: Governance strategies in the competitive dialogue of Dutch infrastructure projects, *Public Administration*, 91(4), 928-946.
- Lepak, D., Smith, K., & Taylor, M. (2007). Value creation and value capture: A multilevel perspective. *Academy of Management Review*, 32, 180-194.
- Levitt, B. & March, J. (1995). *Chester I Barnard and the Intelligence of Learning*: New York, Oxford University Press.
- Linden, G. & Voogd, H. (2004). *Environmental and Infrastructure Planning*. Groningen, The Netherlands: GeoPress.
- Lowndes, V. & Roberts, M. (2013). *Why Institutions Matter. The New Institutionalism in Political Science*. New York: PalgraveMac Millan.
- Male, S., Kelly, J., Gronqvist, M. & Graham, D. (2007). Managing value as a management style for projects. *International Journal of Project Management*, 25, 107-114.
- Manseau, A. & Shields, R. (2005). *Building Tomorrow: Innovation in Construction and Engineering*. Farnham, UK: Ashgate Publishing (Routledge).
- Matthyssens, P. & Vandenbempt, K. (2008). Moving from basic offerings to value-added solutions: Strategies, barriers and alignment. *Industrial Marketing Management*, 37(2008), 316-328.

- Matthyssens, P., Vandenbempt, K. & Berghman, L. (2004). *Waardecreatie en innovatie in de industrie: nieuwe denkkaders versus oude gewoonten Value creation and innovation in the Industry*. Leuven, Belgium: Acco.
- Metze, M. (2010). *Veranderend Getij. Rijkswaterstaat in crisis. (Changing tide. Rijkswaterstaat in crisis)*. Amsterdam: Uitgeverij Balans.
- Miller, J. & Page, S. (2007). *Complex Adaptive Systems. An introduction to computational models of social life*. Princeton, NJ, USA: Princeton University Press.
- Mitleton-Kelly, E. (2002). *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations. Ten Principles of Complexity & Enabling Infrastructures*. New York: Elsevier.
- Möller, K. & Rajala, A. (2007). Rise of strategic nets. New modes of value creation. *Industrial Marketing Management*, 36(7), 895-908.
- Möller, K. & Svahn, S. (2003). Managing strategic nets: A Capability Perspective. *Marketing Theory*, 3(2), 209-234.
- Morledge, R., Smith, A. & Kashiwagi, D. (2006). *Building Procurement*. Hoboken, NJ, USA: Wiley-Blackwell.
- Mosey, D. (2009). *Early Contractor Involvement in Building Procurement. Contracts, Partnering and Project Management*. Hoboken, NJ, USA: Wiley-Blackwell.
- NAO (2018). *PFI and PFI2*. Report on the rationale, costs and benefits of the Private Finance Initiative (PFI); the use and impact of PFI, and ability to make savings from operational contracts; and the introduction of PF2. London: UK Treasury, National Audit Office.
- Nelson, R. & Winter, S. (2002). Evolutionary Theorizing in Economics. *Journal of Economic Perspectives*, 16(2), 23-46.
- Newman, M. (2011). *Networks. An Introduction*. Oxford, UK: Oxford University Press.
- Nicolis, G. & Prigogine, I. (1989). *Exploring Complexity: An Introduction*. London: St. Martin's Press.
- Noorderhaven, N., Molier, E., van Oijen, A. & Rietberg, M. (2006). *Institutioneel, economisch en cultureel kader van de bouw*. Zoetermeer, The Netherlands: PSIBouw.
- Noordhuis, M. (2015). *De waarde van ketensamenwerking (The value of cooperation in the production chain)*. Ridderkerk, The Netherlands: Hollandrisserkerk b.v..
- OECD (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data (3rd edition)*. Paris: OECD Publishing.
- Orton, J. & Weick, K. (1990). Loosely coupled systems: A reconceptualization. *The Academy of Management Review*, 15(2), 203-223.
- Ostrom, E. (2005). *Understanding Institutional Diversity*. Princeton, NJ, USA: Princeton University Press.
- Ostrom, E. (2011). Background on the institutional analysis and development framework. *Policy Studies Journal*, 39(1), 7-27.
- Peteraf, M. & Barney, J. (2003). Unraveling the Resource-Based Tangle. *Managerial and Decision Economics*, 24, 309-323.
- PIANO (2005). *Vergelijkend onderzoek naar beleid en praktijk van aanbestedings- en contractvormen in de bouwsector in westerse landen (A comparison of tendering procedures and contract forms in construction)*. The Hague, The Netherlands: PIANO.
- Porter, M. (1980). *Competitive strategy*. New York: The Free Press.
- Porter, M. (1985). *Competitive Advantage: Creating and sustaining superior performance*. New York: The Free Press.

- Porter, M. (1996). *What is a Strategy?* Boston: Harvard University Press, Harvard Business Review.
- Porter, M. (2008). *On Competition*. Boston: Harvard University Press, Harvard Business Review.
- Prahalad, C. (1993). The role of core competences in the corporation. *Research Technology & Management*, 36(6), 40-47.
- Prahalad, C. (2004). The Blinders of Dominant Logic. *Long Range Planning*, 37(2), 171-179.
- Project Management Institute (2001). *A Guide to Project Management Body of Knowledge*. London: Project Management Institute.
- Project Management Institute (2008). *The Standard for Portfolio Management*. London: Project Management Institute.
- PSIBouw. (2004). *Inventory of international reforms in building and construction*. Zoetermeer, The Netherlands: PSIBouw.
- Regieraad Bouw. (2004). *Van Raad naar Daad: Actieplan op hoofdlijnen*. The Hague, The Netherlands: Ministry of the Interior.
- Reynaers, A. (2014). *It takes two to tango. Public-private partnerships and their impact on public values*. Amsterdam: Free University of Amsterdam.
- Rijkswaterstaat (2004). *Ondernemingsplan 2004-2008. Een nieuw perspectief voor Rijkswaterstaat. Doorpakken wel degelijk (Business Plan 2004-2008)*. The Hague, The Netherlands: Ministry of Infrastructure and Water Management.
- Rijkswaterstaat (2007). *Scheiding van Publiek Belang Dividing Public Interest*. The Hague, The Netherlands: Ministry of Infrastructure and Water Management,.
- Rijkswaterstaat (2016a). *Koers 2020. Vertrouwen, verbinden, verbeteren (Business Plan towards 2020)*. The Hague, The Netherlands: Ministry of Infrastructure and Water Management.
- Rijkswaterstaat (2016b). *Marktvisie. Samenwerken aan een vitale en duurzame sector (Market Vision)*. The Hague, The Netherlands: Ministry of Infrastructure and Water Management.
- Rip, A. & Kemp, R. (1998). *Technological Change*. Washington DC, USA: Batelle Press.
- Rose, T. (2008). *The Impact of Financial Incentive Mechanisms on Motivation in Australian Government Large Non-residential Building Projects*. Queensland, AU: Queensland University of Technology.
- Rose, T. & Manley, K. (2010). Motivation toward financial incentive goals on construction projects. *Journal of Business Research*, 64 (2010), 765-773.
- Rotmans, J. (2006). *Transitiemanagement. Sleutel voor een duurzame samenleving (Transition Management)*. Assen, The Netherlands: Koningklijke Van Gorgum.
- Rotmans, J., Dirven, J. & Verkaik, A. (2002). *Samenleving in transitie: een vernieuwend gezichtspunt (The Society in Transition)*. The Hague, The Netherlands: Ministry of Agriculture.
- Rutten, M., Dorée, A. & Halman, J. (2009). Innovation and interorganizational cooperation: a synthesis of literature. *Construction Innovation*, 9(3), 286-297.
- Sanders, I. (1998). *Strategic thinking and the new science. Planning in the midst of Chaos, Complexity and Change*. New York: The Free Press.
- Sanders, I. (2002). *Business, Complexity and New Science*. In M. R. Lissack (Ed.), *The Interaction of Complexity and Management*. Santa Barbara, USA: Praeger Publishers.
- Schumpeter, J. (1943). *Capitalism, Socialism and Democracy*. Abingdon-on-Thames, UK: Routledge.

- Seel, R. (2006). *Emergence in Organisations*. <http://www.new-paradigm.co.uk>
- Skeggs, C. (2004). *Project partnering in the construction industry*. London, UK: FIDIC articles series.
- Söderholm, A. (2008). Project management of unexpected events. *International Journal of Project Management*, 26(2008), 80-86.
- Spender, J. (1989). *Industry Recipe: The nature and sources of managerial judgement*. Oxford, UK: Basil Blackwell Oxford.
- Stacey, R. (2007). *Strategic management and Organisational Dynamics. The Challenge of Complexity*: Upper Saddle River, NJ, USA: Prentice Hall.
- Stoker, G. (2006). Public value management: a new narrative for networked governance? *The American Review of Public Administration*, 36(1), 41-57.
- Straatemeier, T. & Bertolini, L. (2019). How can planning for accessibility lead to more integrated transport and land-use strategies? Two examples from the Netherlands, *European Planning Studies*, DOI: 10.1080/09654313.2019.1612326
- Tadelis, S. & Williamson, O. (2010). *Transaction Cost Economics*. Berkeley, USA: University of California.
- Taleb, N. (2007). *The Black Swan. The Impact of the Highly Improbable*. London: Pinguin Books.
- Tang, M. & Thomas, H. (1992). The concept of strategic groups: Theoretical construct or analytical convenience, *Managerial and Decision Economics*, 13, 323-329.
- Teece, D. (2009). *Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth*: Oxford University Press, Oxford, UK.
- Teece, D. (2010). Business Models, Business Strategy and Innovation, *Long Range Planning*, 43, 172-194.
- Teisman, G. (2005). *Publiek management op de grens van chaos en orde. Over leidingeven en organiseren in complexiteit (Public Management on the Edge of Chaos and Order)*. Delft, The Netherlands: University of Delft.
- Tidd, J., Bessant, J. & Pavitt, K. (2005). *Managing Innovation. Integrating technological, market and organizational change*. Hoboken, NJ, USA: Wiley.
- Transparency International (2005). *Global Corruption Report 2005*. London, UK: Pluto Press.
- Treacy, M. & Wiersema, F. (2007). *De discipline van marktleiders The Discipline of Market Leaders*. Sciedam, The Netherlands: Scriptorum.
- Turner, J. & Simister, S. (2001). *Project Contract Management and a Theory of Organization*: London: ERIM Report Series
- Turner, R. (2007). *Gower Handbook of Project Management*. Aldershot, UK: Gower, Aldershot.
- Van den Brink, M. (2009). *Rijkswaterstaat on the Horns of a Dilemma*. Groningen, The Netherlands: University of Groningen.
- Van de Rijt, J. & Santema, S. (2013). *Prestatieinkoop. Met best value naar succesvolle projecten (Best Value Procurement)*. Driebergen, The Netherlands: Scenter Institute.
- Van de Ven, A. (2007). *Engaged Scholarship: A guide for organizational and social research*. Oxford, UK: Oxford University Press.
- Van den Heuvel, G. (2005). The parliamentary enquiry on fraud in the Dutch construction industry collusion as concept between corruption and state-corporate crime, *Crime, Law & Social Change*, 44, 133-151.

- Van Duivenboden, H., Van Twist, M., Veldhuizen, M. & In 't Veld, R. (2000). *Ketenmanagement in de Publieke Sector (Chain Management in the Public Sector)*. Utrecht, The Netherlands: Lemma.
- Van Geet, M., Lenferink, S., Arts, J., & Leendertse, W. (2019). Understanding the ongoing struggle for land use and transport integration: Institutional incongruence in the Dutch national planning process. *Transport Policy*, 73, 84-100.
- Van Weele, A. (2014). *Purchasing and Supply Chain Management*. London: Cengage.
- Verbaan, W. (2008). *Megatrends Bouw. Van vergrijzing tot kredietcrisis (Megatrends in Dutch Construction)*. Leiden, The Netherlands: Drukkerij Groen.
- Verhees, F. (2013). *Publiek-private samenwerking: adaptieve planning in theorie en praktijk (PPP: adaptive planning in theory and practice)*. Groningen, The Netherlands: University of Groningen.
- Verhees, F & Arts, J. (2016). *Public Private Partnerships -Pursuing adaptive qualities in spatial projects*: in: de Roo, G. & Boelens, L. (eds.), *Spatial Planning in a Complex Unpredictable World of Change - Towards a proactive co-evolutionary type of planning within the Eurodelta*. Groningen, The Netherlands: InPlanning.
- Von Branconi, C. & Loch, C. (2004). Contracting for major projects: eight business levers for top management. *International Journal of Project Management*, 22, 119-130.
- Vrijhoef, R., Kuhlmann, M., Kuijpers, P., de Lange, P., van der Klauw, M. & Visscher, K. (2013). *Op Weg naar de Goede Vraag (Asking the right Question)*: Hogeschool Utrecht, Utrecht, The Netherlands.
- Vrijhoef, R. & Wicherson, J. (2010). *Ketenintegratieprogramma. Verbeterprogramma voor projectgebonden samenwerking tussen Com-wonen en Dura Vermeer Bouw Rotterdam* (Value chain integration. A case study of COM wonen). Rotterdam: CPI publishing.
- Vulperhorst, L. (2005). *Verzwegen Onderneming: Ondernemers, overheid en het einde van het Bouwkartel (2001-2005) (Silent Business)*. Amsterdam: VanGennep.
- Weber, B. & Alfen, H. (2011). *Infrastructure as an Asset Class. Investment Strategies, Project Finance and PPP*. Hoboken, NJ, USA: Wiley.
- Weick, K. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21 (1976), 1-19.
- Weinberg, G. (2001). *An Introduction to General Systems Thinking*. New York: Dorset House.
- Willems, J., Busscher, T., Hijdra, A. & Arts, J. (2016). Renewing Infrastructure Networks: New Challenge, New Approach? *Transportation Research Procedia*, 14, 2497-2506.
- Willems, J. (2018). *Navigating Waterway Renewal*. Groningen, The Netherlands: University of Groningen,
- Williamson, O. (2007). *Transaction Costs Economics: An Introduction*. Berkeley, USA: University of California.
- Zollo, M. and Winter, S.G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organizational Science*, 13(3): 339-351.

For the functioning and development of infrastructure networks, the construction market is indispensable. But how do public infrastructure network managers involve the market in their network management? And does this market involvement also lead to a sustainable market dynamic now and in the future? This study attempts to gain insight into the complex relationships between (public) infrastructure network managers and their market. The transaction is not similar to the (realization) contract, the magic document, object of many studies, in which one often wants to compress all these relationships. The contract is just the formal downturn of only one of the relationships in the transaction. What we mean with the transaction is the whole set of interacting relationships on the interface between infrastructure network management and market. By way of the relationships of the transaction, the network manager influences the construction market, and network management is vice versa influenced by this market. A change in one of these relationships – as a result of a new network or market policy or economic developments, for example – affects all other relationships. The transaction is also the key to the evolvement of sustainable market operation, but at the same time the key to generating added (network) value for the network manager. As such, the challenge is to link network management to a market approach that generates added value for the network, while simultaneously encouraging a sustainable market dynamic. Insight into the relationships will help to understand the practice of the infrastructure construction sector. We hope that this insight can help to make the relationship between public (infrastructure) network managers and the construction market more effective.

Wim Leendertse is a senior advisor at Rijkswaterstaat, the executive agency of the Dutch Ministry of Infrastructure and Water Management, and professor Management in Infrastructure Planning at the University of Groningen's Faculty of Spatial Sciences, Department of Planning. His research focusses on project- and program management and especially on the complex relationships in public-public and public-private partnering.

Jos Arts is full Professor Environmental and Infrastructure Planning at the University of Groningen, Faculty of Spatial Sciences, Department of Planning. He focuses on issues such as planning approaches for sustainable networks, life-cycle and area-oriented approaches to infrastructure planning and decision-making for transport infrastructure.

ISBN 978-90-367-9482-4



9 789036 794824

// IN //
PLAN //
/ NING

