

Governing multi-actor decision processes in Dutch industrial area redevelopment

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Governing Multi-Actor Decision Processes in Dutch Industrial Area Redevelopment

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
Technische Universiteit Eindhoven, op gezag van de
rector magnificus, prof.dr.ir. C.J. van Duijn, voor een
commissie aangewezen door het College voor
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door

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geboren te Oldenzaal

Dit proefschrift is goedgekeurd door de promotoren:

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PREFACE

The first man who, having enclosed a piece of ground, bethought himself of saying: “This is mine”, and found people simple enough to believe him, was the real founder of civil society. From how many crimes, wars and murders, from how many horrors and misfortunes might not any one have saved mankind, by pulling up the stakes, or filling up the ditch, and crying to his fellows: “Beware of listening to this impostor; you are undone if you once forget that the fruits of the earth belong to us all, and the earth itself to nobody.”

Jean Jacques Rousseau (1754) Discours sur l’origine et les fondements de l’inégalité parmi les homes.

A consequence of the above mentioned occurrence is that it is possible for individual companies to buy land plots on industrial areas in the Netherlands, making industrial areas look like patchworks of individually owned pieces of land. This highly fragmented land ownership eventually makes redevelopment of industrial areas complex; each individual landowner has an important vote in plan development. As a consequence, industrial area redevelopment in the Netherlands stagnates. I think everybody will agree with me when I state that this problem is unimportant when comparing it to the “crimes, wars and murders” as mentioned in the dissertation of Rousseau. However, I found it important and challenging enough to spend my PhD thesis on it.

My project started in September 2005, within the group of Construction Management and Urban Development. The following four years were characterized by several highlights and difficulties, and – judging from what colleague-PhDs say – this fluctuation seems to be common practice. When looking back, I can say that the

positive moments largely outweigh the difficult moments in my project. Now I've reached the moment to close this chapter, and several people helped me to reach this moment.

In the first place, I have to express my sincere gratitude to Wim Schaefer, my first promoter. He is a real expert in the field of urban development, and I am very glad that he gave me the opportunity to run this project within his group. It was one of the largest challenges in my life thus far, and he guided and supported me in a very pleasant way. In this respect, I have to say that he is a true motivator, and that he helped me in developing not only my thesis but also my personality. Thanks a lot!

Bauke de Vries functioned as my second promoter during this project. I am very grateful to him, because he showed a great deal of interest in my work and he had faith in me from the beginning; I really appreciate his support. I also want to thank the other members of my committee, namely Chris Snijders, Jacques van Dinteren, Fernando Nunes da Silva, and Qi Han. They all gave very valuable feedback on different topics in my thesis.

My appreciation goes to Nancy Sutherland and Edward Conti, who took the time to read my thesis and correct my use of English; to Rob Gordon, who gave me the opportunity to become acquainted with the practical reality of industrial area redevelopment at the Brabantse Ontwikkelingsmaatschappij; to UCB (Universitair Centrum voor Bouwproductie) and KTB (Kennis Transfer Bouw) for funding my project; and to those who participated in my experiments. Furthermore, I want to thank several colleagues from our department. Ingrid, Mandy, Annemiek, Jolanda, Jos, Ingrid, Peter, Aloys, and Astrid; thank you for your support!

I already mentioned my colleague-PhDs, but I specifically want to thank Ruben, Marloes, Vincent, Oliver, Brano, Dave, Christina, William, and Tobias for all the lunches, drinks in the Skybar, talks at the coffee machine; in short, for all the pleasant activities during my stay at the TU/e. In this respect, I also want to thank my friends from outside the University for their support: Thijs, Michiel, Bas v.R., Jaap, Bas D., Remi, Bas W., and Paul. I promise to be around more often after finishing this project.

In order to finish my MSc. and PhD studies, I have lived in Eindhoven more than seven years, and I really enjoyed my time here. But I especially liked it during the last two years, because I met Elkie. Hitting the four aces on the tennis court really paid off! I am proud and happy that you are my girlfriend, and I look forward to spend my life together with you!

Finally, I want to thank my family for their support. Of course, I have to thank opa's and oma's Blokhuis and Heveling for always being interested and having faith in me. Special thanks go to my little sister Ellen – the smartest girl in the family – for giving me the opportunity to disapprove all her boyfriends, and to my big sister Laura and her partner Jan: bringing Lucas and Luisa into my life is the most beautiful thing that ever happened to me. There are two persons that I want to thank most: my mother and father. Best parents in the world! I love you.

Erik Blokhuis

Eindhoven, June 2010

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CHAPTER 1

INTRODUCTION

Industrial areas prove to be necessary for realizing a sustainable Dutch economy; they accommodate a large share of the total employment in the Netherlands, and each hectare yields approximately €1.7 million per year. On the other hand, Dutch industrial areas are also characterized by a growing number of problems, among which environmental issues and urban sprawl are often mentioned (e.g., Louw and Bontekoning, 2007).

The problem that stands central in this thesis is that a large share of the total amount of industrial areas is obsolete while new industrial areas are increasingly being granted, and that redevelopment of these obsolete industrial areas stagnates. This problem has large consequences for the spatial quality and available green spaces in a densely populated country like the Netherlands. Several pressure groups tried to give insight in the dimensions of the problems (e.g., Milieudefensie, 2007), supported by research institutes and scientific scholars. Gradually, industrial areas have become a prime theme in policy debates in the Netherlands. Strong measures like fully freezing new industrial area development and granting large amounts of subsidies for industrial area redevelopment are currently taken into consideration.

Currently ongoing redevelopment projects are often characterized by lengthy negotiation processes, conflicts, and high chances on failure. A major cause of this is that multiple stakeholder groups occupy powerful positions in redevelopment

projects, having partly shared and partly contradictory interests, and that none of these involved stakeholders is powerful enough to manage projects individually. Therefore, a growing interest in process governance concepts through which projects can be managed more effectively is noticeable in professional and scientific literature. In this research, the lack of central process governance is recognized as a major cause of the stagnation of industrial area redevelopment. Therefore, the general research objective is to provide a theoretical basis for the support of a regional governing agency in managing an industrial area redevelopment process. This theoretical basis is eventually utilized in the development of a basic decision support tool for industrial area redevelopment.

Decision support and planning support systems are increasingly being developed in the field of urban (re)development. Recent systems also incorporate participation and collaboration between multiple and diverse stakeholder groups, with the aim to support the consensus-finding process (e.g., Geertman and Stillwell, 2009). These systems are mostly based on a planning model that assumes a leading role of the government (Klosterman, 2009), and the outcomes of these systems are mostly represented as landscape designs and land-use plans. However, planning models in which both public and private stakeholders function as leading partners are increasingly being applied in urban (re)development, and the design of such public-private processes necessary for realizing landscape and land-use plans is claiming growing attention of those in charge of technical management and implementation. To date, except for some anecdotal evidence, a formal model of the collaborative decision process has not been developed for this domain, incorporating the recent shift in planning practice. The state of the art in decision and planning support technology does not incorporate mechanisms of cooperation between actors nor about performance indicators that are relevant to the multitude of different actors, and does not support the design of optimal processes. This thesis aims to contribute to this extension in decision and planning support systems.

For achieving the stated objectives, this thesis is organized into three major parts. In the first part, a literature review is presented. This literature review covers three topics. In chapter 2, literature on industrial areas in the Netherlands is reviewed. The aim of this chapter is to make the reader familiar with industrial area development in the Netherlands. Therefore, definitions and typologies are presented, together with a short overview of the history of Dutch industrial area development. Furthermore, attention is paid to the economic relevance of industrial areas. Then, focus shifts towards process features, discussing the current planning approach and the role of several actors in this planning approach.

In chapter 3, the most important problem aspects of the current industrial area planning approach are mentioned. Furthermore, several causes of these problems are discussed. The problem analysis mainly focuses on the dimensions of the Dutch redevelopment task, on the redevelopment process, and on the progress of upgrading the stock of obsolete industrial areas. From this overview, it is observed that Dutch redevelopment processes stagnate. Finally, the most important causes of this stagnation are presented.

Because of the presumed large role that central process governance can have on solving the stagnation of industrial area redevelopment, the concept of central process governance is explained in chapter 4. In this chapter, the reasons for the increasing need for governance are presented. Furthermore, the concept of meta-governance is introduced as an appropriate concept for industrial area redevelopment, and this concept is illustrated by means of a best-practice case study. The chapter concludes with a proposal for a regional governance structure for Dutch industrial area redevelopment.

In the second part of this thesis, the desired contribution of this research in supporting the establishment of such a governance structure is clarified, together with the ways to achieve this. In chapter 5, the research design – constructed to achieve the general research objective – is represented. The main research questions are discussed in detail, together with the applicability of several models, methods and related research projects from other research fields. Next, the design of the research model is discussed, and the conceptual framework required for executing the steps mentioned in the research model is presented. Subsequently, the chosen methodology is discussed in detail in chapter 6.

In the final – third – part, the results are represented. In chapter 7, the individual choice behavior of involved actors is modeled, thereby answering the first research question. Chapter 8 entails a model of interactive choice behavior of these actors. This model is based upon a combination of game theory and conjoint analysis, and gives an answer on the second research question. Chapter 9 combines the results of the individual and interactive choice models, giving recommendations on how to put meta-governance into practice in industrial area redevelopment. A model is presented in which the level of cooperation between involved stakeholders is incorporated. Furthermore, insight in the most important characteristics of industrial area redevelopment processes from the stakeholders' point of view is presented. Finally, recommendations are given concerning the design of the process, which can be put

into practice by a regional governance agency. This answers the main research question.

Chapter 10 concludes this thesis. In this chapter, the resulting models are summarized, and the main results of the analyses are reviewed. Furthermore, a discussion is presented concerning the interpretation of the research results, the limitations of the research, and recommendations for future research.

CHAPTER 2

INDUSTRIAL AREAS IN THE NETHERLANDS

2.1 Introduction

According to several authors (Dutch Ministry of Economic Affairs, 2004; Louw and Bontekoning, 2007; Louw *et al.*, 2009), industrial areas are necessary to realize a sustainable economy in the Netherlands. Supply of space for industrial activities is important from an economic, spatial and social perspective. Because of this importance on the one hand, and because of an increasing criticism concerning the results from the current Dutch industrial area planning approach on the other, the planning of industrial areas has become a prime theme in planning policies (Louw and Bontekoning, 2007; Louw *et al.*, 2009).

Dutch industrial areas are the central object of research. The aim of this chapter is to give an overview of the current Dutch industrial area market, in order to make the reader familiar with the most important characteristics of industrial area development in the Netherlands. First, a formal definition of the concept of industrial areas is given, together with characterizations of different types of industrial areas and an overview of the history of industrial area development in the Netherlands. Then, the above mentioned economic importance of industrial areas is discussed. After these general explanations, the emphasis shifts towards the process features of industrial area development, focusing on the currently adopted industrial area planning approach and on the role of several actors in executing and preserving this planning approach. Finally, the facts and figures that have resulted from this industrial area

planning approach are discussed. The chapter concludes with recommendations from several advisory boards, aiming for optimizing the Dutch industrial area market.

2.2 Definitions, types, and history

In general, industrial areas offer space to companies that are in search for accommodation, in order to enable them to realize new industrial property. A number of formal definitions can be found for industrial areas. According to the Concise Oxford English Dictionary (2008), an industrial estate (area) is defined as “*an area of land developed as a site for factories and other industrial use*”. An often used and more detailed definition of industrial areas in the Netherlands is formulated by THB (2008): “*An industrial area is a spatially or functionally connected area, intended and suitable for usage by companies active in trading, industry, commercial and non-commercial servicing, and manufacturing, exclusive of areas that are reserved for offices, retail trade, or catering industry*”. Schuddeboom *et al.* (2009a) define industrial areas as “*a legally limited space within a municipal spatial plan, on which the establishment of a certain type of companies is possible*”. Furthermore, they add some additional criteria: it has a gross surface of at least 1 hectare, and it is – or will be – used by more than one company (no solitary industrial properties). Industrial areas that meet these criteria are denoted as formal locations. Areas that are in use for industrial activities, but that do not meet the described criteria, are considered as non-formal locations. The definition of Schuddeboom *et al.* (2009a) is most complete, because of the distinction between formal and non-formal locations. Therefore, I employ their definition of industrial areas in this research, and I delimit my research to formal industrial locations.

2.2.1 Types of industrial areas

Still, the concept of industrial areas remains very broad; the functional quality of the current stock of industrial areas is very diverse. In an attempt to simplify the analysis of the industrial area market, several scholars have tried to introduce logical typologies with enough distinctive features (e.g., Arts *et al.*, 2005; Van Dinteren, 2008). Most of these typologies have a functional character; they relate the type of industriousness with location characteristics, presuming that similar companies have comparable accommodation preferences.

One of these different typologies is related to a nationwide database, which makes it possible to compare stock types on a regional level. This typology is introduced in the IBIS database – the Dutch national database for industrial areas – in 1995, and used in

several studies (e.g., de Graaf, 2005; Schuddeboom *et al.*, 2009a). It employs a distinction between five types of industrial areas: (1) *Areas for heavy industrial activities*: areas intended for industries that are strongly harmful for the environment; (2) *Seaport areas*: areas with a quay for (un)loading, along deep water, accessible for ocean-going vessels; (3) *Mixed industrial areas*: areas for regular business activities, not being high-grade industry or logistics; (4) *High-tech business parks*: areas destined for companies with high-quality, technical activities; and (5) *Areas for logistical activities*: areas specifically designed for transport, distribution and wholesale trade.

However, this typology has some shortcomings, and several authors (THB, 2008; Van Dinteren, 2008) conclude that the typology does not perfectly match the current supply of industrial areas and the changing demands from entrepreneurs. For instance, there is no clear distinction between high-tech business parks and office locations. Furthermore, the current typology has no uniform point of comparison; for instance, the environmental impact stipulates whether an area belongs to type 1, while architectural and urban quality are decisive for areas being classified as a type 4. Finally, the spatial shares of the five types are distributed very unequally; most industrial areas are classified as a mixed area (approximately 60%), while business parks and logistic parks both cover only 4% of the total amount of industrial areas.

Because of these shortcomings, Van Dinteren (2008) proposes a new segmentation which is based upon spatial quality. Spatial quality is thereby regarded as consisting of three dimensions: practical user value, perception value, and future value. The practical user value is more or less equal to functional quality; it entails the basic requirements of entrepreneurs. Perception value is determined by the image, the appearance, and the spatial layout of the area; this is related to urban quality and architecture. Future value is conditional upon the practical user value and the perception value, and can be influenced by increasing the level of urban management and administration. Based upon this definition of spatial quality, a three-part segmentation is proposed, each having a certain level of spatial quality (figure 2-1).

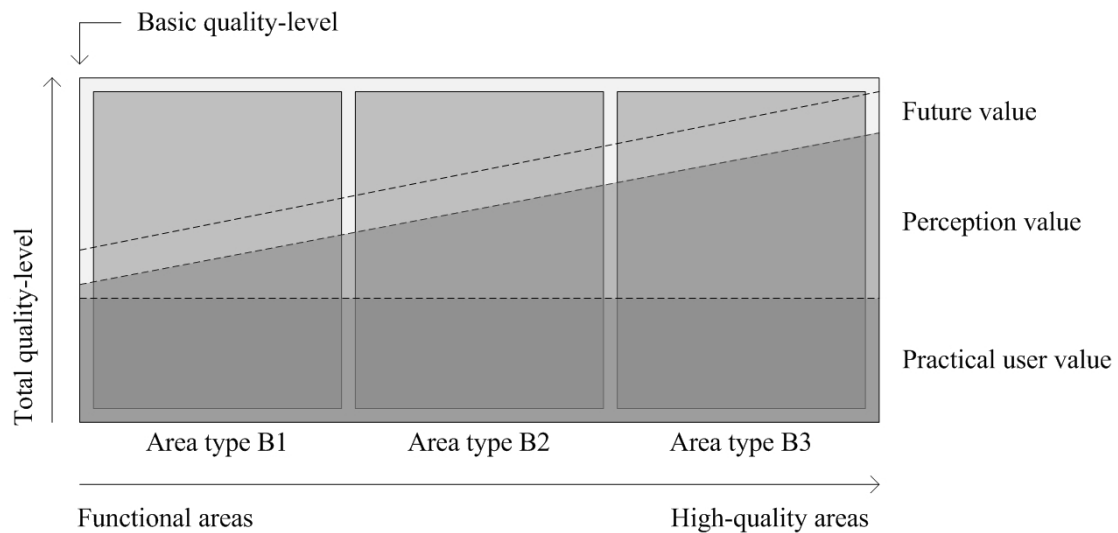


Figure 2-1: typology of industrial areas, based on differences in spatial quality (Van Dinteren, 2008)

Because spatial quality becomes increasingly important in industrial area planning, I employ this segmentation in my research, and I want to focus on areas with an insufficient quality level for being classified in segment B1. Areas that are classified in this hypothetical segment ‘B0’ hold the largest share of problems (see chapter 3 for an overview of these problems).

2.2.2 Historical industrial area development

The current Dutch industrial area market cannot be understood without some information about the history of industrial area development in the Netherlands. In general, four generations of Dutch industrial areas can be distinguished (Louw *et al.*, 2009). In this section, these generations are explained shortly (for a thorough discussion on the differences between these generations, see De Graaf, 2005).

The first generation of industrial areas, originated in the beginning of the nineteenth century, was mainly located in city centers. In this period, the predominantly small-scaled industrial activities were mixed with housing. However, as a result of the industrial revolution at the end of the nineteenth century, involving a doubling of industrial production and a strong rise in wages, companies were facing a growing demand for space, and they were causing an increasing level of contamination. The city centers were not able to satisfy the growing need for space, and the residents could no longer be exposed to the pollution. Because of a restricted mobility of employees, companies moved to the edges of cities, near residential areas.

The industrial areas located near residential areas eventually became absorbed within the city because of the expansion of residential areas, resulting in similar problems as with the first generation of industrial areas. The continuously increasing mobility of employees in the course of the twentieth century created the possibility to make a new shift in urban planning, in which principles of the functional city became leading. In this movement, separation of living, working and recreating was the central point of departure, and infrastructure was seen as an important link between those functions. Industrial areas became mono-functional, separated from other functions, and were located near waterways and railroads because these infrastructural links were used most frequently to transport freight.

After World War II, all efforts were aimed at rebuilding the Dutch economy. A social and government-led program was launched, laying out a basis for a successful economic recovery. As a result of this, car possession increased very quickly in the 1950's and 1960's, creating the necessity to develop new infrastructure. Industrial areas and housing became more and more separated from each other – industrial areas were located at the outskirts of urban areas – and the numbers of commuters doubled. As a result of the increased importance of the car and freight traffic by trucks, this generation of industrial areas was well connected to road infrastructure, waterways and railroads (De Graaf, 2005; Louw *et al.*, 2009).

Because of a growing lack of space within urban areas in the 1970's and 1980's, industrial areas became located near highways and arterial roads, and – in the 1990's – near corridors between economically important centers, still bordering urban areas. These areas, characterized by a high accessibility, represent the most recent generation of industrial areas. Locating the industrial areas near highways and arterial roads can be explained by the decreasing transport of freight by rail and water and the increasing share of transport by road. Furthermore, the economic structure also changed: the share of small scaled companies and service providers on industrial areas increased in favor of large scaled industrial companies. These small-scaled companies attach more value to their image, visibility and accessibility (De Graaf, 2005). This fourth generation of industrial areas has undergone a considerable growth in recent years.

Meanwhile, the first and second generation industrial areas experienced huge transformations. Almost all old factory sites and first generation industrial areas from the nineteenth century are transformed into residential and commercial areas. Diversification has arisen, because the reuse of old vacant buildings proved to be commercially very profitable for living, recreation and industriousness (VROM-raad,

2006). Especially the excellent location of these areas, the classic industrial appearance, and the relation to historical development of the cities that accommodate such industrial property contribute to the success of these transformation projects.

2.3 Economic and spatial relevance

Currently, the main goal of developing new industrial areas by municipalities and regions is threefold (Louw *et al.*, 2004): (1) attracting companies; (2) stimulating local economy; and (3) creating employment. Concerning the first goal, the development of industrial areas seems very successful in recent years; companies increasingly decide to establish their business on industrial areas (e.g., Pen, 2002; and PBL, 2009). As a result, industrial areas accommodate about 32% of the total employment in the Netherlands (Weterings *et al.*, 2008; PBL, 2009). Next, industrial areas play a substantial role in the Dutch economy. Louw and Bontekoning (2007) point out that 35% of the total value added is created on industrial areas. Each industrial area hectare yields approximately €1.7 million each year (Louw and Bontekoning, 2007). Therefore, it is concluded that creating industrial areas in the Netherlands is necessary to realize a sustainable Dutch economy. Concerning the third goal, Louw and Bontekoning (2007) state that the development of new industrial areas does not contribute to employment growth on a regional scale; industrial areas do not generate employment, but have an important local distributive effect on employment (Louw and Bontekoning, 2007).

In addition to the economic relevance, industrial areas are also important from a spatial point of view. Industrial area land use covers more than 2% of the Dutch surface (Louw *et al.*, 2009), and this amount is growing steadily. Taking into account that the Netherlands is one of the most densely populated and urbanized countries in the world, Dutch planners are confronted with a scarcity of land (van der Valk, 2002). This underlines the importance of distributing the space for industrial activities efficiently and economically.

2.4 Actor behavior and the development process

As Dutch industrial areas show to be important from social, economic and spatial points of view, scientific research on this subject covers a very large number of diverging topics (for an extensive overview, see Van Dinteren (2008) and Louw *et al.* (2009)). A substantial part of this research after Dutch industrial areas focuses on features that are related to actor behavior and the influence of this behavior on the development process. For instance, Meester (1999) and Pen (2002) paid attention to

the relation between company migration and industrial area planning, Louw (2000) discussed the role of the Dutch authorities in the planning and production of industrial areas in the Netherlands, and Pellenbarg (2002) examined results of the policy of the Dutch government to develop sustainable industrial areas. Furthermore, De Graaf (2005) studied the level of interaction between involved actors in industrial area development, Louw and Bontekoning (2007) presented an overview of the planning debates and policy issues for industrial areas in the Netherlands, and Louw (2008) discussed the consequences of the involvement of a large number of landowners on the interdependent relations when redeveloping industrial areas. Finally, Louw *et al.* (2009) presented an overview of the planning of Dutch industrial areas, covering all phases of the development process.

In addition, some interesting scientific studies have been conducted in the field of spatial development processes in general in the Netherlands. For instance, Van der Valk (2002) explained the Dutch planning system from a political point of view, and – in this line – Priemus and Louw (2003) and Louw *et al.* (2003) discussed the evolution of Dutch spatial development policy over the last decades, thereby giving recommendations on how to solve problems that occur because of the growing interdependence between public and private actors.

Finally, several practical and professional studies have been executed regarding industrial area (re)development processes. Some influential examples are VROM-raad (2006), presenting a new strategic planning approach for industrial areas, with a revised division of roles among public and private parties; DHV (2007), giving recommendations for increasing the role of private developers in the industrial area market; and Algemene Rekenkamer (2008), studying the effectiveness of the Dutch policy that aims for decelerating the ageing process of existing industrial areas. Furthermore, THB (2008) discusses several strategic points of interest in order to optimize the industrial area market, thereby aiming for increasing the role of regional development companies and private investors, and PBL (2009) presents an evaluation of the current industrial area planning approach and its results, thereby giving recommendations on how to improve this planning approach.

Thus, a considerable share of the research on Dutch industrial areas focuses on the planning process, and on the behavior of actors within this process. A final striking example that supports this statement is the inaugural lecture by Van Dinteren (2008), who portrayed industrial areas as sports fields, with players, rules, and boundaries, thereby prominently positioning the process within the discussion about industrial areas. Therefore, I postulate that process features generally have a significant

influence on the outcome of industrial area (re)development projects; within this research, emphasis will be put on process characteristics of industrial area redevelopment. Following this emphasis, the Dutch system of general spatial planning and urban planning is discussed in the following paragraph, together with the current – largely deviant – planning approach for industrial areas.

2.4.1 General spatial planning in the Netherlands

The Dutch system of spatial planning and urban development is described by many authors (e.g., Hajer and Zonneveld, 2000; Van der Valk, 2002; Priemus and Louw, 2003; and Louw *et al.*, 2003). According to these authors, one of the main characteristic of the Dutch planning system is that it is governed by a three-tier, multiparty governmental system. The national government is the top tier and consists of 13 ministries, of which the Ministry of Housing, Spatial Planning and Environment is in charge of spatial development, often in cooperation with the Ministry of Economic Affairs. Furthermore, the country is split up into 12 provinces and 431 municipalities.

Several responsibilities and authorities are allocated to each governmental level, aiming for a largely decentralized execution of spatial policy with a minimal amount of rules and legislation. In this system, each governmental level draws up a structure vision, which can be characterized as a strategic policy document. This vision should contain the principles of the spatial policy on each specific governmental level, together with a plan on how to execute this policy, and how this spatial policy eventually affects the spatial policy of lower governmental levels. Imposition of the national policy on provinces and municipalities and of the provincial policy on municipalities is effected through governmental consultations and through usage of specific tools (for an overview, see VROM, 2009). At the end, municipalities are responsible for the execution of spatial policy on local level. For this, they develop land-use plans covering the total municipal domain. In these land-use plans, the allocation of functions to specific parts of the municipality is recorded.

Implementation of spatial plans in the past

In the past, these municipal land-use plans proved to be insufficient for providing local authorities adequate and effective control over their spatial policy and over plan implementation (Priemus and Louw, 2003). Achieving the desired spatial and physical quality and related economic revenues proved to be problematic without additional sources of control. To overcome this, and to become able to give direction

to spatial development, local authorities started to participate actively in the land market and land development, becoming land developers (Louw *et al.*, 2003).

In this active land policy, municipalities bought agricultural land at an early stage in order to prepare the site for building, divide it into building lots and release it to contractors and occupiers. By owning the land, a local authority not only governed the spatial development using public tools, but also through ownership of property rights, as a landowner. Result of this approach was that municipalities faced low risks in land development, owning a monopoly on land acquisition. According to Priemus and Louw (2003), the presence of (negative) external effects, employment effects in supplying industrial areas, and equitable effects such as stimulating the social housing sector were other reasons for intervening in the land market.

As a result, Dutch municipalities could operate fairly autonomous in urban area development projects and were able to develop plans on the basis of their own insights as long as these were consistent with higher level objectives and restrictions as part of a hierarchically organized planning process. After setting the public planning framework, private parties were responsible for realizing the plan elements, sometimes accompanied by governmental or semi-public agencies that were developing pieces of land. Hence, there was a fairly strict separation between the responsibilities of public and private parties, which is sometimes expressed by the statement that in the Netherlands, development was plan-led.

Recent changes in the urban process environment

This practice of municipal and provincial land policy has been in place for more than 50 years, and it functioned reasonably well. However, within the last two decades, several changes have occurred. One reason for these changes is that, since the early nineties, a growing number of projects were planned in which the private implementation and realization of the public plans was problematic, because of high risks or changing demands from the market (Bruil *et al.*, 2004). The resulting stagnation of urban development projects was disadvantageous for both public and private actors. This was the reason why the national government in the early nineties headed for a spatial policy aimed at plan realization (Spit, 2002; Bruil *et al.*, 2004), in which the strict separation of public and private tasks and responsibilities evanesced; more market responsibility in urban development was advocated. The starting point of this new spatial policy was that an early and intensive cooperation between municipality and interested market parties should result in a public-private agreement (Priemus, 2006).

Implementation of this policy required a more market-oriented attitude of the government, in which municipalities act as a reliable contract partner. Additional consequence of this was that public subsidies were abolished; this caused a heightening of the development risks for municipalities, and implicitly the need to cooperate with private parties. This resulted in an increasingly active role of private developers. Currently, they manifest a large interest in the land development process, becoming more active in acquiring land on greenfield sites – partially to secure future construction assignments – and by doing so they force local authorities to rethink how to govern land development and land-use policy (Louw *et al.*, 2003). As a result, the public monopoly of the land market is gradually being transformed into private monopolies in the building market (Priemus and Louw, 2003).

2.4.2 Industrial area development processes

The way in which industrial areas are planned deviates from the current planning approach of regular urban developments; in the spatial planning of industrial areas, the influence of governmental agencies is still very large. Even today, when the role of private agents in planning and developing new urban areas is increasing rapidly (Louw *et al.*, 2003), approximately 75% of the supply of building land on industrial estates is controlled for by local governments. This share has been more or less constant over the last decade (Louw and Bontekoning, 2007). The large role of municipalities in planning and developing industrial areas is justified by the assumption that industrial areas stimulate local or regional economic development and provide necessary space for employment growth. Provinces try to coordinate these activities; however, they are not yet very successful in doing that (van Dinteren *et al.*, 2007). Finally, the Ministry of Economic Affairs aims for channeling the development of industrial areas by supplying subsidies and advices (Louw *et al.*, 2009). For an overview of the industrial area development process, see figure 2-2.

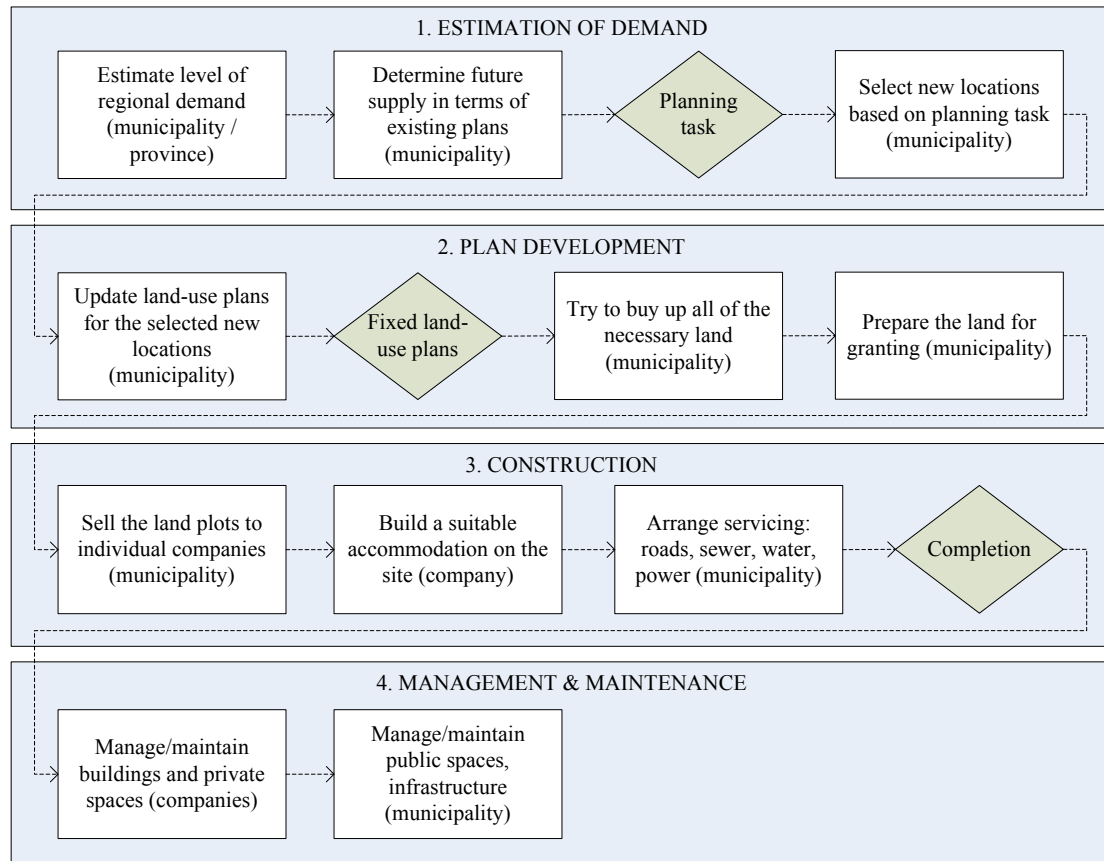


Figure 2-2: industrial area development process

Three main steps can be distinguished that are passed through in the process of developing new industrial areas (Louw, 2000):

1. *Estimating the level of regional demand:* Most models predicting the need for industrial areas are based on regional employment growth prognoses. In order to estimate the demand for industrial areas, the Dutch government currently uses the business location monitor (BLM) (for the latest version, see Arts *et al.*, 2005);
2. *Determining the future supply of industrial areas in terms of existing spatial plans:* The calculated demand for new industrial areas is compared to the available capacity in existing spatial plans for the production of industrial areas. Based on this comparison, the government calculates the dimensions of the planning task; and
3. *Selecting new locations:* This planning task is translated to regional development plans, specifying the locations that are suitable for the development of new industrial areas, and eventually to land-use plans.

On the basis of a land-use plan, a municipality can start with the development of an industrial area; trying to buy up all of the necessary land, using legal tools if necessary, and preparing the area. In this way, the possibilities of directing spatial development are large for municipalities. Louw (2000) states that municipalities – by owning the land – can stipulate the type of structure of the buildings on the area, the use of sustainable construction materials, parking space, and development timing. Furthermore, it contributes to covering the public production costs.

For companies, the current most usual way to realize industrial property in the Netherlands is to buy a prepared plot on an industrial area from a municipality and to build a suiting accommodation on it. Usually, companies can buy prepared plots relatively easy. After this, the company contracts an architect to design a building that fits its production processes, which will be realized by a contractor and financed by own reserves or loan capital. Eventually, it is possible for growing companies to buy a larger plot than initially necessary. At the same time, the local authority arranges the roads constructions, water supply and sewer, power provision, etc. Maintenance and management of the buildings is the responsibility of the companies; the maintenance and management of the public spaces and technical systems remains the responsibility of the municipality (Needham and Louw, 2003).

2.5 Actors' involvement

As mentioned in paragraph 2.4, actor behavior is assumed to be important in explaining and understanding the current industrial area development routine. In this, actors can be defined as: “individual or an aggregated social entities that have the ability to make autonomous decisions and act as a unit – e.g., a company or an association is a collective actor with overall accepted rules for collective choice and can thus be regarded as a single social entity” (after Pahl-Wostl, 2005). Furthermore, an actor has an interest in industrial area development when the development of the area contributes to the goals of the actor or threatens the realization of these goals, and the level of authority of an actor is determined by its control over necessary (e.g., financial, legislative) resources.

Many actors are involved in industrial area development projects, each having specific reasons for their behavior. De Graaf (2005) described the role of the eight actor groups within industrial area redevelopment projects. In this paragraph, insight is given in the behavior of three influential actor groups: municipalities, established companies / users, and investors.

2.5.1 Municipalities

Olden and Louw (2005) and Louw *et al.* (2004) describe the role of the municipality as follows: “The local government stipulates the supply of industrial areas in all respects. Plan shaping, development, granting and management are in the hand of the municipalities.” This degree of government involvement in current industrial area development can be justified by the following factors:

- The municipality is responsible for the land-use plan procedure, and is therefore always a member of the planning team (De Graaf, 2005).
- Municipalities assume that industrial areas stimulate local and regional economic development and employment growth.
- The social costs of the occurring problems are not expressed when public parties are not involved (Schoor, 2001).
- Municipalities have a commercial interest; they gain much money with the granting of industrial areas (PBL, 2009). It is more lucrative for municipalities to grant new areas and sell the plots than to invest in old areas.

As can be seen in figure 2-2, municipalities are responsible for almost all steps in the development process of new industrial areas; several departments are involved. First, the economic policy department is always involved: they support the supply of sufficient space for industrial activity, in order to stimulate economic growth and employment growth. Second, the department of spatial planning is involved, because industrial area development is only possible when land-use plans allow such development. Furthermore, the spatial planning department is responsible for the spatial quality of urban areas within the municipality. Thirdly, the municipal land development company has interests in the development of new industrial areas; gaining income for the municipality is the major goal of this department.

The large governmental involvement contributed to the current popularity of industrial areas amongst entrepreneurs looking for accommodation space. Municipalities have interests in continuation of this practice, because they consider it necessary for their spatial and economical policy. Municipalities make sure to meet the demand of the business community for building land in terms of quality and quantity. Furthermore, this practice makes it easier for municipalities to redevelop inner city locations; companies are relocated more easily when an alternative location can be offered (Needham and Louw, 2003).

However, this large involvement has some consequences. First, municipalities hardly invest in the quality of industrial areas to keep production costs low and to recover the

costs of the site preparations as soon as possible. The administrative attention for industrial areas decreases rapidly after the construction phase. Second, municipalities are frequently unwilling to organize the daily management and maintenance of roads, green spaces, lighting and security in an adequate manner. Third, because the interests of the different involved municipal departments are divergent, tensions can arise when developing new industrial areas, causing severe delays in planning procedures. Finally, there is a strong mutual competition between municipalities in attracting companies. As a consequence, municipalities are more rapidly prepared to flexibly deal with municipal policy requirements concerning industrial areas (VROM-raad, 2006; Van Dinteren, 2008).

2.5.2 Established companies

Industrial areas are attractive for entrepreneurs because they offer more legal certainty, a good accessibility, a surplus of available building land, and relatively low land prices because of inter-municipal competition. Low real estate and land prices result in a reduced attention for maintenance. Because of this, buildings are written off rapidly (Needham and Louw, 2003). This is partly caused by the inexperience of entrepreneurs in exploiting real estate, as this is often not their core business activity. Furthermore, land costs cover only a small part of the total capital expenditures of production companies (approximately 1%). This relative low influence of land prices makes it possible for companies to purchase more land than initially necessary. In this way, companies preserve the possibility on future extension (Schoor *et al.*, 2001; Louw *et al.*, 2004; VROM-raad, 2006). This stimulates inefficient land use.

2.5.3 Investors

The role of long-term investors on the industrial area market is very limited; most entrepreneurs design and construct their own buildings because of the relatively large supply of building land. This leads to a very company-specific building stock with low and hardly increasing market values, little circulation because of the high costs of moving to a building in the existing stock, and thus little company space for hire (Schoor, 2001; Needham and Louw, 2003). Buildings on industrial areas are not yet interesting investment objects; the scarce professional private parties that are involved in industrial area development are mainly developing contractors, securing their future construction activities. When considering industrial buildings, only 10% is owned by professional investors (Van Dinteren, 2008).

Louw (2000) distinguished three main causes for the relatively small market share of investors in the industrial area market. The first is tradition: investors have no expertise in the industrial area market. Second, little is being developed for the free market, resulting in a relatively low gaining capacity for developers, a low rent level and high sale risks, because of the company-specific product. No uniform buildings are offered, despite the increasing suitability of applying standardized concepts in the current industrial environment. Third, many buildings on industrial areas are regarded as a contribution to the pension of the owners. These owners feel hesitant about giving up this financial security.

According to Needham and Louw (2003), another reason can be found through a real estate analysis. Because buildings are stock products (the number is dominated by supply from the existing stock, not by supply from new developments), the market value is determined by the price of existing buildings. New developments are price-takers, and not price-fixers. Prices of the current stock of industrial buildings are very low – around minimal production costs – because of the large supply. With these low prices, it is not attractive for investors to buy land and develop industrial buildings themselves (Needham and Louw, 2003). This leads to the conclusion that – although the possibilities for private parties to enter the industrial area development market are present (see Van Dinteren, 2008) – it does not pay off under current conditions.

2.6 Results of the current planning approach

In the previous paragraphs, the Dutch industrial area planning approach was discussed, together with the role of several actors within this planning approach. Furthermore, several problematic consequences were mentioned indirectly. In the first part of this paragraph, the results of the current planning approach are elucidated in general, and a detailed overview of these consequences is given in the second part, presenting facts and figures. The focus lies on the dimensions of the current stock of industrial areas, the absolute and relative growth of this stock, and on price development.

2.6.1 General consequences

The first major consequence of the current planning approach is the very large supply of industrial area land plots: approximately 50% of all construction land in the Netherlands is currently reserved for industrial activities, while the industry covers less than 20% of the currently built-up land (Louw and Bontekoning, 2007). Thus, in planning industrial areas, industry claims too much space beforehand, and

municipalities subsequently reserve too much space for industrial areas. Furthermore, the large stock of prepared land for industrial areas stimulates the granting of industrial areas, because municipalities want to recover the costs as soon as possible.

The redundantly large supply of industrial area land plots is mainly caused by the lack of realism in the estimations of the demand for new industrial areas. Several studies (e.g., PBL, 2009; Van Dinteren, 2009; Louw *et al.*, 2009) discuss the shortcomings of the current estimation approach. Another cause of the large supply of industrial area land plots is the choice of municipalities to develop new industrial areas for meeting the estimated demand, instead of redeveloping existing areas that are not optimally used. This choice is legitimated by the assumptions that redevelopment does not yield enough gain in space to meet the demands, and that redevelopment is more expensive than new development. Both assumptions are severely questioned (see PBL, 2009). Final cause of the large supply of industrial areas is the strong mutual competition between municipalities in attracting companies. Each municipality wants to have a certain amount of industrial area land plots in stock, with low land prices. Having industrial area land plots in stock gives municipalities the possibility to flexibly manage unexpected demands for industrial space from the market. This is possible because the production costs are relatively low and eventual losses are accepted by municipalities.

According to Louw *et al.* (2009), companies profit from this approach; industrial areas are attractive places to be established, they offer a high legal certainty in building and usage possibilities from a planning point of view, the accessibility of the areas is often very good, companies can buy extra land and keep it in stock, and the land and construction prices are often low. Because of the large supply of new industrial areas and the relatively low prices, a very low share of companies buy or rent a building from the existing stock. In this respect, the industrial area market differs significantly from other markets for commercial real estate, like office buildings and shopping properties.

2.6.2 Industrial area supply

On January 1st 2009, the Netherlands possessed 3.707 industrial areas. In 2008, it added up to 3.561 industrial areas. Most important reason for this increase is the development of new areas, and the identification of several economical zones as industrial area. Currently, industrial areas cover a surface of 105.181 hectares gross, and 77.365 hectares net. Compared to 2008, the gross surface has increased with approximately 4% (see table 2-1).

Table 2-1: industrial area stock in the Netherlands, 2004-2009 (reference date: 01-01) (Schuddeboom *et al.*, 2009b)

Stock	2004	2005	2006	2007	2008	2009
Number of industrial areas	3.633	3.616	3.605	3.606	3.561	3.707
Surface area (gross hectare)	94.547	95.016	94.564	97.292	100.910	105.181
Surface area (net hectare)	70.107	70.254	70.217	71.632	73.781	77.365
Ratio (gross-net) (%)	74,15%	73,94%	74,25%	73,62%	73,11%	73,55%
In use by companies (net hectare)	59.155	59.388	57.748	59.505	65.816	63.572
Grantable land (net hectare)	10.952	10.866	12.469	12.064	12.306	13.793

The number of hectares that was still available for granting on January 1st 2008 added up to 13.793 hectares. This increased in comparison to 2007 (12.064 hectares) and 2008 (12.306 hectares). In the years preceding 2006, the number of hectares that was available for granting was considerably lower. Economical development can be assigned as an important reason for this. When the economy grows, pressure is put on governmental agencies to realize available plans for new industrial areas.

In figure 2-3, an overview is given of the yearly granting of new industrial areas in hectares. From this, we can conclude that the years 1998, 1999, and 2000 were prosperous in terms of granting of new industrial areas; this declined in 2001. After 2003, the number of new industrial area hectares increased again. This can be explained mainly by economic cyclical fluctuation (Schuddeboom *et al.*, 2009a). The increase continued in the years after 2004; in 2005 and 2006, the granting increased to 703 and 842 hectares respectively. In 2007, 1.119 hectares was granted; a growth of approximately 33% with respect to 2006.

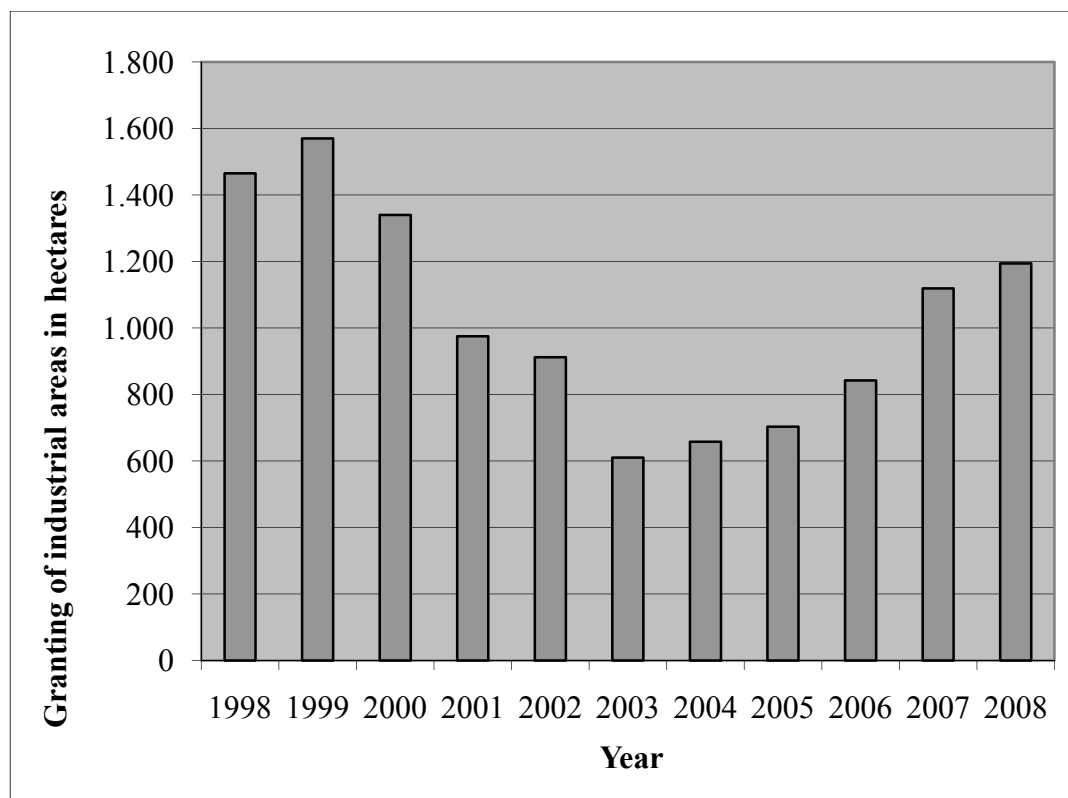


Figure 2-3: granting of industrial areas (in hectares) (reference dates: December 31st) (Schuddeboom *et al.*, 2009b)

2.6.3 Prices

Besides the annual granting figures, the land price level is also an interesting aspect to study more in detail. As explained in section 2.5, land prices are kept low because of a strong inter-municipal competition in attracting new industrial activities. However, these low land prices cause several problems, of which inefficient land use, low investor involvement, and low attention for maintenance are most important.

In figure 2-4, the averaged minimum and maximum prices of industrial land in the Netherlands are represented. Because the industrial area market is characterized by a high percentage of owner-occupiers, this paragraph focuses on land prices, and leaves the rental prices and land lease prices aside.

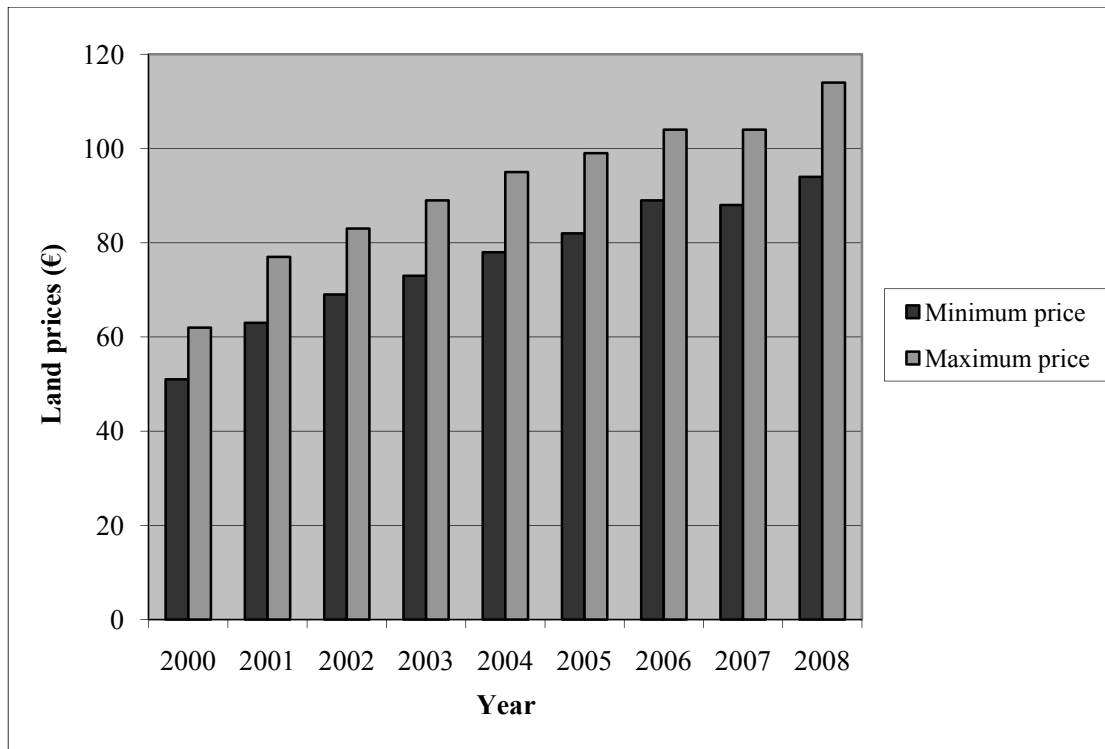


Figure 2-4: averaged Dutch minimum and maximum land prices (excluding VAT) (Schuddeboom *et al.*, 2009b).

Over the last nine years, we can discern a constant growth of minimum as well as maximum land prices, of approximately 7% per year. Still, new industrial area building land is relatively low-priced; the prices of land reserved for new residential areas are three to four times higher. Industrial area land is sold far below the market price, resulting in criticism from many scholars (e.g., Needham and Louw, 2003; Van Dinteren and Van Der Krabben, 2008a; Louw *et al.*, 2009). According to PBL (2009), the main reason for these low prices is that municipalities do not apply residual valuing methods for industrial area land, as they do in the residential housing sector, because company space does not have a uniform market value.

2.6.4 Suggested changes in industrial area development process

Because of these negative side effects of the current industrial area planning approach, which will be discussed more in detail in the next chapter, many authors suggested several changes in the development process. These suggestions can be divided in two groups; short-term changes and long-term changes. The most important suggested short-term changes are as follows:

- Substantially raising the price of land plots by municipalities (Van Dinteren, 2008, THB, 2008; PBL, 2009; Louw *et al.*, 2009);

- Changing the quality of the supply towards a well-balanced mix of functions (VROM-raad, 2006); and
- Obliging municipalities to primarily focus on redevelopment of industrial areas in meeting the spatial demand for economic activities (VROM-raad, 2009; Van Dinteren, 2008; THB, 2008; PBL, 2009; Louw *et al.*, 2009).

Second, there are several suggestions for long-term changes in the development process, of which the two most important are as follows:

- Professionalization of the industrial area market, in which private developers and investors become a leading partner in the development and management of industrial areas (Van Dinteren, 2008; THB, 2008; PBL, 2009); and
- Positioning the planning and execution of (re)development of industrial areas on a regional scale, thereby stimulating the cooperation of municipalities on this scale, aiming for the supply of a regional, functionally balanced stock of industrial areas (for a thorough discussion on this regional approach for industrial areas, see Van Dinteren, Posthuma and Bruin, 2007; and Van Dinteren, 2009).

2.7 Summary

In this chapter, the history, present, and desired future of industrial area development in the Netherlands is discussed, together with the spatial and economic importance of Dutch industrial areas. The first major conclusion following from this analysis is that industrial areas are important for realizing a sustainable economic growth in the Netherlands; they play an important role in accommodating employment, in stimulating local and regional economies, and in creating added value.

After this discussion on the importance of industrial areas in the Netherlands, a short overview of research on industrial areas is presented. From this, it is concluded that a considerable share of the research on Dutch industrial areas focuses on the planning process, and on the behavior of actors within this process. On the basis of a more detailed elaboration of these process-related studies, I postulate that process features generally have a significant influence on the outcome of industrial area (re)development projects. Therefore, emphasis will be put on process characteristics of industrial area redevelopment within this research.

Contiguous to this postulate, an explanation of the currently adopted industrial area planning approach is presented. Remarkably, this planning approach differs strongly from regular urban development planning approach. One of the most important

differences is the lack of participation of private real estate investor companies in industrial area development; municipalities are mainly responsible for the development of new areas, while municipalities and the users of the area (entrepreneurs) are responsible for the management and maintenance.

The adopted approach significantly influences the outcome of industrial area development processes. One of the main consequences is the redundantly large supply of very cheap industrial area land plots. A few reasons for this are mentioned in this chapter: lack of realism in the estimations of the demand for new industrial areas; financial profitability of developing new industrial areas for municipalities; and mutual competition between municipalities in attracting companies. Another consequence of the current industrial area development process is a lack of attention to redevelopment of non-optimally functioning areas among municipalities. The chapter concludes with an overview of several short- and long-term recommendations for solving and preventing occurring problems in the near future.

CHAPTER 3

PROBLEM ANALYSIS

3.1 Introduction

In the previous chapter, an overview is given of the Dutch industrial area market, elucidating the most important characteristics, and discussing the past, present and future of industrial area development in the Netherlands. The influence of industrial areas on the Dutch economy stands central in this. Furthermore, it was postulated that the necessary collaborative processes between involved actors, combined with the individual behavior of these actors, significantly determine the outcome of industrial area development, and that this results in several problems in the Dutch industrial area market. The problems that are discussed in chapter 2 are related to the development of new industrial areas.

In this chapter, the most important problems that are related to the existing stock of industrial areas are listed, and several causes of these problems are discussed. It is advocated that the occurring problems lead to a large need for redevelopment of unused, obsolete industrial areas. Therefore, the Dutch redevelopment task and the redevelopment process are discussed, and an overview of the progress of the Dutch redevelopment task is given. From this overview, it is observed that Dutch redevelopment processes stagnate. In the last part, the most important causes of this stagnation are presented.

3.2 Recognition of main problems

Because of the high level of supply of new industrial areas, and the resulting low prices of industrial area land, large problems have originated on existing industrial areas (Van Dinteren, 2008). These problems are discussed in several studies (e.g., Needham and Louw, 2003; Louw and Bontekoning, 2007; THB, 2008; PBL, 2009; and Louw *et al.*, 2009). When summarizing these studies, two large problems can be distinguished: (1) a lack of occupancy of industrial real estate objects on existing areas, and (2) rapid obsolescence of existing industrial areas.

Using figure 3-1, these two main problems can be explained more in detail. As concluded, local governments – being the main developers of industrial land – show no hesitation in developing new industrial areas (see section 2.5.1). The resulting large amount of newly constructed industrial areas leads to a lack of occupancy on existing areas; companies prefer establishment on a new area over redevelopment of the existing building because of the better price/quality ratio, leaving behind industrial areas with obvious signs of obsolescence and a growing lack of occupancy. Furthermore, the large occupancy on the new areas results in a larger forecast of the need for new industrial areas, because predictions on future spatial demands are partly based on extrapolation of historical granting figures. This – again – results in an increasing supply of new areas, and a growing lack of occupancy on existing industrial areas (figure 3-1), which is directly related to areas becoming obsolete very quickly.

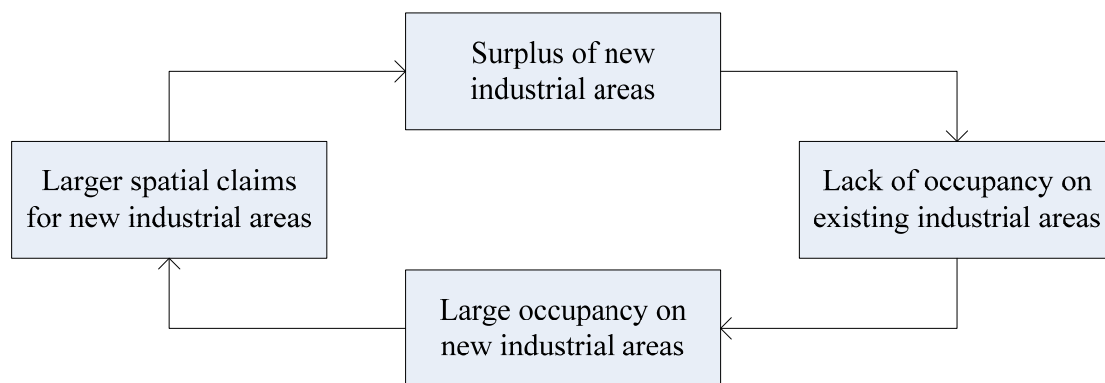


Figure 3-1: Dutch industrial area market: a vicious circle (Olden, 2007)

Thus, each company movement causes an acceleration of the obsolescence of an industrial area. And currently, it is more attractive for companies to relocate their business when the current location is no longer satisfactory. Municipalities do not take redevelopment into consideration when aiming to meet the demand for industrial

areas. Until recently, there was no connection between the municipal policy for new industrial area development and the policy for solving the obsolescence of existing areas through redevelopment. This is caused by the assumptions that redevelopment does not yield spatial gains (PBL, 2009) and that redevelopment is a complex, unpredictable and risky process.

In this research, the quick process of industrial areas becoming obsolete is regarded as a main problem in the Dutch industrial area market. The *problem owners* of the quick process of existing industrial areas becoming obsolete are governmental bodies. The national and provincial government is a problem owner because of spatial and economic consequences. From the viewpoint of efficiency of spatial usage, industrial areas perform poorly. In turn, this imperfection of the spatial quality of most industrial areas has consequences for the economic performance; it is difficult to attract economic activities when offering industrial areas with a poor spatial quality. Furthermore, local governments can also be designated as problem owners, despite the fact that they are partially responsible for the occurrence of the problems. Almost 75% of the municipalities indicate that they have obsolete industrial areas in their stock, and 40% of the municipalities complain about infrastructural problems (PBL, 2009).

3.2.1 Defining obsolescence

Little attention is being paid to obsolescence in the extensive literature on industrial areas; an unambiguous definition is not available. Good examples of Dutch research projects focusing on obsolescence are Schuur *et al.* (2001) and PBL (2009). Schuur *et al.* (2001) proposed a distinction between four processes of obsolescence: (1) technical obsolescence: the area is obsolete, and does not satisfy the original user needs, because of a lack of maintenance of roads and buildings; (2) economic obsolescence: the originally stated user needs can change over time, making the area less suitable for this user; (3) social obsolescence: a decrease of the possibilities on an industrial area because of an aggravation of environmental legislation; and (4) spatial obsolescence: the surroundings of industrial areas can change over time, and even when the area meets the current user needs, conflicts occur with new functions in the surrounding of the area.

In contrast, PBL (2009) distinguishes between two types of obsolescence: (1) obsolescence pertaining to business economics, and (2) obsolescence pertaining to a poor spatial quality. The first type occurs when the area does not longer fulfill the needs of the users. This is for instance the case when production and employment of

companies established on an area increases, or when the companies' demands shift towards different area qualities. The second type of obsolescence connects to the perception of users concerning the spatial quality. Problems arise when the perceived quality of the area declines below the accepted standards for safety, noise, traffic, etc.

Both definitions are not made operational; no conclusions can be drawn concerning the effectiveness of the distinctions and concerning the shares of different types of obsolescence within the total stock of obsolete industrial areas. In an attempt to improve this difficulty in measuring obsolescence, several studies are currently undertaken in which spatial quality is made operational. Because these insights are not yet available, the above mentioned definitions serve to clarify the concept of obsolescence; no further attention will be given to the different typologies.

3.3 Appearance of the problem: Dutch redevelopment task

In time, the quickly worsening obsolescence of existing industrial areas will result in the need for redevelopment. In this research, redevelopment is defined as the sum of all interventions on industrial areas, not being part of regular maintenance, aiming for diminishing the level of obsolescence of the total area. Concerning the dimension of the industrial area redevelopment task in the Netherlands, several studies have been carried out in the past. In this section, an overview is given of recent, most influential predictions.

The point of departure in most predictions is the Dutch national database of industrial areas (IBIS), constructed in 2002 and in which the level of obsolescence is recorded on a yearly basis. Between 2002 and 2005, this database only registered the total gross area surface of obsolete industrial areas. Based upon the information in this database, the Dutch Ministry of Housing, Spatial Planning, and Environment calculated that, at the end of 2002, 34% of the available 92.700 hectares of industrial areas in the Netherlands were obsolete and in need for redevelopment. This amounted to 31.600 hectares.

However, the outcomes of these first calculations were severely criticized. Main argument was that – in most cases – only parts of the designated areas could be characterized as obsolete, leading to the statement that these calculations did not give an accurate insight in the actual dimensions of the redevelopment task. Therefore, Reesink and van Aalst (2003) tried to make an assessment of the total number of hectares of industrial areas that was actually obsolete, using index numbers. This resulted in a reduction of the original estimation: according to these renewed

calculations, approximately 28% of the total stock of industrial areas was obsolete, amounting to 25.700 gross hectares.

Based upon the improved figures of the database in 2003, combined with results of a study of ETIN (2002), the Dutch Ministry of Economic Affairs (2004) concluded that more than 20% of the total amount of industrial areas was obsolete at the end of 2003 (21.670 ha). The large differences between the estimations in 2002 and 2003 already indicate that predicting the dimensions of the Dutch industrial area redevelopment task is difficult.

Therefore, since 2006, information was included in the IBIS database concerning the net and gross parts of individual industrial areas that are actually obsolete, in order to achieve a higher quality of the national database. Furthermore, information was gathered about existing redevelopment plans and realization of these plans. The information of the IBIS database in 2006 was used by Olden (2007), concluding that more than 45% of the total stock of granted industrial land plots was located on a partially or fully obsolete area on January 1st 2006. Furthermore, the data displays that averagely 75% of the total surface of problematic industrial areas was actually obsolete, leading to the conclusion that approximately 27.500 gross hectares of industrial areas needed to be redeveloped to remain suitable as industrial space. In contrast, the IBIS 2007 figures revealed that 1.052 areas contained signs of obsolescence (29%), equaling 32.230 gross hectare surface (33%) on January 1, 2007 (Schuddeboom *et al.*, 2007). The figures over 2008 contain only information about industrial areas in 8 out of the 12 provinces; it is difficult to draw nationwide conclusions from this information.

The results of these studies are severely questioned (see Traa and Knobben, 2009). Therefore, several additional studies have been conducted in order to obtain a realistic insight in the Dutch redevelopment task. First, THB (2008) used the IBIS 2007 information, and conducted verifying research on the basis of a quick scan of a limited set of industrial areas. Five types of redevelopment are distinguished:

1. Facelift: Large-scaled redecoration of (parts of) the industrial area, aiming for reparation of technical obsolescence, mostly focused on public parts of the area;
2. Revitalization: Occurring technical, economical and social obsolescence requires an integral approach. The total area is integrally redeveloped, preserving the original economic function;

3. Heavy revitalization: Several pieces of land have to be acquired in order to decontaminate the soil. These land plots can be granted after preparation. The area preserves its original economic function;
4. Re-profiling: Occurring economic, social and spatial obsolescence requires an integral redevelopment, after which the area is assigned a different economic function, often with higher real-estate values; and
5. Transformation: Areas with economic and spatial obsolescence are integrally redeveloped and transformed into an area with a residential function.

The estimations of THB (2008) exclude projects that entail a facelift or a transformation, leading to the conclusion that only 55% of the total gross surface of the obsolete industrial areas – as calculated by IBIS 2007 – is part of the actual redevelopment task (15.800 gross hectares). However, because this research is based upon a sample survey, including only 58 out of the 1.061 obsolete areas (equal to 5.5%), a large uncertainty margin exists when interpreting the outcomes (see Van Dinteren and Van der Krabben, 2008a, 2008b). As an interesting extension, THB (2008) also estimated the redevelopment task in financial terms: the total costs of redevelopment of obsolete industrial areas in the Netherlands are assessed at 6.35 billion Euros.

Second, PBL (2009) focused purely on existing plans for redevelopment of industrial areas, thereby distinguishing transformation into residential function, transformation into other urban functions, and revitalization with preservation of the original economic function. Results show that redevelopment plans exist for 15% of all industrial areas that are recorded in IBIS (2007). Revitalization with preservation of the original economic function covers approximately 33% of these existing redevelopment plans. Thus, for 5% of the total stock of industrial areas (4.865 gross hectares), actual redevelopment plans exist in which the original function of industrial area is preserved. Again, these figures should be interpreted with prudence; it concerns a global indication (PBL, 2009).

3.3.1 Discussion

The divergence in the different outcomes of redevelopment task predictions indicate that it is difficult to give an accurate overview of the industrial area redevelopment task in the Netherlands (see also PBL, 2009, and Traa and Knoben, 2009). In table 3-1, I have summarized the differences between the outcomes of the discussed five calculations.

Table 3-1: outcomes of different prediction concerning demand for new industrial areas (gross hectares)

Source	Reference date	Redevelopment task (gross hectares)	Total stock (gross hectares)	Share (%)
Reesink and van Aalst (2003)	January 1 st 2003	25.700	92.700	27.7%
Economic Affairs (2004)	January 1 st 2004	21.670	94.547	22.9%
Olden (2007)	January 1 st 2006	27.500	94.564	29.1%
Schuddeboom <i>et al.</i> (2007)	January 1 st 2007	32.230	97.292	33.1%
THB (2008) *	January 1 st 2007	15.800	97.292	17.0%
PBL (2009) **	January 1 st 2007	4.865	97.292	5.0%

* THB (2008) excludes facelift and transformation projects

** PBL (2009) focuses solely on areas for which a plan is available, focusing on revitalization projects.

Traa and Knoben (2009) discuss several reasons for the large differences in the estimates of the dimension of the redevelopment task. First, the ambiguous definition of obsolescence makes comparison difficult. Furthermore, the reliability of the IBIS-database that is used in most calculations is questioned (see also THB, 2008; and Van Dinteren and Van der Krabben, 2008b), and the absence of distinction between different types of obsolescence in the database makes it impossible to create solid conclusions concerning appropriate types of redevelopment. Despite these difficulties, the Dutch government endorses to the calculations of THB (2008), and aims for redeveloping 15.800 hectares of obsolete industrial areas in the period 2010-2020.

Calculating the exact dimensions of the redevelopment task in the Netherlands does not lie within the scope of this research. However, the scale of the figures presented above indicates the existence of a large stock of obsolete industrial areas in the Netherlands, asking for a solution.

3.4 Industrial area redevelopment in the Netherlands

As discussed in section 2.6.4, several changes are suggested in the current industrial area development approach, in order to solve the occurring problems that are related to the quick process of obsolescence, and to avoid the occurrence of these problems in the future. These suggestions are divided in two groups; short-term changes and long-term changes. One of the three suggested short-term changes is to primarily focus on redevelopment of industrial areas in meeting the spatial demand for economic activities.

As a result, redevelopment of industrial areas is placed high on the Dutch political agenda. Possibilities for redevelopment are inventoried preceding each initiative for new industrial area development (THB, 2008), and the national government aims for redeveloping 15.800 hectares of obsolete industrial areas in the next ten years. Three reasons can be appointed for this increased political importance of industrial area redevelopment (Louw and Bontekoning, 2007): (1) large concerns about the vitality of Dutch cities; (2) increasing pressure on the available space; and (3) desired improvement of the quality of the current stock of industrial areas, stimulating economic development.

Because of the focus on redevelopment of obsolete industrial areas in Dutch spatial policy, this topic stands central in this research. To date, a large share of the current research efforts within the field of industrial area redevelopment in the Netherlands addresses financial and economical aspects (e.g., VROM-raad, 2006; THB, 2008; PBL, 2009). In this research, process features are regarded as having a significant influence on the outcome of industrial area redevelopment projects (see section 2.4). Therefore, focus is on the process of industrial area redevelopment.

3.4.1 Dutch industrial area redevelopment processes

Broadly, industrial area redevelopment processes follow resembling routes in the Netherlands. On the next page, the ‘ideal’ route of such a process is presented, based on Gordon (2008). In general, an industrial area redevelopment process exists of four process steps: (1) initiative, (2) plan development, (3) realization, and (4) management and maintenance. These steps are represented in figure 3-2 and are examined further below.

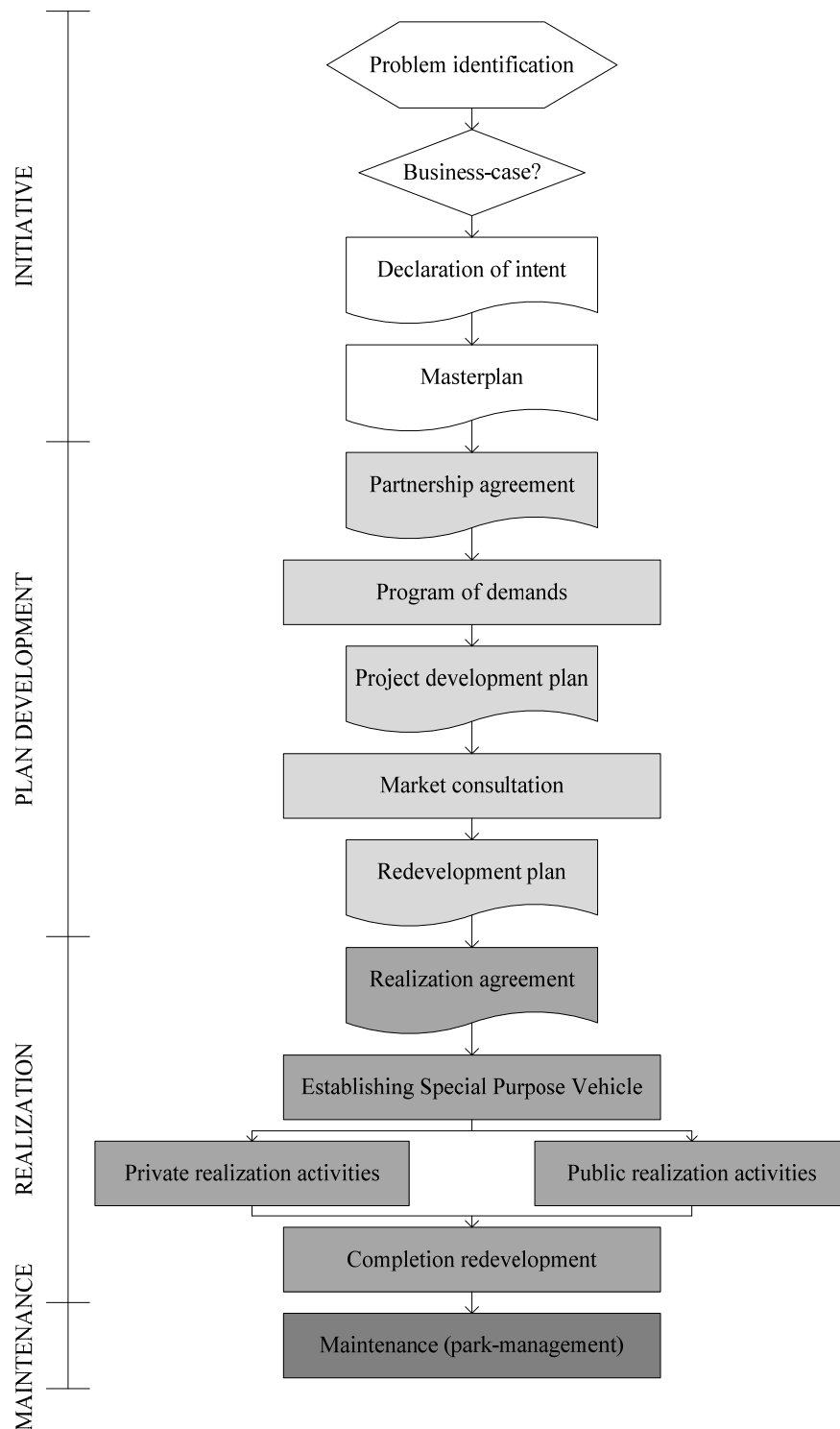


Figure 3-2: Redevelopment process scheme (Gordon, 2008)

Initiative: In the initiative phase, it becomes clear whether or not actors have a feasible case. Two most important actor groups involved in this decision are the municipality and the local industrial entrepreneurs; both groups should be convinced that redevelopment is necessary and achievable (Gordon, 2008). At the end of the

initiative phase, problem definition, dimensions of the plan, involved actors and their interest and redevelopment strategy are determined. The main goals of this phase are to detect opportunities and constraints for redevelopment, and to create support for the activities in the next phases. At the end of the initiative phase, a master plan is established, in which an integral vision on the total area is presented. In general, master plans are mainly product oriented; a focus on resulting processes and organization – which I regard as being equally important as a product orientation – is often lacking.

Plan development: Because a master plan designates different objects that require redevelopment, and because these objects are often positioned in different parts of the industrial area, the project starts with plan development in the first sector, based upon the prioritization of sectors in the master plan. In this phase, a program of demands, designs of urban plans, and feasibility studies should be developed for the specific sectors. An important intermediary product is the (project) development plan, based upon which market parties are invited to participate in further plan development and realization. The plan development phase is concluded with the determination of the redevelopment plan. Equal to the initiative phase, little attention is being paid to process characteristics within the plan development phase.

Realization: In this phase, the redevelopment plan is executed. Preceding realization, involved actors sign a realization agreement, in which the parties commit themselves to the actual realization of the redevelopment. Part of this agreement is an accord on the distribution of the costs and yields amongst the actors, possibly resulting in a Public-Private Partnership.

Management / maintenance: In the maintenance phase, the redeveloped industrial area is conserved, often by using the tool of park management. The goal is to preserve the improved spatial and functional quality of the industrial area, and to prevent the area from becoming obsolete again.

3.5 Stagnation in executing the redevelopment task

In section 3.3, I mentioned that a considerable share of the total stock of industrial areas reveals signs of obsolescence. In this respect, it can be concluded that the importance of redeveloping obsolete industrial areas is large. As a result, many plans were made by municipalities over the last 25 years for the redevelopment of obsolete industrial areas. Currently, redevelopment plans exist for 15% of all industrial areas in the Netherlands that are recorded in the IBIS database (PBL, 2009).

However, the execution of these plans runs very slow. In the period 1990-2006, only 2.750 hectares has been redeveloped – an average of 175 hectares per year (Olden, 2007). More recently, THB (2008) calculated that over the period 2002-2006, averagely 325 hectares per year has been redeveloped. If this redevelopment tempo is maintained, it will take a long time to bring the current stock of obsolete areas back to an acceptable quality level. In the meantime, the process of industrial areas becoming obsolete continues; in the 1990's, the stock of obsolete areas more than doubled.

3.5.1 Qualitative aspects of realized redevelopment projects

When regarding finished redevelopment projects, it can be concluded that the spatial yields of these redevelopment projects are very low (e.g., Olden, 2007). For supporting this, the general distinction between five types of redevelopment – as employed in section 3.3 – is used: (1) facelift, (2) revitalization, (3) heavy revitalization, (4) re-profiling, and (5) transformation. Adhering to this division, Olden (2007) concludes that almost all current redevelopment projects are aimed at giving the area a facelift (92%). These facelifts are often not sufficient to avert the downward spiral of decaying industrial areas; focus within these projects lies at redeveloping public spaces, not private land plots.

Of all redevelopment projects, only 2% was aimed at revitalizing the area, and 6% of the redevelopment projects concerned a re-profiling or transformation task (Olden, 2007). Because of the large share of facelifts, redevelopment projects hardly yield any grantable industrial land. Out of the newly granted industrial land between 2001 and 2005, only 1% was accounted for by redevelopment of obsolete industrial areas. To achieve spatial gains, a larger share of revitalization is necessary.

3.5.2 Conclusions

In reaction to these redevelopment figures, several authors conclude that the tempo should be increased (THB, 2008; PBL, 2009), and that the share of revitalization within redevelopment should be extended (Olden, 2007; Traa and Knoben, 2009), mainly because of an increasing pressure on the available space and of the necessity to stimulate the Dutch economy. Therefore, the Dutch national government aims for accelerating redevelopment processes, targeting to redevelop approximately 1.500 hectares per year, starting in 2010 (Traa and Knoben, 2009).

I conclude that the execution of industrial area redevelopment projects stagnates, despite the largely increased attention for industrial area redevelopment in the Dutch planning policy. This is the central problem, treated in this research, and the focus lies thereby on revitalization. In addition, I presuppose that a lack of process governance is mainly causing this stagnation. This is further elaborated on and supported in the next section.

3.6 Lack of governance as a cause of stagnation

Several studies focusing on possible causes of the occurrence of the industrial area redevelopment stagnation have been published recently (e.g., VROM-raad, 2006; THB, 2008; PBL, 2009; and Traa and Knoben, 2009). In these studies, various recommendations are presented concerning the optimization of the execution of the redevelopment task. These recommendations mostly have a functional, institutional and financial character, focusing on improving the future predictions of the demand for industrial areas, stimulating regional cooperation in order to optimize space usage on regional level, raising the land prices, reducing the possibilities for new industrial area development, increasing the involvement of private parties in redeveloping obsolete industrial areas, and significantly raising the governmental financial contribution to smoothen the industrial area redevelopment task.

I presume that, after implementation of these recommendations, involved stakeholders eventually will recognize the necessity of redeveloping obsolete industrial areas, and act accordingly. Already, a trend can be observed that the number of start-ups of industrial area redevelopment projects increases (Olden, 2007). Therefore, this research does not focus on breaking through the problematic vicious circle (fig. 3-1). In relation to the assumed significant influence of process features on the outcome of redevelopment projects, it seems more interesting to study, support and accommodate the consensus-building process within redevelopment projects, assuming that redevelopment will become customary for involved stakeholders.

The reason for this is, that – when starting up a redevelopment project in the increasingly complex and rapidly changing environment – redevelopment processes within and among organizations are incessant activities, consuming substantial time and effort; this already appears in currently started redevelopment projects. The complexity of redevelopment projects is largely determined by the involvement of a large number of actors, having shared and coherent interests on the one hand, and individual and conflicting interests on the other (Needham and Louw, 2003; Olden, 2007; Yousefi *et al.*, 2007; Wang *et al.*, 2007). Currently, there is no insight into the

way the actors with their insights and interests are positioned within redevelopment processes, and it is unknown how these processes can be governed.

3.6.1 Beyond-local governance of redevelopment processes

When redeveloping obsolete industrial areas, municipalities are frequently unable to adopt a dominant role in the process. Furthermore, they are unable to bear the resulting high costs of land acquisition and redevelopment activities, and have to attract additional (often private) investments. In contrast, established companies are not able to redevelop industrial areas without the involvement of public parties, because their ownership over public land and their legislative powers. This leads to the conclusion that industrial area redevelopment processes are characterized by a strong mutual interdependence; no individual actor can solitarily determine the outcome of negotiations. In this line of reasoning, Schuur *et al.* (2001) concludes that the problem of stagnation of industrial area redevelopment is mainly a natural consequence of economic handling of several involved actors. This economic handling of the involved actors results in non-consensual negotiations on industrial area redevelopment.

In this respect, THB (2008) concludes that the stagnation of the execution of industrial area redevelopment is caused by problematic process coordination, not by a lack of legal tools. Successfully resolving the stagnating redevelopment of obsolete industrial areas is hindered by the absence of a strict governance system. This is supported by Van Dinteren (2008), who states that a fixed governance structure is absent and that this is an essential precondition for a quick execution of the redevelopment task.

For such governing structures, the regional arena is often allocated as being the most appropriate executive level (e.g., VROM-raad, 2006; and THB, 2008). The province should be the responsible party; it has to supervise the establishment of an adequate system for planning, programming and execution of the industrial area redevelopment policy. On a lower level, regional development companies offer opportunities for a professional, optimal execution of the regional policy concerning redevelopment of industrial areas.

Thus, the lack of a well-functioning process governance system is appointed as a main cause of the occurring stagnation in industrial area redevelopment. The final problem definition as admitted in this research is therefore formulated as follows: *Redevelopment of obsolete industrial areas in the Netherlands stagnates because of*

the absence of a clear regional process governance system. To date, the question how to govern industrial area redevelopment processes is not dealt with. Facilitating this can contribute to an acceleration of industrial area redevelopment processes. From this viewpoint, the general research objective is defined as *‘exploring ways to effectively support the governance of involved stakeholders’ choice behavior, in order to stimulate the current decision-making processes in industrial area redevelopment projects’.*

3.7 Summary

In figure 3-3, an overview is given of the reasoning that is applied throughout this chapter, in which the most important problematic aspects within the current Dutch industrial area market are explained, and major delineations are represented.

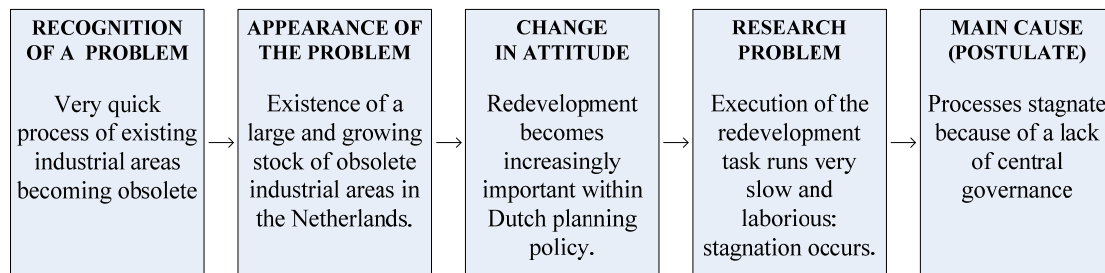


Figure 3-3: overview of the problem analysis

First, it is argued that most of these problematic failures can be traced back to one main problem: the rapid obsolescence of the existing stock of industrial areas. The existence of this problem is affirmed by a representation of the dimensions of the Dutch industrial area redevelopment task; despite large differences in the calculation outcomes, they form the basis for the conclusion that a large part of the stock of industrial areas in the Netherlands is obsolete.

The increasingly voluminous dimensions of the stock of obsolete industrial areas create a large necessity for redevelopment. In line with the growing attention for redevelopment of these obsolete areas in the Dutch spatial policy, the process and progress of the redevelopment of obsolete areas is examined in detail. Based on the disappointing figures on yearly realized redevelopment projects and on the low spatial yields of actually realized redevelopment projects, it is concluded that the execution of industrial area redevelopment projects stagnates.

Because of the growing political attention for redevelopment of obsolete industrial areas, and the accompanying large number of recommendations concerning the execution of redevelopment, it is presumed that redevelopment will become customary for involved stakeholders. Therefore, focus within this research is on studying, supporting and accommodating the consensus-building process within redevelopment projects. The reason for this is, that – when starting up a redevelopment project in the increasingly complex and rapidly changing environment – redevelopment processes within and among organizations show to be difficult, risky, expensive and time-consuming.

The point of departure in this research is the postulate that the main cause of the occurring stagnation in industrial area redevelopment is the absence of a well-functioning process governance system. Several authors support this statement; they posit that the regional arena is the appropriate level of the execution of such governance. Therefore, the final definition of the research problem is formulated as follows: *Redevelopment of obsolete industrial areas in the Netherlands stagnates because of the absence of a clear regional process governance system.* Because of a lack of insight in effective ways to implement a governance system, and because of the presumed advantages related to the acceleration of industrial area redevelopment processes when gaining this insight, the general research objective is defined as follows: *‘Exploring ways to effectively support the governance of involved stakeholders’ choice behavior, in order to stimulate the current decision-making processes in industrial area redevelopment projects’.*

CHAPTER 4

PROCESS GOVERNANCE

4.1 Introduction

This research focuses on the stagnating industrial area redevelopment processes in the Netherlands. As concluded in the previous chapter, a lack of process governance is conceived as a main cause of the occurring stagnation. When redeveloping industrial areas, public and private parties are brought to cooperation. To date, there is no insight in the way in which the involved actors are positioned in such environments, and it is unknown how the outcomes of these processes can be positively influenced by governing the decision-making of these actors.

It is assumed that – while respecting the responsibilities and relative independence of the parties involved in industrial area redevelopments – the parties need such governance, in which the main direction is monitored, the tempo is raised, the most important decisions are coordinated and the relations with laws and legislation and the public responsibilities are always monitored. Several other studies (e.g., Van der Valk, 2002; Huffstadt, 2005; VROM-raad, 2006; Priemus, 2006; and THB, 2008) also come to the conclusion that ‘multiform network steering’ seems appropriate in the current setting of Dutch industrial area redevelopment projects, in which several public and private parties play a role. Within these new forms of cooperation, public and private parties jointly must make decisions; the central governing agency must integrally assess the interests of all involved actors, taking into account the public interest, and integrate the result of this assessment into a plan with a firm social basis.

Without such governance, industrial area redevelopments come to a standstill and implementations gaps or – even worse – contradictions between urban strategy and actual implementation arise (Priemus, 2006).

In this chapter, the concept of process governance is explained in detail. First, several reasons are presented for the increasing need for central process governance. Then, the concepts of governance and meta-governance are introduced and discussed as promising approaches for application in managing industrial area redevelopment projects. The appropriateness of the concept of meta-governance is then legitimated by discussing lessons learned from best-practice industrial area redevelopment projects, of which one is elaborated on. The chapter concludes with a proposal for a regional governance structure for Dutch industrial area redevelopment, together with an elucidation of how this research supports the establishment of such a governance structure.

4.2 Reasons for central governance

In general, various reasons are mentioned for the increased need for central process governance. These reasons are mostly related to changes in the present management structure of urban redevelopment projects, and they can be traced back to two main – related – groups: changes in the urban context and changes in roles and relationships.

4.2.1 Changes in the urban context

According to Keil (2006), the formation of the current term of ‘governance’ is to be seen in the context of basic social, economic, demographical and cultural transformations which have come into being from the beginning of the 1980’s. Several authors (e.g., Kearns and Paddison, 2000; Bock, 2006; and Van Marissing *et al.*, 2006) state that the biggest change has been towards economic globalization. Because of this globalization, capital investments have become more mobile, resulting in a loss of control over urban economies (Kearns and Paddison, 2000). The increasing capital investments mobility caused a heightened level of interurban competition, with cities trying hard to attract investments, thereby becoming more entrepreneurial because of the arisen dependency on private financiers (Hohn and Neuer, 2006). Furthermore, strongly related to the development of globalization, internationalization and privatization are denoted as important factors contributing to an increased importance of governance (Van Marissing *et al.*, 2006).

4.2.2 Changing roles and relationships – complex society

Many characteristics mentioned in the previous section have caused a change in the roles of and in the relationships between involved actors. For instance, Keil (2006) states that the tendency towards governance reflects the shifting balance between government and society: away from the public sector and more towards the private sector. Privatization, deregulation and multi-actor policy-making are key ingredients of this trend (Elander and Blanc, 2001; Keil, 2006). According to Stoker (1998), the recognition of the limits of government is the main reason for this development. Rakodi (2003) complements this by stating that dissatisfaction concerning the ability of existing political systems to respond to the views and needs of all social groups challenges the state-led view of urban management. The fact that the societal field of force has become much more multiform has contributed to this growing dissatisfaction; the current society is increasingly shaped by ideas, wishes and interests of a large number of (non-)organized citizens, companies and institutions. Local authorities today have to co-exist and collaborate with a much wider network of agencies and interest-groups than in the past (Bassett *et al.*, 2002; Minnery, 2007).

In this increasingly complex environment, a purely governmental system is no longer seen to be able to achieve goals and resolve occurring problems (Van Marissing *et al.*, 2006). Governments have to blend their capacities with those of various non-governmental actors to remain effective (Stone, 1993). A more integrative approach, one that goes beyond the boundaries of the different departments, should replace the current system of developing and redeveloping urban areas. This requires new thinking about power; capacity to act and accomplish goals is the main aim of the renewed power structures, recognizing that any group is unlikely to be able to exercise comprehensive control in a complex world (Stoker, 1998; Keil, 2006). In this respect, the need for forms of government that are less heavy-handed, more flexible and more subtle than the traditional forms is recognized (Rakodi, 2003).

4.2.3 Towards governance in industrial area redevelopment

These fundamental social changes were followed by a number of problems, among which problematic decision-making and consensus-building processes are important examples. According to several authors (e.g., Louw, 2000; Louw *et al.*, 2003; Huffstadt, 2005; and Van Dinteren, 2008), this is also the case in industrial area redevelopment projects. These problem occurrences make the search for new models of control necessary (Keil, 2006), giving rise to the question how to handle decision-

making involving a number of different central and local government and non-government bureaucracies (Rakodi, 2003).

Decentralization and the division of responsibilities between increasing numbers of agencies has led to an increased recognition of the need for negotiated agreements between actors. In response to these transformation processes, and the loss of control by the government, governance concepts have become a subject of general discussion (Bock, 2006). Governance involves this form of power in which actors and institutions gain a capacity to act by combining their resources, skills and purposes into a longer-term coalition. This involves identifying an area of interest, the forces in operation and the nature of the intervention that would produce a more desirable dominant coalition (Stoker, 1998). In industrial area redevelopment, the most important goal of governance is to establish cooperation between involved actors, in order to realize a number of functions from a societal point of view.

4.3 Formal definitions

It is difficult to give an unambiguous definition of the term governance; it has many meanings (Keil, 2006; Minnery, 2007). According to Jessop (1998), the term 'governance' can be traced to the classical Latin and ancient Greek words for the steering of boats. Besides this etymological explanation of the origin of the term, many practical definitions are presented in the literature. These definitions can be subdivided in four main – and interrelated – groups.

The first group focuses on differences between the concepts of government and governance. For instance, Healey (2003) describes governance as “a particular transformation, from modes of government associated with a bureaucratized welfare state focused on universal service delivery to the more ‘entrepreneurial’ modes of governance”. Furthermore, Stoker (1998) states that the concept of governance is wider than the concept of government, directing attention to the distribution of power both internal and external to the state.

Second, several scholars include inter-organizational cooperation in their definition of governance. In this, governance refers to the action, manner or system of governing in which the boundary between organizations and public and private sectors has become permeable (Stoker, 1998), and is usually understood as “a control and regulatory structure that brings together governmental and societal actors, includes both formal and informal elements, and is characterized by hierarchical, competitive, and cooperative relations between actors” (Bock, 2006). The definition of Pierre (1999) is

related to this, stating that governance should be regarded as a process in which public and private interests are blended and coordinated. Emphasis is often on consensus-building and goal realization, through participatory mechanisms (Garcia, 2006). Most scholars recognize the interdependency of organizations and the necessity of interaction in defining governance.

Third, several definitions concerning governance underline the increasing control, prevention and solution of problems and conflicts. For instance, according to Rhodes (1997), governance refers to processes of regulation, coordination and control. Furthermore, Schmitter (2002) defines governance as a mechanism for dealing with a broad range of problems and conflicts in which actors regularly arrive at mutually satisfactory and binding decisions by negotiating with each other and co-operating in the implementation of these decisions. Also, Minnery (2007) puts emphasis on the control of conflicts amongst government, private sector and civil society.

Finally, a group of scholars focus on the institutional context when defining this new form of steering. An often cited definition is that of Stoker (1998b), defining it simply, as a ‘complex set of institutions and actors that are drawn from but also beyond government’. For Rhodes (1996), governance is accorded a more specific meaning, referring to ‘self-organizing, inter-organizational networks’, characterized by interdependence between organizations and continuing game-like interactions between network members.

Swyngedouw (2005) presents a definition that roughly combines the most important parts of the mentioned four definition groups: “Governance (...) systems are presumably horizontal, networked and based on interactive relations between independent and interdependent actors who share a high degree of trust, despite internal conflict and oppositional agendas, within inclusive participatory institutional or organizational associations.” Because of its completeness, I choose to adopt this definition in my research. In the next paragraph, several possible ways to put governance into practice are discussed.

4.4 Executing governance: several modes and mechanisms

From the literature, several possible executive modes of governance are distinguished. For instance, Silva and Syrett (2006) and Provan and Kenis (2007) distinguish three main modes of governance: (1) participant-governed networks, (2) lead organization-governed networks, and (3) network administrative organization. The first two forms are often categorized under regular governance mechanisms, while the latter is

referred to as a meta-governance mechanism in the literature. The regular governance concept assumes self-steering of the public and private parties involved in the network; in the meta-governance concept, an impartial party – not being a stakeholder – is assigned the task to govern.

The fundamental difference between regular governance and meta-governance is that while the former draws attention to the processes that dislocate political organization from government and the state, the latter focuses explicitly on the practices and procedures that secure governmental influence, command and control within governance regimes (Whitehead, 2003). It tends to break down the arbitrary divide that has been constructed between government and governance – suggesting instead a hybrid form of governance. Thus, the concept of meta-governance does not replace the concept of governance; it is premised on the existence of governance regimes, seeking to create a stronger control and authority within decision-making processes.

4.4.1 Appropriate mode for industrial area redevelopment

According to Provan and Kenis (2007), the effectiveness of the different forms of governance depends on four key predictors: trust, number of participants, goal consensus, and need for network-level competencies (mutual interdependency). The complex project environment often originating in industrial area redevelopments seems to fit best under the meta-governance mechanisms (Priemus, 2006). It is highly uncertain whether self-steering will remain effective in complex and plural urban project environments; coordination of the decision-making process seems appropriate and necessary (Priemus, 2006; VROM-raad, 2006; THB, 2008). Therefore, the concept of meta-governance – often defined as the organization of self-organization (Jessop, 1998) – is regarded as an interesting approach for industrial area redevelopment.

4.4.2 Meta-governance

Meta-governance is concerned with the question of ‘who governs the governors?’, and it is about resolving the clashes, conflicts and uncertainties in governance, through rules, organizational knowledge, institutional tactics and other strategies (e.g., Jessop, 1998; Whitehead, 2003; and Evans, 2007). According to Whitehead (2003), meta-governance draws attention to the dialectical interactions between self-organizational networks and the hierarchical structures within which they are embedded. In short, it establishes and maintains the conditions in which partners in

networks can pursue their aims, ensures the continuation of dialogue and assumes responsibility in the event of governance failure (Evans, 2007).

Jessop (1998) gives a more extensive overview of the activities of a governing actor when exercising such a meta-governance role, which include the following:

- Providing the ground rules for governance;
- Ensuring the compatibility of different governance mechanisms and regimes;
- Deploying a relative monopoly of organizational intelligence and information with which to shape cognitive expectations;
- Acting as a 'court of appeal' for disputes arising within and over governance;
- Seeking to rebalance power differentials by strengthening weaker forces or systems in the interests of system integration and/or social cohesion;
- Trying to modify the self understanding of identities, strategic capacities and the interests of individual and collective actors in different strategic contexts and hence alter their implications for preferred strategies and tactics; and
- Assuming political responsibility in the event of governance failure.

In this research, meta-governance is handled as a particular form of steering: exercising guided influence in a process, in order to prevent the occurrence of decision-making conflicts, establish cooperation, and stimulate the consensus-building process. Moreover, meta-governance refers to combining separate components into one plan. Thus, meta-governance encloses steering as well as coordinating activities. Therefore, I define meta-governance as follows: *'The way in which a central governing agency gives direction to an industrial area redevelopment, thereby taking into account the interests of all public and private parties involved and the common interest, aimed at preventing conflict occurrence and guaranteeing a certain predefined result'*. This connects closely to Huffstadt's (2005) definition of meta-governance in urban redevelopment.

Resulting from this definition, I assume that a central governing agency is able to steer decision-making behavior of involved actors, thereby exercising guided influence in a process, in order to prevent or solve decisional conflicts, and to achieve a collective benefit that could not be obtained by governmental and non-governmental forces acting separately. According to Jessop (1998), this role tends to fall to a regional or national public party. Central issues are for instance identification of the common values, norms and rules, orientation and guidelines, patterns of communication, behavior and decision-making, actors' perceptions of their roles and duties, and balances of power.

The remainder of this chapter focuses on the concept of meta-governance. The potential of meta-governance in redevelopment of obsolete areas is demonstrated in the next section, in which best-practice case lessons are discussed. In the subsequent paragraph, a vision is represented on how to organize governance in industrial area redevelopment projects in the Netherlands. In the final paragraph of this chapter, the desired contribution of this research in supporting the execution of governance is formulated.

4.5 Best-practice case lessons

The assumption that well-organized meta-governance contributes to solving problems in complex industrial area redevelopment projects is endorsed by Gigler *et al.* (2004). In this study, in-depth descriptions of six best-practice redevelopment projects in Europe are described. The goal of this study was to indicate how to deal with the social, economic and environmental problems resulting from industrial areas becoming obsolete or abandoned. The results display that in five out of the six best practices, central process management executed by one independent governing party proved to be of great importance (Gigler *et al.*, 2004). Furthermore, involvement of all relevant actors, honest cooperation, integration of interests and a clear information transfer appeared to be significant in achieving project success. Cadell *et al.* (2008) draw similar conclusions, based on their case study comparison of European redevelopment projects, stating that devolving real power and resources to a public-private authority contributes to preventing process-related problems. In order to clarify how this central governance can be put into practice, one of the best-practice cases is explained more in detail: Parque das Nações in Lisbon.

4.5.1 Parque das Nações – Lisbon

The urban redevelopment project ‘Parque das Nações’ in Lisbon, Portugal is often seen as a best practice when regarding the central governance structure. In this project, the involved actors successfully created an organization in which it was possible to accelerate decision-making processes.

The basis of this project was the long existing need to redevelop the eastern part of Lisbon, an area that manifested a lack of occupancy and obsolescence for a long time. This area was mainly reserved for industry. From 1950, some large community housing projects started being located eastwards, which did not decisively change the social status of this part of the city. The stretch of land between the railroad and the river, the site of today’s Parque das Nações, was an obsolete, decayed industrial area

used for a broad range of activities, from petrochemical industry to container yards and military depots. These activities were housed in old or obsolete installations, with poor functional and often low economical performance. The area was generally associated with severe environmental problems. The project was intended to strengthen the image and the competitiveness of the city (Silva *et al.*, 2008).

Initiative and strategy

Changes in land-use patterns and land-values, caused by urban growth, territorial specialization and new infrastructure turned the area into an increasingly attractive site. The organization of the World Exposition in Lisbon, held from May 22 until September 30, 1998, created an ideal possibility to renew this part of Lisbon. EXPO'98 could be used as a lever to gather both the will and the financial means to relocate the existing activities and redevelop the land into a new high-standard modern city district.

The organizers of EXPO'98 formulated the aim to contribute to the acceptance of Lisbon as a major Atlantic city by a creatively and durably intervention in the renewal of the urban structure (see figure 4-1). Furthermore, five overall goals were formulated (Silva *et al.*, 2008): (1) to enhance the residential function of the area; (2) to attract the younger generation to the area; (3) to improve the environmental quality in a heritage setting; (4) to promote cultural production; and (5) to aim at scientific, technological and advanced educational resources. After the event, it was important to consolidate and strongly link the area to the existent urban network of the city (Silva *et al.*, 2008).



Figure 4-1: artist impression of the renewed urban structure in the eastern part of Lisbon (www.parqueexpo.pt)

The redevelopment project was planned in three phases:

- Phase 1 (1993-1995): Land appropriation;
- Phase 2 (1995-1998): Preparation and hosting of EXPO'98;
- Phase 3 (1998-2010): Full redevelopment to a new city district.

In order to be able to shorten the development times, the Portuguese government sublet all the development activities into one organization: Parque EXPO SA. This organization was created on March 23, 1993, with a dual mission: (1) to organize and carry out the EXPO'98 world exposition in Lisbon, and (2) to manage and carry out a large urban redevelopment project in and around the grounds where EXPO'98 would take place, leading to the development of a new city district. Parque EXPO SA acted both as planning and building authority and project manager during the first two phases and as business partner in public-public and public-private partnerships in all three phases.

The organization was equipped as a private company with three shareholders: the Ministry of Environment, the Ministry of Finance and the Lisbon Municipality. The share of Lisbon was limited (3%). In short, Parque EXPO SA is a private company, owned by the State. The two involved municipalities (Lisbon and Loures) are represented in the Board. To carry out its dual mission, Parque EXPO SA was given full capacity to expropriate land and special powers over (1) project management, financing and contracting; (2) urban planning and permit issuing (until December 1999, when these powers were transferred back to the two municipalities); (3) urban management (until a date to be established, when this responsibility is to be transferred back to the two municipalities; the issue is pending); (4) marketing and commercialization; (5) special tax exemption; and (6) exemption from environmental impact assessment. Long-winded and therefore delaying procedures were circumvented by granting possession of 340 hectares of land within the assigned area to the company.

Results

The organization of the World Exposition was a great success. The exposition attracted approximately 11 million visitors in 132 days, and 155 countries and international organizations were represented. On September 30, 1998, the World Exposition ended, and the area remained locked up until February 1999, when it re-opened as Parque das Nações, meaning 'park of the nations'. The several buildings used for the exposition remained positioned within the new park, mostly transformed

for new goals; for instance, the main entrance of the exposition was transformed into a shopping centre.

Currently, Parque das Nações is still a new city district under construction in Lisbon. It covers a total surface of 430 hectares located across the border between two municipalities (Lisbon and Loures). The planning scheme forecasted work to be finished at the end of 2010. That year, land sale and licensing processes should be finished. However, parcel sale exceeded all forecasts because of the successful transition to Parque das Nações and the good real estate market. Consequently, only 5% of the available land plots were still for sale at the beginning of 2003. In 2007, the last land plot was sold.

Adjustment of the plans

Initially, Parque das Nações had to be developed with zero-costs. Involved ministries planned to finance the total development from turnovers of the EXPO itself (40%) and from the area development (60%). That proved unfeasible. Already in 1997, estimates represented that the zero-cost objective was out of control with the increasing costs of the EXPO infrastructure and facilities, as well as with the new road access network and the surrounding area (Silva *et al.*, 2008). For this reason a number of changes were carried out. To be able to finance the running costs of Parque EXPO SA, the land prices were raised (land within the EXPO-area is the most expensive in Lisbon) and the building density was raised. At the end of 1999, the company's mandates for independent plan development and plan modification expired. Current plan modifications must follow a long and careful procedure.

Parque EXPO SA

It was possible to attract private investors because of the foundation of Parque EXPO SA. Advantages were fast plan development, fast granting of land and modification of plans during a certain period by means of a legal decree. Due to this integral approach, the company was able to buy, clean and sell large areas. Parque EXPO 98 SA not only acted as a plan developer and management office, but also developed some subprojects on the Parque EXPO location.

Remaining financial obligations to private investors is the main reason that Parque EXPO SA still exists. The most important income of the company consisted of sale of a limited number of land plots; however, the last plot was sold in 2007. Still, there are three important expenses: current financial obligations to investors, staff cost (180

highly qualified people) and maintenance and management of the EXPO-area. To cover these expenses, Parque EXPO SA is looking for tasks in the private market. At this moment they are involved in projects in Shanghai, Nigeria, Sao Paulo, and Zaragoza. Until the year 2010, Parque EXPO SA will carry the deficits. After that, the organization submits the costs and benefits to the national government. The dimensions of these costs and benefits is yet unknown.

Urban management

The daily management of the urban area is carried out by Parque EXPO SA. They face the problem that the revenues and expenditures of the urban management are not related. The revenues from taxes of residents and entrepreneurs are paid to the municipality of Lisbon. The users of the area pay a large amount of tax as a result of the costs of the land and the high-quality buildings. However, these taxes do not find their way back to investments in the improvement of their direct environment, because the contribution from the municipality to urban maintenance and management exists from a fixed amount for Parque EXPO SA. This fixed amount is not sufficient for maintaining the high-quality public space of Parque das Nações. In this way, the management of the urban area is financially impossible. Until now, the municipality had no ambition to take over the responsibility of management and maintenance. Because the land plots are mainly owned by a large number of private investors, there is no expectation for an increase in the income for the management of this area.

Evaluation: division of responsibilities and mandates

The most important drive for the Lisbon-approach was the deadline. The establishment of an independent company, with the objective to develop the city district, offered a good solution to obtain this time-related objective. The organizational framework created in 1993 proved effective and it is generally agreed by participants that this was indeed a major key to the success of the project. It allowed for a combination of public mission responsibility with managerial flexibility, innovation and quality standards.

The integrated and coordinated approach, allowed by this form of organization, resulted in benefits both on the technical side (better and more sustainable solutions) and the economical side (private companies found dialogue easier than with conventional public administration; the good results achieved with EXPO'98 made Parque EXPO SA a trusted partner for private companies and gave Parque das Nações

a very positive social image). This, together with the introduction of several unique anchor facilities (Lisbon Oceanarium, multipurpose arena, museums, a multi-modal transport hub and a shopping mall), and conscious marketing, resulted in a highly attractive leisure area. However, concentration of powers in one single organization is also sensitive, requiring good-will and political leadership to secure that smooth and fruitful institutional cooperation is achieved across the range of public administration departments involved, and public control.

The future of the new city district partly depends on the transfer of urban management responsibilities to the municipalities. Delay and uncertainty over the transfer of responsibilities on urban management to the involved municipalities forms a major threat. The integrated and coordinated approach to planning, building and urban management not fitting into the traditional local public administration organization is also a risk. High costs and demanding technical requirements for up-keeping and managing the high standard and complex infrastructure and public space further underline this threat.

When projecting the described EXPO'98 approach on the redevelopment of obsolete industrial areas in the Netherlands, one major distinction should be taken into consideration. In the case of EXPO'98, the industrial area was transformed into a residential area with additional commercial and leisure functions. This thesis focuses on revitalizing obsolete industrial areas; the industrial function will be maintained. In general, transformation projects are less problematic. This is mainly caused by the higher value that can be added to the area when embedding residential and commercial functions. Furthermore, when revitalizing obsolete industrial areas, the currently established companies permanently play a larger role; these companies are often very critical and occupy powerful positions in redevelopment processes. However, the reason why the EXPO'98 project is regarded as a best-practice in this thesis is that the specific organizational governance structure resulted in a very efficient decision environment. This large scaled project was completed within a very short timeline, mainly because of the establishment of one governing actor.

4.6 Governance structure for industrial area redevelopment

In the case of industrial area redevelopment in the Netherlands, the region seems most appropriate for executing the meta-governance role, because this regional scale connects to spatial-economical processes and because the functional and financial aspects of the supply of industrial areas can be tailored most effectively on regional level (VROM-raad, 2006; Priemus, 2006; THB, 2008; PBL, 2009). This connects to

the recommendations of THB (2008), proposing an adapted approach for industrial area redevelopment in the Netherlands. In this adapted meta-governance approach, distinction is made between regional coordination, planning and monitoring, and local execution.

Execution occurs on local level, because municipalities have the necessary tools at their disposal. The region is responsible for process governance, thereby supplying expertise, offering process support, planning investments on long term, and prioritizing redevelopment projects. Furthermore, regions can give an impulse to the execution and realization through supporting regional financial balancing, or through the establishment of a regional development company (THB, 2008). In this research, these regional development companies are regarded as central governing agencies for the execution of the redevelopment task; they are deemed responsible for developing alternative plans or scenarios, and for articulating a set of goals or objectives, typically relevant for society at large.

Provinces should be responsible for the coordination and monitoring between multiple regions, in which spatial and financial coherence are main aspects. Based upon the regional visions, provincial financial contributions should be distributed amongst regions. The national government should provide an unambiguous vision on industrial areas, in which the relation between redevelopment of obsolete industrial areas and development of new industrial areas should be emphasized, and in which financial arrangement have to be made (for an overview of the most important financial arrangements, see THB, 2008). Furthermore, the national government can distribute financial contributions amongst provinces.

It is expected that the proposed regional execution of the redevelopment task will gain momentum in the coming years, especially when provinces and the national government aim for regional coordination in their funding conditions (THB, 2008). An extra impulse for this regional execution is the establishment of regional development companies that are entrepreneurial, and have financial means at their disposal.

4.7 Supporting the execution of governance

Whereas the formerly hierarchical – governmental – steering draws attention to the unequal distribution of power, institutionalized hierarchies and ensuing conflict, the network steering implied in the above presented governance structure draws attention to interdependencies, mechanisms that coordinate and integrate actors, and

cooperation (Nicholls, 2005). Because of this, many scholars showed an interest in the application of network steering – focusing on participation, collaboration, interaction, communication, and consensus-building – in urban renewal projects (e.g., Forester, 1989; Healey, 1998; and Innes and Booher, 1999), in order to support the establishment of stable governance structures.

However, according to Davies (2005), it is important to recognize that the resulting interactions amongst public and private actors may not produce consensus but can lead to conflict. The level of correspondence and/or of contradiction between the interests of the most important involved actors determines the specific interdependent interactive setting, eventually leading to interactions with specific degrees of cooperation and conflict, varying from coherent to contrastive. Minnery (2007) endorses this, by stating that the relationships between these involved parties may be both conflicted and dialectical.

To date, hierarchy and conflict are suppressed in urban governance literature, whereas it is still a key component when studying the relation between actors involved in urban redevelopment. While most scholars do recognize the importance of cooperation and conflict in shaping the relational context of actors, there have been very few attempts to analyze systematically how *both* aspects play a role in negotiation processes between actors. Analyses of the structures and processes of urban governance will be effective only to the extent that they recognize the roles of both cooperation and conflict (Minnery, 2007).

This research aims for supporting governing agencies in managing industrial area redevelopment processes by studying and modeling the arising interactive decision-making processes, thereby focusing on the possible occurrence of cooperation and conflict. For this, possible models and methods from other research fields are sought. The insight in the decision-making behavior of involved stakeholders, together with insight in possible conflict occurrences, eventually results in several practical recommendations for the central governing agency when designing a process approach.

4.8 Summary

This chapter connects to the problem analysis, in which it was postulated that the currently occurring stagnation of industrial area redevelopment in the Netherlands is caused by a lack of process governance. When redeveloping industrial areas, complex negotiation environments arise in which local governments are often unable to govern

the redevelopment of obsolete industrial areas; they need to manage redevelopment projects in cooperation with different public and private actors each having their own specific interests.

In the search for better ways to govern industrial area redevelopment projects, there has been a shift from an emphasis on the role of ‘urban government’ to an emphasis on ‘urban governance’. Governance, and especially meta-governance, is conceived as a promising approach for application in the complex industrial area redevelopment projects. Meta-governance is defined as follows: *‘The way in which a central governing agency gives direction to an industrial area redevelopment, thereby taking into account the interests of all public and private parties involved and the common interest, aimed at preventing conflict occurrence and guaranteeing a certain predefined result’*.

Creating a strong and transparent central meta-governance structure is expected to be of essential importance. Several best-practice industrial area redevelopment projects demonstrate that centrally governing such alliances contributes to project success (Gigler *et al.*, 2004). The aim of meta-governance within industrial area redevelopment projects is to establish cooperation between relevant parties, in order to realize a number of functions and purposes from a public, social importance, through the establishment of one central governing agency, responsible for the management of the decision-making process. In Dutch industrial area redevelopment, regional development companies seem most appropriate for executing this central governance role.

Assuming that meta-governance can be a solution to the occurring problems in the Dutch industrial area redevelopment market, it is essential to analyze the consensus-finding processes, as well as causes of tension and conflict (Hohn and Neuer, 2006), in order to theoretically support governing agencies in managing decision-making processes. The next chapter will discuss the way in which these analyses are executed in this research.

CHAPTER 5

RESEARCH DESIGN

5.1 Introduction

Because regional meta-governance is regarded as an appropriate management structure for solving stagnation in industrial area redevelopment in the Netherlands, this research aims for theoretically supporting regional governing agencies in managing redevelopment processes. Studying and modeling interactive decision-making processes stands central in this research. The focus lies on the analysis of possible occurrence of cooperation and conflict.

In this chapter, the research design – constructed to achieve the research aim – is expounded. First, the main research objectives are discussed in detail, from both a societal as well as a scientific point of view. In addition, the most important research questions are listed. Second, several models, methods and related research projects from other research fields – created for solving related problems – are discussed with regard to their applicability on this specific problem field. This review of related models and methods is conducted using the categorization of Raiffa (2002), who distinguishes four approaches in studying decision-making. Third, the design of the research model is discussed, in which definitions and delineations are given and a new research approach is proposed as a necessary extension to existing models. Finally, the conceptual framework required for executing the steps mentioned in the research model is presented.

5.2 Research objectives

As discussed, there is a serious need for redevelopment of a large number of industrial areas in the Netherlands. Redevelopment of these obsolete industrial areas can provide a range of economic, social, and environmental benefits. However, recent figures display that the redevelopment of obsolete industrial areas in the Netherlands stagnates (see section 3.5). An important cause for this stagnation is the increased project environment complexity, requiring a shift in the planning process from top-down governmental steering towards more interactive meta-governance steering.

To date, a lack of insight in the application of meta-governance, in order to prevent or solve conflict occurrences and to create mutual consensus, exists in the literature. Therefore, the general research objective is to provide a theoretical basis for the support of a regional governing agency in managing an industrial area redevelopment process, thereby making use of insights from other fields of research. This theoretical basis will be utilized to develop a decision support tool for the governance of industrial area redevelopment.

The development of a decision support tool for collaborative multi-actor planning requires an appropriate model of the decision-making process. Unfortunately, except for some anecdotal evidence, a formal model of the collaborative decision process has not been developed for this domain, incorporating the recent shift in planning practice. Virtually all the existing group-decision systems are based on a planning model that assumes a leading role of government (Klosterman, 2009). The state of the art in decision support technology does not incorporate mechanisms of cooperation between actors nor about performance indicators that are relevant to the multitude of different actors. Furthermore, the outcomes of existing systems are mostly represented as designs of landscapes or land-uses. The design of the *process* that is necessary for realizing such landscapes and land-use plans is underexposed, despite the fact that this is claiming growing attention of practitioners involved in real-world projects.

The goal of this research is to better understand how individual and interactive decision-making of the main actors in industrial area redevelopment processes can be modeled, in order to analyze and predict the occurrence of cooperation or conflict. A better understanding of these individual and interactive decision-making processes is a key requirement for the development of a decision support system for the regional governing agency. The model underlying the system simulates or predicts the influence of alternative plan designs and of alternative negotiation settings on decision-making behavior. In turn, this information can be used to derive practical

recommendations on how this decision-making behavior can be influenced by a central meta-governing agency. This agency is deemed responsible for developing alternative plans or scenarios, for influencing the conditions of the negotiation setting, and for articulating a set of goals or objectives, typically relevant for society at large, in order to accelerate decision-making processes.

Specifically, the central research question is formulated as follows: *What interventions should a regional governing agency utilize in order to prevent conflict occurrence in industrial area redevelopment projects?* Related sub-questions are:

- What are the individual preferences of the most important involved stakeholder groups, and are these preferences mutually similar or contradictory?
- What characteristics influence the occurrence of cooperation or conflict in interactive settings?

5.3 Related research

Considering the fact that most evident problems in the relatively new scientific field of urban development processes are related to decision-making, human interactions and changing roles in these interactions, I want to employ contributions from scientific domains that focus on providing insight in the nature of individual and participative processes. Within the fields of business administration and economics, many different concepts and approaches have been developed, mainly with a managerial focus, enabling managers to support and steer actors' decision-making. Accordingly, different approaches have been suggested, studying both individual and interactive decision-making. In Raiffa (2002), an overview is given of the most applied approaches in studying decision-making. His proposed categorization (figure 5-1) is employed in this paragraph.

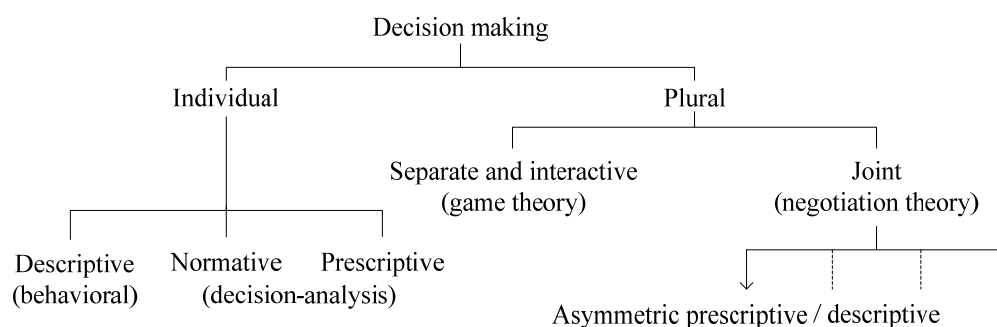


Figure 5-1: four approaches to decision-making (after Raiffa, 2002)

5.3.1 Individual choice analysis

As can be derived from figure 5-1, the majority of the existing individual choice analysis techniques can be classified into two groups; behavioral approaches and decision-analysis approaches. Within the decision-analysis approaches, normative as well as prescriptive approaches are distinguished. Below, several related studies are divided into these groups, and discussed in terms of applicability.

Behavioral approaches

The first group consists of descriptive behavioral approaches, trying to link decision-making behavior to characteristics of urban (re)development projects and using choice heuristics. In the field of industrial area redevelopment, several descriptive studies are published. Firstly, several authors (e.g., Needham and Louw, 2003; and Yousefi *et al.*, 2007) describe and discuss the individual interests of involved actor groups in industrial area redevelopment projects, based on literature reviews and interviews. These studies present a clear view of the objectives and needs of the different players involved in industrial area redevelopment processes, and are useful in determining ways to encourage the players to actively participate in the process, or in developing practical decision support frameworks.

Furthermore, case studies are often used in this individual choice analysis group. For instance, Adams *et al.* (2000) address the question how fiscal measures can influence landowner behavior, thereby aiming for stimulating industrial area redevelopment. Coiacetto (2001) distinguishes six different types of project developer behavior (Passive Local Property Owning Developers; 'Means to a Mission' Developers; Specialized Client Developers; Showpiece Developers; 'Eye on the Street' Builder-Developers; and Value Adding Opportunity Developers), based on observations in two case studies. Next, Adams *et al.* (2001a) study the negative effects of several types of ownership constraints on the progress of industrial area redevelopment projects, suggesting that the behavioral characteristics of landowners are a major type of ownership constraint. Another example using case studies is McCarthy (2002), focusing on the performance of governmental agencies in addressing public goals – related to environment, employment, spatial quality, and participation – and private goals – related to liability for contamination, legislation, and financial support – in industrial area redevelopment. Finally, Dair and Williams (2006) treat the influence of six different, separate actor groups (viz. regulators, interest groups, property

developers, professional advisors, end users, and key decision-makers) in achieving sustainability in industrial area redevelopment projects.

Decision-analysis approaches

The second, quickly expanding group of individual choice applications consists of quantitative – normative and prescriptive – modeling approaches, often assuming that individuals select the alternative that has the maximum utility. In this, alternatives are perceived as bundles of features, often called attributes, which can take different values. Individuals choose alternatives from specifically composed sets, involving a subjective trade-off among the perceived attribute values, resulting in a utility value for each alternative. Attribute values contribute to the utility of alternatives; these contributions are called part-worth utilities. Finally, given the utilities of the alternatives in the choice set, the alternative with the highest utility will be chosen.

There are various ways to measure the influence of attributes in the decision-making process, within which two types of approaches can broadly be distinguished. The first is the compositional approach. This involves that subjects are asked to directly state the attractiveness of attribute values and to indicate the importance of each of the attributes on some rating scale. Multiplication of attractiveness and importance scores results in part-worth utility estimates that are used to obtain estimates of total utilities, and to predict choices. Examples are Syms (1999), conducting a survey amongst surveyors and developers, thereby trying to find out the relation between industrial area redevelopment project characteristics and the choice to redevelop an obsolete industrial area, and McGreal *et al.* (2000), studying motives behind the decision of several types of investors to invest in industrial area redevelopment projects.

Although these methods have many practical advantages, they suffer from potential problems and biases. Green and Srinivasan (1990) listed a number of problems: (1) if there is substantial inter-correlation between attributes, it is difficult for the respondent to provide ratings for the levels of an attribute holding all else equal; (2) biases may result from direct questioning of the importance of socially sensitive factors; (3) the respondent may answer on the basis of his or her own range of experience over existing products rather than on the experimentally defined range of the attribute levels; (4) one assumes the additive part-worth model to be the literal truth; (5) redundancy in the attributes can lead to double counting; (6) when attributes are quantitative, there is little chance to detect potential nonlinearity in the part-worth function; (7) the researcher obtains no respondent evaluation of purchase likelihood because no full profiles are seen.

On the other hand, decompositional approaches – also referred to as conjoint approaches – derive importance weights of attributes from responses to total choice alternatives; hence, they explicitly allow for trade-offs among attributes. Responses are decomposed according to an assumed underlying preference function, for example using regression analysis. In this approach, the importance of an attribute is indicated by the range of part-worth utilities estimated for the scores of this attribute.

A prominent decompositional approach is that of Discrete Choice Analysis (Ben-Akiva and Lerman, 1985). This approach is increasingly used to study individual choice behavior; for instance, Lee *et al.* (2003) created a model to analyze the behavior of residents in Seoul when involved in a new organizational form of residential area redevelopment, concerning the possible choices to sell their old resident and buying a new one; several possible strategies are proposed and compared on a financial basis. Furthermore, Alberini *et al.* (2005) examine the effect of market-based incentives – like reductions in regulatory burden and subsidies – on real estate developers' perception on industrial area redevelopment attractiveness. Finally, Tam and Byer (2002) created a decision support system in order to assist industrial area landowners in making economically sound decisions when choosing remedial actions and uses for remediated sites from an owner's perspective.

Evaluation

The number of studies within the field of urban development that focus on actors' individual preference and choice behavior is growing in recent years. The presented approaches share the assumption that choice behavior involves a value judgment, used to rank the available choice alternatives in terms of preference, and some choice mechanism to translate this ranking into choice probabilities or choice. The value judgment is considered to be a function of the characteristics of the object of choice. Therefore, many scholars focus on gaining insight into the most important attributes for different actors involved in industrial area redevelopment projects, thereby using different – qualitative and quantitative – methods.

Still, the applications of preference and choice modeling studies within the field of urban development are limited compared to other fields of research. For example, in transportation (Ben-Akiva and Lerman, 1985; Hensher and Rose, 2009), tourism (Kemperman, 2000; Lyons, Mayor and Tol, 2009), and retailing (Oppewal, 1995; Sands, Oppewal and Beverland, 2009), choice modeling has been widely and extensively applied. Within the field of urban development, the possibilities of

applying choice modeling are not utilized exhaustively; research on actor behavior in urban development is quite limited in scope and in theoretical progressiveness. This research field can profit from generating distinguished models of individual choice behavior, because most problems within urban (re)development are related to actors' decision-making. Application of individual discrete choice models is considered to be valuable within this research; through this, insight can be gained in actors' individual decision-making behavior, together with underlying needs and interests influencing this decision-making.

5.3.2 Interactive choice analysis

However, individual choice analysis approaches do not take into account the notion that the aggregation of several individuals, with differing interests but mostly with the goal to reach consensus, might lead to complex interactions, strategic behavior, and perhaps conflicts. This, in turn, may affect individual preferences, reducing the value of the individual choice model outcomes. Because multiple decision-makers with diverging interests are involved in industrial area redevelopment projects, the individual approaches seem insufficient for building an appropriate model of the decision process; the interactive component should be covered too.

This section treats several approaches for studying interactive decision-making. This field of research, in which interactive decision-making between actors in urban (re)development stands central, has evolved in recent years. The available approaches can be classified into three groups: prescriptive, descriptive and normative approaches. The first two groups are mainly characterized by the application of qualitative research methods, while quantitative methods are often used in the normative approaches.

Prescriptive approaches

One main stream in the literature, focusing on interactive decision-making, entails the application of prescriptive approaches, indicating how a project and related processes ideally should be arranged and managed. Within this stream of literature, principles from line management, project management and process management are used. Interesting references are De Bruijn *et al.* (2002), Winch (2002), Norman and Flanagan (2003) and Cooper *et al.* (2005). These principles can be regarded as a set of conditions which should be taken into consideration when developing a product.

In urban development literature, one condition that is often emphasized (e.g., Forester, 1989; Healey, 1996, 1998; and Innes, 1996, 1998, 1999) is to enlarge the role of communication, collaboration and interaction in planning practices, thereby aiming for better consensus-building processes in increasingly complex project environments. In this respect, Margerum (2002) explores constraints in consensus-building processes, based on 20 case studies, giving recommendations on how to improve the effectiveness of collaborative organization forms, and Buchecker *et al.* (2003) investigate ways to promote community participation in landscape development, also using case studies combined with expert interviews. Finally, Golobic and Marusic (2007) developed an integral method to combine residents' and experts' knowledge by using public surveys and participatory workshops, and integrated this into a communicative planning process. The main aim of these studies is to improve the participatory process, in order to achieve a higher level of consensus in plan proposals and to optimize the development of the intended product.

Descriptive approaches

Another, more descriptive stream of literature studying interactive decision-making processes uses principles from institutional analysis (e.g., Teisman, 1992; and Klijn, 1996). These studies give a good insight in the goals of different actors involved in urban plan developments, in the way these actors formulate their strategies and in the way the institutional frameworks are and should be designed in order to optimize outcomes of planning processes. The challenge of institutional analysis is to capture the complexity of real world relationships in urban development projects while at the same time offering ways to generalize the behavior of actors and the significance of events in the development process under different conditions; the final goal is to gain insight in the suitability of applying specific institutional structures in such development processes.

A good example of a descriptive study of interactive decision-making with a strong institutional emphasis is Healey (1991), aiming to analyze interrelations between urban regeneration policies and the development industry. For this, she reviewed the suitability of relevant institutional models of the development process – grouped into equilibrium models, event sequence models, agency models and structural models – and suggested an alternative model (see Healey, 1992) to overcome shortcomings in operational models. Another good example is Teisman (2000), who discusses and compares three models – the phase model, the stream model, and the rounds model – for analysis of complex decision-making, and applies this to a railway development case study. Finally, Klijn and Teisman (2003) analyze the effectiveness of Public-

Private Partnership constructions in establishing cooperation between actors in real-world urban (re)development cases.

Normative / prescriptive approaches

The third group of modeling approaches is mainly based on decision theories. The development of alternative solutions for a stated problem stands central in the majority of these approaches. Recently, two streams of literature have evolved, trying to analyze interaction phenomena, and to solve related problems. The first stream is referred to as Group Decision Support Systems (GDSS). A GDSS can be defined as the (computer-based) support of a group of people dealing with an issue of mutual concern. The primary objective of a GDSS is to improve the effectiveness of the decision process, and tends to support the communication of preferences and evaluation of the various members of the group and support the joint evaluation and valuing process. In short, a GDSS generates alternative outcomes, which are evaluated by involved actors. The goal is to find a type of outcome that is widely supported by involved group members. These systems are not directly focused on negotiation and therefore neither analyze goals in terms of common denominators, nor opportunities for trade-offs.

In recent years, the potential use of the GDSS method was explored extensively in several studies, often distracting the conceptual foundation from different theories: analytical expert systems (Nijkamp *et al.* (2002), GIS-applications (Ceccato and Snickars, 2000, Peng, 2001, Rinner, 2001, Thomas, 2002), Planning Support Systems (Geertman, 2002), Multi-Agent Systems (Arentze and Timmermans, 2003), Cellular Automata (Slager *et al.*, 2008), Cellular Automata combined with a Multi-Agent System (Ligtenberg *et al.*, 2001), Linear Programming (Burger *et al.*, 2008) and Simulation-Gaming (Mayer and de Jong, 2004; Mayer *et al.*, 2005). The Urban Decision Room (Van Loon and Wilms, 2006; Van Loon, Heurkens and Bronkhorst, 2008; Heurkens, 2008) should be mentioned as a recent interesting GDSS-development in supporting multi-actor decision-making in complex urban (re)development projects using simulation. This Urban Decision Room can be defined as an interactive computer simulation, which can be used by multiple actors, aiming for the generation of alternative outcomes of complex planning decisions.

The second stream is referred to as Negotiation Support Systems (NSS), which can be seen as a derivative of GDSS, to fulfill the need for provision of electronic support for groups involved in negotiation problems and processes (Arnott and Pervan, 2005). Negotiation Support Systems (NSS) are designed to assist negotiators in reaching

mutually satisfactory decisions by providing a means of communication and through analysis of available information. Thus, in contrast to GDSS models, NSS applications focus on optimization of an outcome (Holsapple *et al.*, 1998; Murtoaro and Kujala, 2007).

The number of NSS model applications in the literature is growing quickly, frequently aiming for expanding the theoretical foundations of the systems. In this respect, Holsapple *et al.* (1998) should be mentioned, presenting a clear a straightforward theoretical model of negotiation activity as a formal basis for NSS applications and as a guide for developing negotiation support systems. However, the number of applications of NSS models in the research field of urban (re)development is still very limited. Two recent interesting NSS applications are Sounderpandian *et al.* (2005) and Murtoaro and Kujala (2007). Sounderpandian *et al.* (2005) present a negotiation support system that provides practical guidelines for a mediator to conduct industrial area redevelopment negotiations, thereby optimizing a weighted utility function of the players involved in the negotiation. Murtoaro and Kujala (2007) propose an approach for studying negotiations in complex, major projects, including buyers (clients) and sellers (contractors), thereby applying zones of possible agreement. Application of the approach is tested through a case study, revealing that the utilization of such collaborative approaches can be beneficial for all involved players.

Using experimental settings

Models of negotiation underlying GDSS or NSS applications are often based upon an experimental representation of the decision setting. Two theories are most regularly employed in designing such experimental settings because of their suitability for studying plural decision-making behavior: game theory and negotiation theory (Holsapple *et al.*, 1998; Raiffa, 2002).

Game theory has a normative nature, and application of this theory results in a description how groups of very rational individuals should make separate, interactive decisions. Within this theory, distinction is made between cooperative and non-cooperative game theory. Cooperative game theory deals with situations in which groups of players agree on cooperation, thereby coordinating their actions. This results in joint profits, often exceeding the sum of the individual profits; cooperative game theory deals with the question how to divide these joint profits. In contrast, non-cooperative game theory primarily deals with the analysis of situations in which cooperation is not agreed upon, thereby focusing on possible strategies, payoffs, and game outcomes.

In the field of urban development, an increasing number of applications of – cooperative as well as non-cooperative – game theory can be found. For instance, Hideshima and Okada (1996) created a cooperative game model in order to present fair cost allocations of infrastructure arrangements among landowners and public sector in urban renewal projects. Furthermore, Weiler (2000) explored a non-cooperative game-theoretic framework for understanding private strategies in pioneering urban renewal projects, along with the potential market failures and externalities involved. Next, Wang, Fang and Hipel (2007) present a cooperative game-theoretic model to support negotiations on related cost and benefit allocation in industrial area redevelopment project. Finally, Lai *et al.* (2008) use a non-cooperative game-theoretic approach to demonstrate how land-tenure systems affect the process of urban development.

In contrast, negotiation theory has a prescriptive character, and discusses how groups of reasonably bright individuals should and could make joint, collaborative decisions. In negotiation theory, multiple individuals are involved, cooperating to arrive at a joint decision; however, reaching a joint decision is not a requisite. The eventual joint decision entails joint consequences, or payoffs, for each individual; the theory focuses on the potential of decisions that are rational when measured against a group (Raiffa, 2002). The goal of the negotiation theoretic approach is to provide a systematic, logically consistent, and theoretically well-founded approach to the study of negotiations, resulting in advice on how to provide guidance within negotiations (Murtoaro and Kujala, 2007). Partnering, mediation, and arbitration are regarded as the most effective examples of negotiation support, used to avoid or reduce conflict (Pena-Mora, 1998). Good examples in which negotiation theory is used in the development of NSS are presented by Holsapple *et al.* (1998) and Murtoaro and Kujala (2007).

Evaluation

Several approaches can be applied for modeling actors' choice behavior. Within the groups of prescriptive and descriptive interactive choice modeling approaches, real-world interactions among actors in land and property development processes are often studied through case study analysis. However, this approach has the clear disadvantage of the limited number of successful and comparable cases. Moreover, the usefulness of case studies is limited, because it is difficult to measure the influence of unique factors on the interaction results. Hence, it is difficult to generalize the insights in choice behavior of actors in the limited number of cases.

An alternative research approach is to use more experimental settings for analysis, in order to give prescriptive or normative recommendations. Experiments offer the opportunity to study behavioral aspects in relation to responses on controlled stimuli. For instance, GDSS and NSS applications have been used in experiments with real-world players to analyze decision-making processes in land and property development.

Such experimental settings underlying GDSS and NSS applications are mostly constructed using principles from game theory or negotiation theory. Negotiation theory can be seen as a cooperative and communicative extension to game theory. However, underlying every negotiation structure is a game-like component. In each negotiation, partners are forced to balance cooperative actions with competitive ones, and this leads them into thinking what the players might do separately (Murtoaro & Kujala, 2007). This is handled in the domain of game theory. Thus, compared to negotiation theoretic modeling, game theoretical modeling comprises the application of very basic negotiation frameworks with widely utilizable assumptions, which can be advantageous in a relatively new and small research field. Furthermore, game theory offers the possibility to select the best possible outcomes of a game: usually called equilibriums. This straightforward modeling and result expectancy within the application of game theory is advantageous when comparing it to application of negotiation theory, the results of which are principally vaguer.

Still, despite the fact that the application of game theory within the field of urban development seems very interesting and is growing steadily, little work has been done to develop models that systematically relate the characteristics of industrial areas, redevelopment plans and interactive game settings to the behavior of actors in a redevelopment process when negotiating on a plan proposal, thereby giving insight into the most important points of interest and possible sources of conflicts. A general theoretical model that includes both physical and social complexities and their influences in an economic system is lacking. Understanding and supporting interactive processes is important, but without knowing the influence of different utility functions of involved actors on this interactive behavior, these insights are of minor use. Therefore, an alternative modeling approach is advocated, in which game theory is combined with a multi-attribute trade-off technique. Resembling modeling approaches are already used in other research fields; this is further examined in chapters 6 and 8.

5.4 Conceptual research-framework

To achieve the objectives, thereby answering the central research question as stated in section 5.2, the research is subdivided into four main parts (see figure 5-2). First, insight is created in the decision setting of industrial area redevelopment decision-making processes, resulting in an overview of the most important characteristics influencing the actors' decision-making. Second, individual choice behavior of the most important involved actors is modeled. The generation of individual choice models and utility functions is included in the research model because of the expected importance in determining outcomes of interactive processes. These interactive processes, characterized by strategic choice behavior of the most important involved actors, are modeled in the third part. Through this, insight is gained in the influence of the presence of other decision-makers with (partially) conflicting interests on stakeholders' decision-making. The result is an analysis of probable occurrence of conflicts. Furthermore, insight is gained in the factors that mainly cause conflict occurrences. Fourth, recommendations concerning process governance are generated, answering the questions how the choice behavior of involved stakeholders can be influenced in conflicting situations, and which intervention tools should be used to exert this influence.

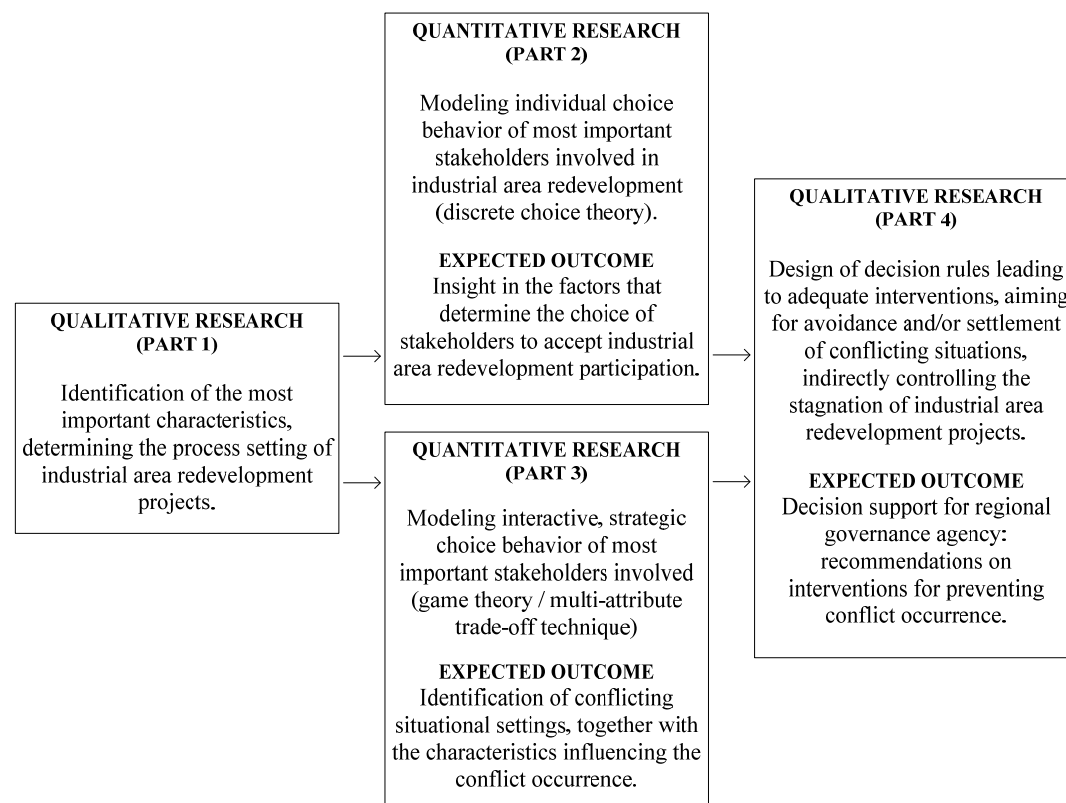


Figure 5-2: research model

In the remainder of this section, I focus on constructing a conceptual framework underlying choice behavior of actors involved in industrial area redevelopment processes. A sound conceptual framework to describe these actors' individual and interactive choices, and the environment in which these choices are made, is crucial in understanding and predicting the outcomes of industrial area redevelopment negotiations.

5.4.1 Definitions and delineation

The objective of this thesis is to support the decision-making of a regional governance agency. This decision-making is related to the utilization of interventions, in order to prevent conflict occurrence in industrial area redevelopment projects. The reasons to opt for a regional governance structure are elaborated on in section 4.6. However, in the remainder of this thesis, analyses will mainly cover local, individual industrial area redevelopment projects. The reason for this is that the actual execution of plans remains a local matter.

Such local industrial area redevelopment processes are considered as continuous processes of linked decision moments with well-defined transitions between decision moments – the output of one decision moment forms the input for the next decision moment – and with a fixed process end (see figure 5-3). Advantage of this approach is that each decision moment can be studied separately and into detail. This makes research after decision-making in industrial area redevelopment projects more manageable.

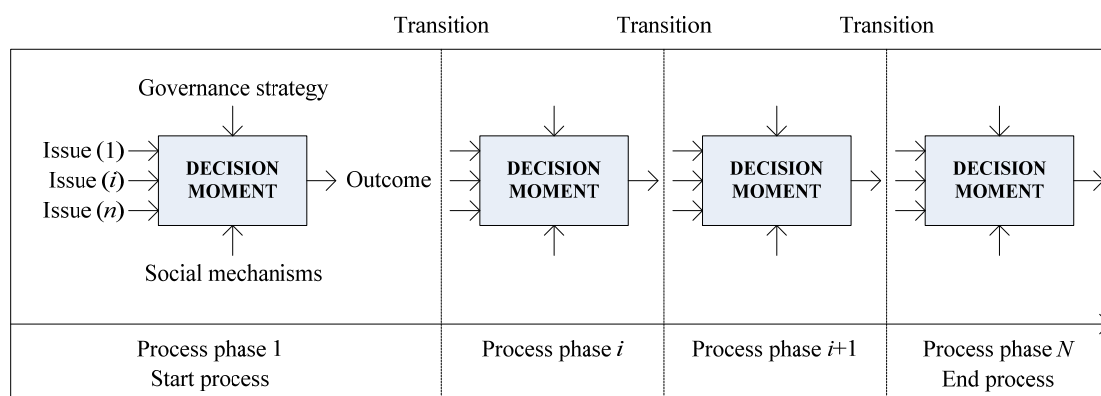


Figure 5-3: industrial area redevelopment projects as linked and finite sets of decision moments

These separate decision moments are characterized by four factors: input, social mechanisms, governance and outcome. Project characteristics, such as time, budget, and performance criteria, function as input. Involved actors, their interests, strategies, options and possible moves, combined with their payoff structures, form the social mechanisms. Governance is seen as the set of opportunities for an external governing agency to direct the choice behavior of involved actors, and the outcome is regarded as a collective move in the process.

This characterization is related to the four parts presented in the research model (figure 5-2). The input factors are covered within the analysis of the decision setting (part 1); social mechanisms are studied through analysis of individual choice behavior (part 2) and interactive decision-making (part 3); and based upon the outcome of these analyses, governance strategies can be designed in order to improve the outcome of the process (part 4).

5.4.2 Decision moments in industrial area redevelopment projects

To be able to apply this within the field of industrial area redevelopment, one specific decision moment has to be chosen. Figure 5-4 illustrates the different phases in an industrial area redevelopment process. Because most of the identified problems arise in the first phase of redevelopment, this research aims to clarify interactions in this phase. During the first phase, actors – such as market parties, users and governmental representatives – are identified in terms of their organizational properties, such as interests, internal organization, constraints, demands and powers to influence and affect the development process. The end of this phase is marked by the delivery of the redevelopment execution plan.

Based upon the development plan, municipalities and established companies decide whether the project will be carried through. This decision moment reflects the end of the initiative phase, and – when stakeholders decide to continue the process – marks the start of the further development and realization phases. It is generally regarded as a critical moment in the whole process of industrial area redevelopment.

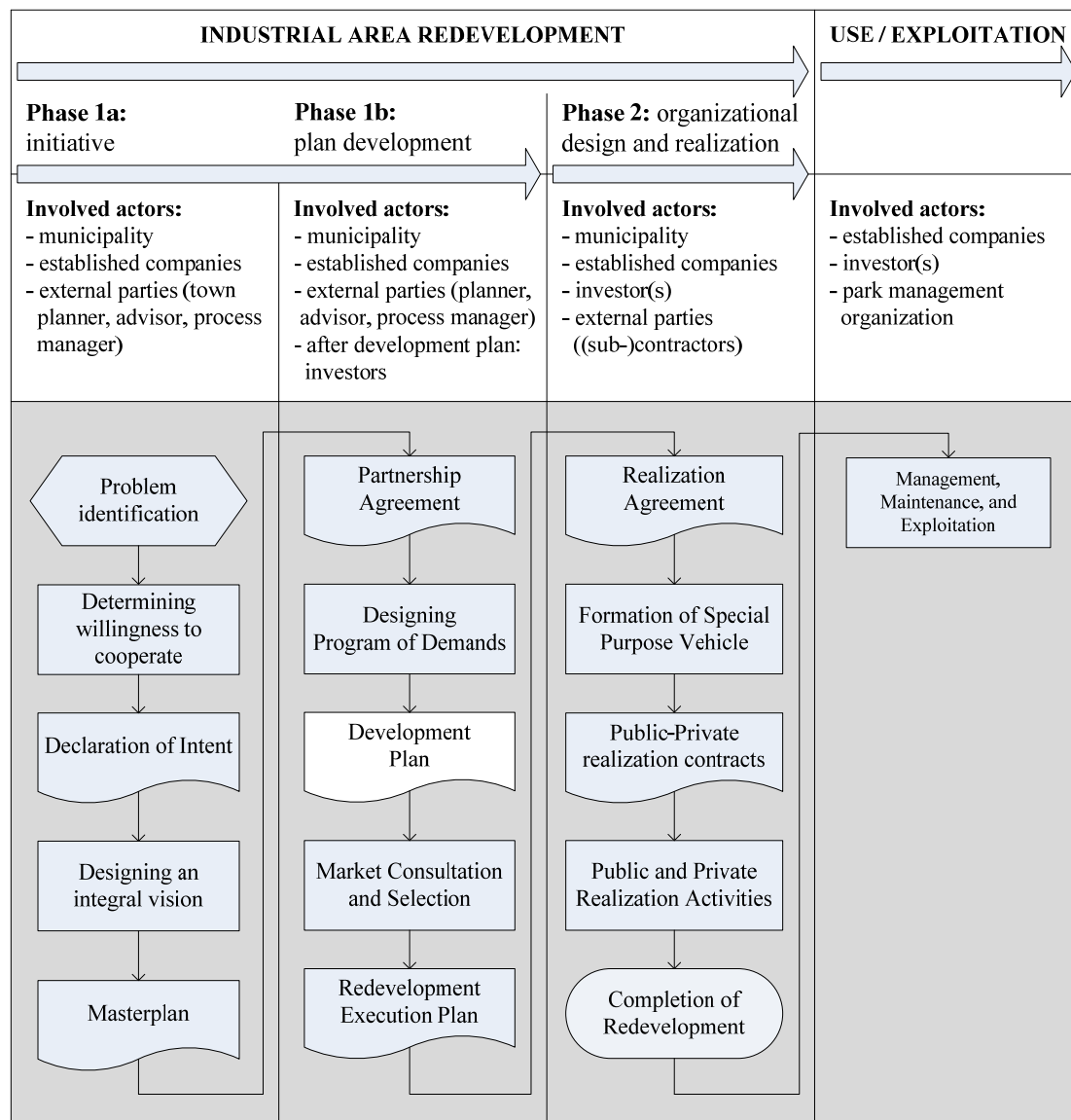


Figure 5-4: phasing and decision moment in industrial area redevelopment projects

Specifically, this research is restricted to the decision moment *acceptance of the development plan*, which is a sub-result within the plan development phase, containing preconditions and basic assumptions underlying further plan development for the area, and recording urban research, rough designs and feasibility and process studies. In figure 5-4, this specific decision moment is highlighted. Based upon the development plan, municipalities and established companies decide whether the project will be carried through. This decision moment reflects the end of the initiative phase, and – when stakeholders decide to continue the process – marks the start of the further development and realization phases. It is generally regarded as a critical moment in the whole process of industrial area redevelopment.

5.4.3 Involved actors

Next, the most important actors should be determined. As stated before, a large number of actors are involved in Dutch industrial area redevelopment projects. Municipalities, provinces, national government, district water boards, investors, developers, users, pressure groups, and media almost always have a vote in the planning process (see De Graaf, 2005). However, the importance of these actor groups differs strongly. For the most part, actors with formal (land-) positions in the area have the largest level of influence in the process. The most important involved actors in each phase of the development process are listed in figure 5-4. In this research, focus lies on the strategic behavior of two actor groups having the highest level of formal land positions in obsolete industrial areas: municipalities and established companies. These actor groups are most important when negotiating on the contents of the development plan.

In section 2.5.1, it was concluded that municipalities are composed of several departments. In practice, this might lead to a non-univocal attitude in (re)development projects. However, in an attempt to make the research more manageable, I chose to regard the municipality as one actor, acting as a single social entity, with complementary goals. In the future, more research should be conducted after the role of the internal organization of municipalities on the outcome of development processes. In the same line of reasoning, the actor group of ‘established companies’ is also very diverse. However, on a higher and more abstract level, their goals are largely complementary, as well as their attitude in redevelopment projects. Therefore, it is less difficult to regard them as an entity with complementary responses.

In addition to the defined two major actor groups, it is assumed that a third actor will be involved, namely the regional governance agency. In this research, a regional development company is regarded as the most appropriate party for fulfilling the role of central governing agency, in order to support the execution of the redevelopment task. This company is deemed responsible for developing alternative plans or scenarios and for articulating a set of goals or objectives, typically relevant for society at large. Unlike municipalities and established companies, a regional development company has no personal interest in redeveloping obsolete industrial areas. The goal of this research is to support the decision-making of the regional development company, while the decision-making of the other two parties is analyzed.

Despite the fact that several professional publications concerning industrial area redevelopment in the Netherlands pose that solutions should be generated by the real

estate sector, investors are excluded in this research. There are multiple reasons for this decision. The first reason is that – under current conditions – redevelopment is a costly process. Investors have no interests in uneconomic projects; unless the conditions change, they will not choose to invest. Because the governmental agencies are partly responsible for the existence of the current problematic situation, and because they are assigned the task to solve societal problems, it is mainly the government that invests in industrial area redevelopment. Secondly, redevelopment of industrial areas under regional governmental governance can lead to a snowball effect; when private investors observe that redevelopment can be successful, they might become more willing to invest in it. Thus, governmental involvement is crucial in the first steps towards large-scaled redevelopment. Thirdly, if investors become interested, the insights in the behavior of municipalities and established companies will be very valuable to them. A regional governor will be superfluous in this situation; the investor will probably execute this governance role. If this occurs, the framework of this research is not fully adequate. In this changed situation, the governor will have a voice in the development of the plans, requiring a slightly different model structure.

5.4.4 Conceptual models underlying actors' choice behavior

As can be derived from the research model, presented in the previous paragraph, actors' choice behavior stands central in this research. The conceptual model of individual decision-making that underlies most of the currently used methods to predict choice behavior is derived from various sources, such as Information Integration Theory (Anderson, 1974), and Probabilistic Choice Theory (Luce, 1959). The model is derived from Louviere (1988) and Kemperman (2000) and is summarized in figure 5-5.

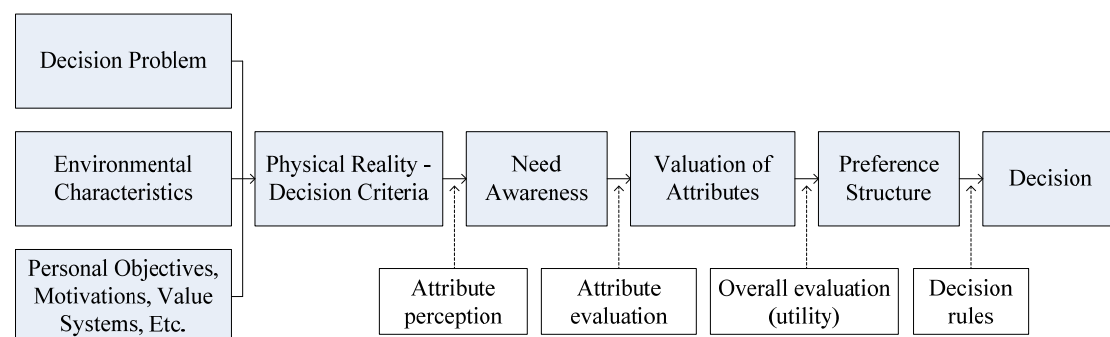


Figure 5-5: conceptual model of actors' individual choice behavior

The model illustrates that choice behavior in industrial area redevelopment projects is the outcome of a personal assessment process, in which an actor goes through various phases towards a decision, accepting or rejecting a plan proposal. Taking into account the actor's constraints and preferences, there will be one proposal which optimizes the actor's experience. As stated before, alternatives are perceived as bundles of features, usually called attributes. Attributes are like variables; hence, they can take different values. Individuals choose alternatives from sets of relevant alternatives. Next, the choice process involves a subjective trade-off among the perceived attribute values, resulting in a utility value for each alternative. Attribute values contribute to the utility of alternatives; these contributions are called part-worth utilities. Finally, given the utilities of the alternatives in the choice set, the alternative with the highest utility is chosen.

The conceptual model of interactive choice behavior differs on some aspects. First, the input of the decision-making process is slightly different; the involvement of certain types of other decision-makers and the characteristics of the resulting interactions are considered as additional attributes. Furthermore, decision-makers try to predict choice-behavior of other players, because the decision-making of players is interdependent; the outcome of the negotiation depends on the convergence of the decisions of the different actors. By predicting the choice behavior of other players, actors try to maximize their personal payoff, resulting from the multi-actor decision process. It can be concluded that, in the interactive model, players make strategic decisions, deviant from the rational decisions in the conceptual model of individual choice behavior.

The strategic decisions of all involved players converge to one outcome. This outcome can be satisfactory for all players, or not. Assuming that unsatisfactory interactions can be solved by a governing agency, supporting the decision-making of such a governing agency is the final objective of this study. The conceptual framework of the decision-making of this governing agency is derived from Holsapple *et al.* (1998) and Murtoaro and Kujala (2007) (see figure 5-6).

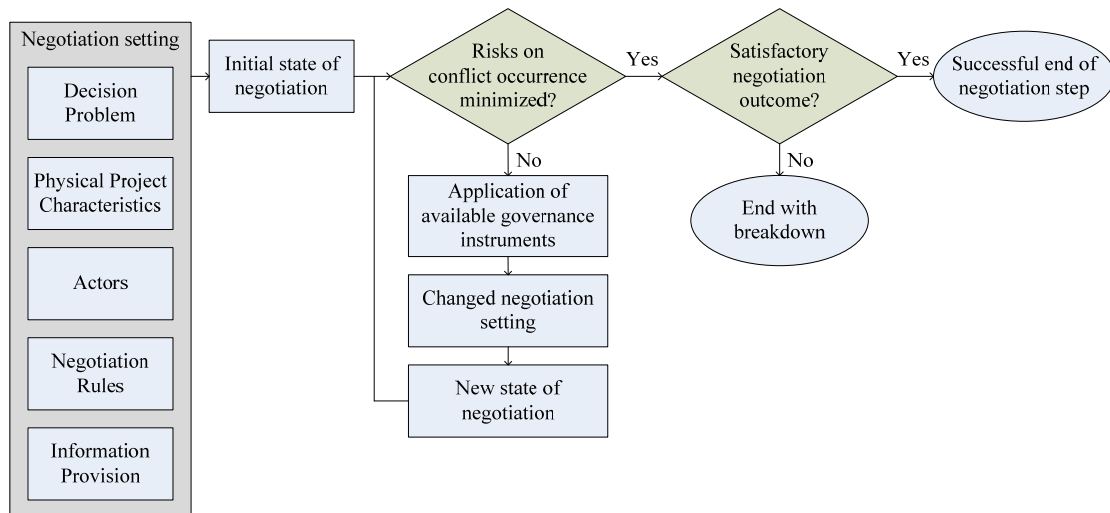


Figure 5-6: conceptual framework of the decision-making of the governing agency

The negotiation setting refers to the environment in which interactive decisions are taken. Some aspects within this negotiation setting can be altered by the governing agency (project characteristics, negotiation rules and information provision), which will be discussed in chapters 6 and 9, and others are constant factors. The decision-making process is influenced by this negotiation context, leading to an initial state of negotiation in which each actor is positioned. From this initial state of negotiation, the governing agency calculates the risks of ending up at conflict. If this risk is not minimized, the governing agency can employ possible governance tools, altering the changeable aspects of the negotiation setting. Here, it is assumed that the governing agency seeks for solutions which require minimal usage of resources. This leads to a new state of negotiation, of which the risks on conflict occurrence are calculated. When this risk is minimized, the involved actors consider the negotiation outcome, and decide whether to agree on the outcome and continue the project, or to break it down.

5.5 Summary

The starting point of this research is the occurring stagnation in industrial area redevelopment projects, mainly caused by a lack of consensus amongst the most important involved actors. Furthermore, it is expected that central meta-governance can contribute to solving the problems in industrial area redevelopment projects. However, insight into ways to govern these processes is lacking. The main goal of the research is to better understand how interactive decision-making of the most important actors in industrial area redevelopment processes can be modeled, in order

to analyze and predict the occurrence of cooperation or conflict, and how this interactive decision-making can be influenced by a regional governing agency. A better understanding of these processes is a key requirement for the development of a decision support tool for this regional governing agency, in order to support the acceleration of industrial area redevelopment projects.

Except for some anecdotal evidence, a formal model of the collaborative decision process has not been developed for this domain, incorporating a governance approach. Therefore, several available techniques for analyzing both individual and interactive decision-making are explored. From this, it is concluded that the discrete choice approach seems applicable for modeling individual choice behavior of actors. Furthermore, the application of game theory seems very interesting for modeling interactive and interdependent choice behavior.

Within the field of game theory, little work has been done to develop models that systematically relate the characteristics of industrial areas, redevelopment plans and interactive game settings to the interdependent behavior of actors in a redevelopment process when negotiating on a plan proposal, thereby giving insight in the most important points of interest and in possible sources of conflicts. A general theoretical model that includes both physical and social complexities and their influences in an economic system is lacking. Understanding and supporting interactive processes is important, but without knowing the influence of different utility functions of involved actors on this interactive behavior, these insights are of minor use. Therefore, an alternative modeling approach is advocated, in which game theory is combined with a multi-attribute trade-off technique.

Finally, in order to achieve the stated goals, the research is subdivided into four main parts, which are represented in a research model (figure 5-2). In the first part, insight is gained in the decision setting of industrial area redevelopment projects. Then, individual and interactive choice behavior of involved actors is modeled, resulting in an overview of conflicting situations. Finally, recommendations are designed for process governance, aiming for avoidance and/or management of conflict occurrences. A conceptual framework is designed for specifically implementing these four research parts. The methodological implications for the research are discussed in the next chapter.

CHAPTER 6

METHODOLOGY

6.1 Introduction

In the previous chapter, it was concluded that for studying the occurring stagnation in industrial area redevelopment processes in the Netherlands, and for evaluating the consequences of possible process governance decisions, it is necessary to understand actors' individual and interactive choices in redevelopment processes. Furthermore, literature on individual and interactive choice models was briefly reviewed, and it was argued that within urban development research, advanced choice modeling is not optimally exposed upon. The review mainly focused on discrete choice theory and game theory, as two interesting, and applicable theoretic approaches.

In this chapter, a more thorough explanation of these approaches is given. First, the theoretical foundation of modeling individual discrete choice behavior is reviewed. Several models have been suggested in the past, mostly based on some economic or psychological theory about consumer choice. Various classes of discrete choice models, such as strict utility models and random utility models, are discussed. Special attention in this respect is given to the multinomial logit model, the most widely applied discrete choice model.

In section 6.3, the principles of game theory are explained: the different elements of games are discussed, several possible solution concepts are presented, and special attention is paid to a specific game form, namely 2x2 games. Next, ways to derive

conflict management decisions from game-theoretic analyses are explored, together with the most appropriate tools for executing conflict management through process governance.

Finally, possibilities to refine game-theoretic models are discussed, in order to improve the quality of the resulting conflict management recommendations. This is necessary because current game-theoretic models exclude physical and social characteristics in interactive decision analysis, which makes it hard to apply it to the specific interactive setting of industrial area redevelopment projects. Eventually, an approach is proposed in which game theory is combined with conjoint modeling theory.

6.2 Discrete Choice Theory

Discrete choice theory (e.g., Ben-Akiva and Lerman, 1985), which originated from econometrics and psychology, seems suitable for gaining insight into the decision-making behavior of actors involved in an industrial area redevelopment project, thereby focusing on the choice to accept or reject a development plan. Discrete choice models are usually derived under an assumption of utility-maximizing behavior by the decision-maker (Thurstone, 1927), and are based on Lancaster's (1966) theoretic assumption that each product is described as a bundle of product characteristics or attributes (Kemperman, 2000). The various choice alternatives within a product group can be viewed as different combinations of attribute levels, and consumers are assumed to derive utility from these attributes. Thus, the central question addressed in discrete choice modeling is how product and service characteristics can be related to the utility that consumers attach to these products or services.

As a refinement of Lancaster's theory, which originally assumes that choice behavior is deterministic, random utility models (RUM's) are often adopted. These random utility models are utilized in order to incorporate a probabilistic character of choice behavior into choice models. This probabilistic character was absent in the original theory of Lancaster – which predicts choices rather than choice probabilities – leading to problems because choice behavior can be argued to be probabilistic in nature as a consequence of the large number of unobserved factors influencing choice behavior (e.g., Kemperman, 2000).

6.2.1 Random utility models

In random utility models, it is assumed that a decision-maker n faces a choice among J alternatives, and that each alternative j yields a certain level of utility U_{nj} , $j = 1, \dots, J$ for the decision-maker n . Furthermore, it is assumed that the decision-maker chooses the alternative resulting in the highest utility. Therefore, the behavioral model is to choose alternative i if $U_{ni} > U_{nj} \forall j \neq i$ (Train, 2003).

When collecting data for the model input, the attributes $x_{nj} \forall j$ of the alternatives are observed, together with some attributes s_n of the decision-maker, and both can be used to specify a function that relates these factors to the decision-maker's utility. The function is denoted $V_{nj} = V(x_{nj}, s_n) \forall j$ (Train, 2003). Since not all aspects of utility can be observed, $V_{nj} \neq U_{nj}$. Utility is decomposed as $U_{nj} = V_{nj} + \varepsilon_{nj}$, where the stochastic component ε_{nj} captures the factors that affect utility but are not included in the structural component V_{nj} . This structural component V_{nj} is usually defined as an additive function of the attributes on which choice alternatives are compared (i.e., $V_{nj} = \beta x_{nj}$, where β is an unknown vector of attribute weights and x_{nj} is a vector of attribute values). The ε_{nj} component is commonly referred to as the error or disturbance term and represents variation in perceived utility due to taste variation, stochastic preferences of individuals and measurement errors (Han, 2006). Since $\varepsilon_{nj} \forall j$ is unknown, these terms are treated as random.

Assuming that individuals demonstrate utility maximizing behavior, the probability that alternative i is chosen by decision-maker n is expressed as:

$$\begin{aligned} P_{ni} &= \text{Prob}(U_{ni} > U_{nj} \forall j \neq i) \\ P_{ni} &= \text{Prob}(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \forall j \neq i) \\ P_{ni} &= \text{Prob}(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj} \forall j \neq i) \end{aligned} \tag{6.1}$$

This indicates that the probability that a decision-maker n chooses alternative i is equal to the probability that the systematic component (V_{ni}) and its associated error component for alternative i (ε_{ni}) is higher than the systematic component (V_{nj}) and error component (ε_{nj}) for other alternatives (j).

Different discrete choice models can be obtained by making different assumptions about the error component distribution. This is reviewed in Crouch and Louviere (2000) and in Train (2003). The most widely used choice model is the multinomial logit (MNL) model, assuming that the error terms are independently and identically distributed (IID) and follow a Gumbel distribution, after McFadden (1974). According to the MNL model, the probability that choice alternative j is chosen from a given choice set J is:

$$\Pr(j|j \in J) = P(U_j \geq U_{j'}, \forall j' \in J, j' \neq j) = \frac{\exp(\mu V_j)}{\sum_{j' \in J} \exp(\mu V_{j'})} \quad (6.2)$$

where:

- $\Pr(j|j \in J)$ is the probability that alternative j is chosen from choice set J ;
- V_j is the structural utility of alternative j ;
- μ is a scale parameter, which is inversely proportional to the variance in the error term, and arbitrarily set to one when dealing with a single data set.

Data collection approaches

In order to estimate these models, different types of data and data collection methods can be used, within which a distinction can be made between revealed and stated models. In short, revealed models are based on observations of actor behavior in real world situations, whereas stated models are based on observations of actor behavior in experimental situations.

When comparing these two data collection methods, the conclusion can be drawn that revealed data – apart from the expected high external validity, often indicating a high predictive power – have several limitations (e.g., Kemperman, 2000; and Han, 2006). First, choice observations cannot be made if particular choice alternatives do not yet exist; innovative solutions can not be included in the model. Furthermore, when collecting revealed choice data, researchers have no or limited a priori control over the covariance structure of the data; this can entail that the attributes of the product are strongly correlated so that their separate effects can not be distinguished. Stated models represent an attempt of overcoming these problems, but also have specific problems. Main problem is the question whether experimental choices are consistent with real world decision-making, thus whether the experiments are externally valid.

Within the group of stated models, distinction can be made between compositional and decompositional models. As discussed in section 5.3.1, compositional models have serious flaws. Therefore, I assume that decompositional stated models – often called conjoint models in the field of marketing – can overcome problems related to the outcomes of revealed data collection, and that eventual problems with stated models can be avoided by carefully designing hypothetical situations. Thus, stated models seem interesting for application in the modeling of individual actor behavior in industrial area redevelopment processes.

Within the group of decompositional stated models, we can distinguish two streams; stated preference models and stated choice models. In stated preference modeling, respondents are asked to rate the profiles on a predefined scale or rank the set of profiles in order of preference. In a stated choice experiment, individuals are asked to make a choice, responding to hypothetical choice situations. This implies that the most important characteristics, labeled as attributes, will be combined often according to a fractional factorial design. Next, the resulting attribute profiles will be placed into choice sets. As mentioned before, the MNL model is widely used in stated choice modeling for estimating the attribute effects.

6.3 Game Theory

In contrast to the individual discrete choice modeling, game theory seems interesting to cover the interactive component. Game theory (e.g., Von Neumann and Morgenstern, 1944; and Luce and Raiffa, 1957) mainly aims to give insights into matters that affect multiple decision-makers. It deals with the modeling of situations of conflict and cooperation, together with the analysis of these models using mathematical techniques (Aumann, 1989). The principal objective of game theory is to determine what strategies the players ought to choose in order to pursue their own interests rationally and what outcomes will result if they do so (Colman, 1999). Thus, game theory can be defined as a tool that helps us understand the behavioral phenomena that we observe when decision-makers interact, and explains players' strategic reasoning within interactive decision-making.

Game theory (the term alludes to the collective decision-making methods used in games such as chess or poker) assumes that the decision-making of players is interdependent; the outcome of a game cannot be determined by one player. Consequently, players have to think ahead and devise a strategy based on expected countermoves of the other player(s). Other basic assumptions that underlie the theory are that decision-makers pursue well-defined exogenous objectives (they are rational,

and try to maximize their own utility), they may have an infinite good memory (perfect recall), and they take their knowledge or expectations of other decision-makers' behavior into account (they reason strategically).

Furthermore, game theory can be classified into cooperative and non-cooperative game theory. Cooperative game theory deals with situations in which groups of players already agreed to cooperate. These players aim for coordinating their actions, eventually resulting in joint profits. Because these joint profits often exceed the sum of the individual profits, cooperative game theory deals with the question how to divide these joint profits.

Non-cooperative game theory primarily deals with the analysis of conflict situations. A conflict can occur when the interests of several decision-makers are opposed or only partly coincide. Each decision-maker will usually choose an option in his own interest, which need not be in the interest of the others. These individual decisions can result in worse outcomes for all players compared to a coordinated decision. As several influential authors (e.g., Schelling, 1960) ignored the cooperative branch when studying strategic decision-making using game theory because of the assumption that the coalitional form suppresses individual decisions, I focus on the non-cooperative branch of game theory from now on. Furthermore, the interactive decision environment of industrial area redevelopment seems to fit more closely to the environment as employed in this non-cooperative branch.

6.3.1 Defining games

The advantage of game theory is that it is based on very basic, and widely utilizable assumptions about choice behavior, and that it uses straightforward concepts to predict the outcome of strategic interaction (e.g., Rasmusen, 1990). That is, game-theoretical models are highly abstract representations of real-life situations, which allow them to be used to study a wide range of phenomena (Myerson, 1991), and they consist of at least three basic elements in order to predict interaction outcomes: players, strategies, and payoffs.

The players in a game are the decision-makers; a player i is assumed to be a solitary actor who makes decisions as a single decision body. Furthermore, the strategy s_i is a complete plan of possible action $A_i = \{a_i\}$ defining what player i might do in any given situation during the game, aiming for utility maximization (Colman, 1999). The total set of strategies available to player i is denoted as the strategy set or strategy

space $S_i = \{s_i\}$ (Rasmusen, 1990). All players make their own choices by selecting a strategy, but the result for each player is partly dependent on the choice of the other player. This resulting set of strategies for each of the n players in the game is denoted as a strategy combination $s = (s_1, \dots, s_n)$. The third element in game theory is payoff. Player i 's payoff is denoted as $\pi_i(s_1, \dots, s_n)$, and this can be defined as a number associated with each possible outcome resulting from a complete set of strategic selections by all the players in a game (Colman, 1999). Generally, higher payoff numbers attach to outcomes that are better in the player's rating system. The main assumption in game theory is that each player attempts to maximize personal payoffs.

The conjunction of chosen strategies and related payoffs is defined as the outcome of the game. A clear distinction has to be made between the concepts of outcome and payoff; an outcome is the decision, if any, arrived at by the players collectively, while the definite payoff of an outcome for a player is the value of that outcome for the player. Because players will have different valuation systems over the set of possible outcomes, and hence have different preferences over the outcomes, this is where conflicts can arise.

In order to predict the outcome of a game, focus of game theoretic modelers is on possible strategy combinations and on selecting one or more strategy combinations as reflecting the most rational behavior by the players. A strategy combination that consists of the best strategy for each of the n players in the game is defined as an equilibrium $s^* = (s_1^*, \dots, s_n^*)$; players choose equilibrium strategies in trying to maximize their individual payoffs. In order to find equilibriums, the players' most preferred strategies should be defined. Solution concepts are suitable for defining such preferred strategies; a solution concept $F: \{S_1, \dots, S_n, \pi_1, \dots, \pi_n\} \rightarrow s^*$ is a rule that defines an equilibrium based on the possible strategy combinations and the payoff functions (Rasmusen, 1990).

6.3.2 Solution concepts

Only a few equilibrium solution concepts are generally accepted, each being applicable to different game classes. Overall, four game classes can be distinguished, based on their characteristics. First, games can be static or dynamic. Static games are games in which there is no information available about choices of the other players (the players are choosing simultaneously), and there is no interest in future interactions because the game is played only once. Dynamic games, in contrast, are games in which the players are choosing in a fixed sequence with knowledge about

the choices made. This means that a player, when choosing, will incorporate the fact that other players will know the outcome of his choice and respond to that. Second, the information provision within a game can be complete or incomplete. A game is one of complete information if all factors of the game are common knowledge; each player is aware of all other players, the timing of the game, and the set of strategies and payoffs for each player. A game is one of incomplete information if one player does not know one of these game factors.

Combining these game characteristics leads to the discernment of four game classes: (1) static games of complete information, (2) dynamic games of complete information, (3) static games of incomplete information, and (4) dynamic games of incomplete information. For each game class, an appropriate solution concept is developed (see figure 6-1).

	<i>Complete information</i>	<i>Incomplete information</i>
<i>Static games</i>	Nash equilibrium	Bayesian Nash equilibrium
<i>Dynamic games</i>	Subgame-perfect Nash equilibrium	Perfect Bayesian equilibrium

Figure 6-1: available solutions concepts for four game classes

Originally, static games were used predominantly in studies after conflicts and cooperation in interdependent multi-party decision settings, thereby using the Nash equilibrium solution concept. However, Schelling (1960) successfully emphasized the importance of information and sequential timing of individuals' decisions by revealing game-theoretic abstractions of real-world problematic negotiations. In order to match the scope of Schelling's analytical examples, game theorists recently developed equilibrium concepts for the other game classes, resulting in subgame-perfect Nash equilibrium, Bayesian Nash equilibrium, and perfect Bayesian equilibrium. Below, all solution concepts are discussed shortly.

Nash equilibrium

The equilibrium concept that is very often employed and very often applicable is the concept of Nash equilibrium (Nash, 1950; Nash, 1951). Nash equilibrium can be defined as a profile of players' strategies s_i^* such that no player individually has the incentive to deviate from its strategy, given that the other players adhere to their strategy. This is formally denoted as $\forall i, \pi_i(s_i^*, s_{-i}^*) \geq \pi_i(s'_i, s_{-i}^*), \forall s'_i$ (Rasmusen, 1990). The way to approach Nash equilibrium is to propose a strategy combination

and test whether each player's strategy is a best response to the other's strategies. It should be taken into account that – although we talk of 'best responses' – the moves are simultaneous, so the players are predicting each others' moves.

An extreme form of Nash equilibrium is dominant strategy equilibrium, which is a conjunction of all players' dominant strategies. The strategy s_i^* is a dominant strategy if it is a player's strictly best response to any strategies the other players might pick, in the sense that whatever strategies they pick, his payoff is highest with s_i^* . This is denoted as $\pi_i(s_i^*, s_{-i}) > \pi_i(s'_i, s_{-i}) \forall s_{-i} \forall s'_i \neq s_i^*$. Compared to the definition of a Nash equilibrium, the definition of a dominant strategy equilibrium is complemented with an extra " $\forall s_{-i}$ "; a Nash strategy need only be a best response to the other Nash strategies, not to all possible strategies.

Subgame perfect Nash equilibrium

A subgame perfect Nash equilibrium is a refinement of a Nash equilibrium used in dynamic games. Dynamic games can be represented in the extensive form as decision trees, and can thus be regarded as a collection of 'subgames'. Subgames begin at a decision node n that is a singleton information set – but is not the game's first decision node – and it includes all the decision and terminal nodes following n in the game tree (see Gibbons, 1992). A strategy profile is a subgame perfect equilibrium if it represents a Nash equilibrium of every subgame of the original game (Selten, 1965). More informally, this means that if (1) the players played any smaller game that consisted of only one part of the larger game and (2) their behavior represents a Nash equilibrium of that smaller game, then their behavior is a subgame perfect equilibrium of the larger game.

A common method for determining subgame perfect equilibriums in the case of a finite game is backward induction. Here one first considers the last actions of the game and determines which actions the final mover should take in each possible circumstance to maximize his/her utility. One then supposes that the last actor will follow these actions, and considers the second to last moves, again choosing those that maximize that actor's utility. This process continues until one reaches the first move of the game. The strategies which remain are all subgame perfect equilibriums. However, backward induction cannot be applied to games of imperfect or incomplete information, and it requires that there be only finitely many moves.

Bayesian Nash equilibrium

Games of incomplete information, also referred to as Bayesian games, can be modeled by introducing Nature as a player in a game (following Harsanyi, 1967). Nature assigns a random variable to each player which could take values of types for each player and associating probabilities or a probability density function with those types. This approach allows games of incomplete information to become games of imperfect information, in which only the history of the game is not available to all players. The type of a player determines that player's payoff function and the probability associated with the type is the probability that the player for whom the type is specified actually belongs to that type. In a Bayesian game, the incompleteness of information means that at least one player is unsure of the type (and of the payoff function) of another player; players have initial beliefs about the type of each player and can update their beliefs according to Bayes' rule on the basis of actual strategies they pursued.

Thus, the normal-form representation of an n -player static Bayesian game specifies the players' action spaces A_1, \dots, A_n , their type spaces T_1, \dots, T_n , their beliefs p_1, \dots, p_n , and their payoff functions π_1, \dots, π_n . Player i 's type t_i (privately known by player i) determines player i 's payoff function $\pi_i(a_1, \dots, a_n; t_i)$, and is a member of the set of possible types T_i . Player i 's belief $p_i(t_{-i} | t_i)$ describes i 's uncertainty about the $n-1$ other players' possible types (t_{-i}), given i 's own type t_i . This game is denoted by $G = \{A_1, \dots, A_n; T_1, \dots, T_n; p_1, \dots, p_n; \pi_1, \dots, \pi_n\}$ (Gibbons, 1992). In this game, a strategy for player i is a function $s_i(t_i)$, where for each type t_i in T_i , $s_i(t_i)$ specifies the action from the feasible set A_i that type t_i would choose if drawn by nature.

In this, a Bayesian Nash equilibrium is defined as a strategy profile and beliefs specified for each player about the types of the other players that maximizes the expected payoff for each player given their beliefs about the other players' types and given the strategies played by the other players, because each player's strategy must be a best response to other players' strategies. Thus, in the static Bayesian game $G = \{A_1, \dots, A_n; T_1, \dots, T_n; p_1, \dots, p_n; \pi_1, \dots, \pi_n\}$, the strategies $s^* = (s_1^*, \dots, s_n^*)$ are a Bayesian Nash equilibrium if for each player i and for each of i 's types t_i in T_i , $s_i^*(t_i)$ solves $\max_{a_i \in A_i} \sum_{t_{-i} \in T_{-i}} \pi_i(s_1^*(t_1), \dots, s_{i-1}^*(t_{i-1}), a_i, s_{i+1}^*(t_{i+1}), \dots, s_n^*(t_n); t) p_i(t_{-i} | t_i)$. That is, no player wants to change his or her strategy, even if the change involves only one action by one type (Gibbons, 1992).

Perfect Bayesian equilibrium

In dynamic games, where players take turns sequentially rather than simultaneously, Bayesian Nash equilibrium can result in implausible equilibriums (containing for instance incredible threats and promises (see Schelling, 1960)). Normally, the subgame perfect Nash equilibrium solution concept can be used to eliminate such implausible equilibriums; however, this solution concept is often not applicable in incomplete information games. To refine the equilibriums generated by the Bayesian Nash solution concept or subgame perfection, one can apply the Perfect Bayesian equilibrium solution concept (see Kreps and Wilson, 1982). Perfect Bayesian equilibrium demands that subsequent plays be optimal, and it places player's beliefs on decision nodes occurring in their information sets; at each information set, the player who has to move must have a belief about which node in the information set has been reached by the play of the game.

The sum of all beliefs held by players in Bayesian games are regarded as a belief system, which is an assignment of probabilities to every node in the game such that the sum of probabilities in any information set is 1. The beliefs of a player are exactly those probabilities of the nodes in all the information sets at which that player has to move. A belief system is consistent for a given strategy profile if the probability assigned to every node is computed as the probability of that node being reached given the strategy profile. For this, Bayes' rule can be applied.

Furthermore, given their beliefs, the players' strategies must be sequentially rational. That is, at each information set the action taken by the player who has to move (and the player's subsequent strategy) must be optimal given the player's belief at that information set and the other players' subsequent strategies, where a subsequent strategy is a complete plan of action covering every contingency that might arise after the given information set has been reached (Gibbons, 1992).

Concluding: by definition, a perfect Bayesian equilibrium is a strategy profile and a belief system such that the strategies are sequentially rational given the belief system and the belief system is consistent, wherever possible, given the strategy profile. The 'wherever possible' clause refers to information sets on equilibrium paths, meaning that these information sets will be reached with positive probability in the game. If an information set cannot be reached with a non-zero probability, Bayes' rule cannot be employed to calculate the probability at the nodes in this set; such an information set is said to be off the equilibrium path.

6.3.3 Comparing solution concepts

The presented equilibrium concepts can be compared on the level of strength, where stronger concepts are regarded as successful attempts to eliminate implausible equilibriums allowed by weaker notions of equilibrium. Gibbons (1992) states that subgame perfect Nash equilibrium is stronger than Nash equilibrium, and that perfect Bayesian equilibrium is stronger than subgame perfect Nash equilibrium, leading to the conclusion that the equilibrium concept of interest is always the perfect Bayesian equilibrium. However, in static games of complete information, it yields equivalent results to the Nash equilibrium concept, and this also counts for the subgame perfect Nash equilibrium concept in dynamic games of complete information, and for the Bayesian Nash equilibrium concept in static games of incomplete information. Thus, for simplicity it is advocated to use the solution concept that suits each game class best.

Because of the explorative character of this research, I choose to employ the most basic game class; static games of complete information. This game class offers insight in the most basic characteristics of interaction and interdependent decision-making, and is therefore suitable for gaining insight into a large number of important factors determining the choice behavior of involved actors in industrial area redevelopment projects.

6.4 2x2 games

In this section, a specific game form is discussed. As explained in the previous paragraph, a game consists of three major elements: players, strategies, and payoffs. The simplest form of game can be obtained by reducing to a minimum the number of players and the number of available strategies. The smallest number of players in a game is two, and since each player must have a choice between at least two alternatives, it follows that the smallest possible games are those that involve two players, each having two strategies available. Such games are called 2x2 games, of which the structure in normal form is represented by a matrix with two rows, two columns, and, consequently, four entries, each entry being a pair of numbers representing a possible outcome of the game (Rapoport *et al.*, 1976).

The 2x2 game is the simplest and most commonly employed representation of strategic relationships between two players. Rapoport *et al.* (1976) studied 2x2 games extensively, focusing mainly on ordinal payoff structures, i.e., those in which a player

prefers one outcome over another, but the degree of preference is not measured. In strict ordinal games, each player has a distinct level of preference for each of the four possible outcomes so that no player is ever neutral towards any two outcomes; ordinal payoffs 1 to 4 represent each player's best to worst outcomes.

Rapoport *et al.* (1976) proposed a set of nested categories, resulting in the often-used observation that there are 78 strategically distinct strictly ordinal 2x2 games. Within this group of games, three subcategories are distinguished: (1) games of complete opposition; (2) games of partial opposition (also referred to as mixed-motive games); and (3) no-conflict games. Other categorizations have since been proposed; for instance, Kilgour and Fraser (1988) conclude that 726 ordinal games can be distinguished when extending the original approach to non-strictly ordinal games – games in which one or both players may have equal preferences for two or more outcomes.

6.4.1 Applicability of 2x2 games

The 2x2 game has been very popular for modeling conflicts. Several examples are listed in Kilgour and Fraser (1988). Jost and Weitzel (2007) apply – with a few exceptions – 2x2 games in their work on strategic conflict management because this type of games ‘can be used to depict a multitude of situations of conflict’. Furthermore, many studies employed specific 2x2 games, of which the prisoner’s dilemma, chicken games, coordination games, and battle-of-the-sexes games are the most well known (see Wang and Yang, 2003). This can be explained by the high level of adaptability of 2x2 games to explaining strategic behavior in real-world interactive situations. As a case in point, Snyder and Diesing (1977) argue for the 2x2 game over any other model in the study of international conflict.

As mentioned in section 5.4.3, two major actors are involved in the initiative and plan development phases of industrial area redevelopment projects: municipalities and established companies. And, roughly speaking, these actors both have two major strategies; to act cooperatively or not. So, besides the argued suitability of 2x2 games in studying conflict occurrences, it can be concluded that this game type also suits the general negotiation environment of industrial area redevelopment projects. Therefore, 2x2 games are employed in this research for modeling interactive choice behavior of involved actors.

6.5 Conflict management - governing decision-making

As game theory assumes that interacting players pursue their own interests, it can be interpreted as a theory of social conflicts in cases where the interests of the separate interacting players are (partially) contradictory. As presented in section 6.3, game theory provides us with a number of analytical tools to study the behavior of players in situations of conflict. This section primarily focuses on the management of such conflicts, by anticipating how the players in conflict will behave and how framework parameters of the conflict will influence its outcome.

Logically, conflict management analyses always start with a given conflict. The main advantage of applying the game-theoretic definition of a conflicting situation – in which players are interdependent and have a conflict of interest – on conflict management is that situations of conflicts and causes for these conflicts can be studied easily and uniformly. And, according to Jost and Weitzel (2007), “once we understand the causes for a conflict, we are able to anticipate the behavior of the parties and manage the situation of conflict even more appropriately from the beginning or even avoid the manifestation of the conflict at all.” This can be used as a basis for supporting the decision-making of regional governing agencies when managing industrial area redevelopment processes.

Still, we have to analyze the strategic behavior of players in a conflicting situation in order to be able to understand the causes for a conflict. And for this, we need to understand the structure of this situation by gaining appropriate knowledge about the framework parameters affecting the conflict. Using this knowledge, conflict management is concerned with the development of specific measures and tools with which a manager can influence the strategic actions of the players in conflict. This conflict management can be applied in problematic interactive settings, aiming for the support of establishing cooperation between involved players. Applications of conflict management can be found in, for instance, Schelling (1960), Rapoport *et al.* (1976), Wang and Yang (2003) and Jost and Weitzel (2007), all presenting possibilities to solve or prevent game-theoretic conflicts.

6.5.1 Conflict management tools

The previously mentioned authors that handled possibilities for conflict management proposed several tools in order to execute conflict management. Schelling (1960) formulated the strategic importance of using commitment, threats and promises in conflicting situations, proved that reducing possible strategies through elimination can

result in opponent's behavior that is beneficial for the player, and emphasized that threats and promises have a strategic effect only if they are credible, thereby demonstrating how credibility can be gained in several real-world situations. Furthermore, he discussed that strategic moves are often evolving from the player's preference for a certain game type, and that players can alter three game characteristics in order to reach a preferred game type: (1) payoffs, (2) information structures, or (3) the order in which decisions are taken.

In addition, Rapoport *et al.* (1976) focused on three slightly different game characteristics that can be altered in order to achieve cooperation in problematic game types: (1) the payoff structure in one-shot games and in iterative games; (2) the number of iterations in the game, and the level of feedback on the outcome of each iteration, in order for the players to become acquainted with the strategy of their opponent through learning; and (3) communication and information provision. This largely coincides with the findings of Schelling, but the analysis of these three possible managerial actions by Rapoport *et al.* (1976) focuses only on 2x2 games and is more profound.

Wang and Yang (2003) demonstrated how 2x2 games can be used to explain business behavior of firms. They focus on four game types: the prisoner's dilemma game, the coordination game, the chicken game, and the battle-of-the-sexes game, and reveal how moving strategically can help players solve problems within these game types. In this, they distinguish between four types of business strategies, based on Fudenberg and Tirole (1984), and demonstrate that influencing the payoff within games through following strategic business strategies can alter the outcome of 2x2 games in favor of both players.

Finally, Jost and Weitzel (2007) thoroughly analyze conflicts in games, mainly studying 2x2 games, and focus on the management of these conflicts, revealing how the strategic behavior of conflicting players can be influenced by direct or indirect governance. In this, they distinguish between vertical conflict management and lateral conflict management. Vertical conflict management considers interdependencies between principals and agents, assuming a hierarchical relationship between the players in which a principal tries to make sure that the agent acts in accordance with the interests and aims of the principal. Lateral conflict management considers situations between players without hierarchical order, aiming for appropriately designing management interventions so that the interaction between the players involved corresponds to formulated organizational aims.

Vertical and lateral conflict management

Conflicts in games with principal-agent relationships are always dynamic; the principal proposes a contract or designs an incentive system, and the agent responds to these propositions. Furthermore, these relationships are characterized by information asymmetry. In this setting, Jost and Weitzel (2007) distinguish two main tools that can be used by the principal for influencing the behavior of the agent: incentive tools and structural coordination tools. In short, incentive tools change the payoff that is linked to the outcome of a situation of conflict; the principal has to consider the expected strategic reaction to the introduction of possible payoff changes. In contrast, the most important structural coordination tools are changing the agent's rights to access certain resources (or bonuses), the delegation of decision rights to a third party in order to change the direct conflict between principal and agent and to monitor the players' compliancy with signed contracts, and the reformulation of certain codes of behavior, for example, to explicitly rule out certain actions, or to define minimum requirements for some actions (Jost and Weitzel, 2007).

Lateral conflict management concerns appropriate design of conflict situations so that the interaction between the non-hierarchically organized players involved corresponds to a specified organizational aim. Jost and Weitzel (2007) distinguish situations in which the players involved can manage the conflict of interests on their own within a predetermined situation of conflict, and situations in which a conflict manager (as mediator or as designer of an institutional framework) can take additional actions in order to create a favorable situation for cooperation between players. Three tools of self-management are discussed: (1) building trust between players in games with repeated decision rounds; (2) starting communication between players about their present collaboration; and (3) bargaining between players when communicating alone is not enough to settle their conflicting interests. In contrast, conflict managers have two major tools at their disposal: designing contracts in which desired behavior is rewarded or undesired behavior is punished, and providing specific information on specific moments to specific players. This becomes employable in situations in which the compliance with the contract cannot be observed or in situations in which there are no adequate possibilities to sanction deviant behavior.

6.5.2 Utilization of tools

We can conclude that – in different types of games – different tools can be used in order to solve conflicts. When insight is gained in the strategic behavior of players, and thus in the possible causes for conflicts, interventions can be designed through

which process governance can be executed. This process governance is aimed at supporting the establishment of cooperation between relevant players, reducing the possibility on conflict occurrences and accelerating the real-world realization of industrial area redevelopment projects.

From the examples of conflict management using game theory in the literature, I conclude that three major tools for altering conflicting games can be distinguished: (1) changing the information of the players involved; (2) changing the payoffs of the players; and (3) changing the rules of the game, focusing on the sequence of decision-making and the possibility of allowing communication in the game. Based upon the choice to restrict to static games of complete information, the second strategy seems to be the most appropriate to focus on in this research.

6.6 Game theory and conjoint modeling approaches

The quality of the design of interventions totally depends on the quality of the analysis of the players' strategic behavior. Therefore, it is very important to build a sound model of the situation of conflict. The analysis of the strategic behavior that underlies this model can be conducted at several levels of detail. In order to analyze the strategic behavior of the players, only those aspects which have a significant influence on their actions are relevant. Ideally, a game-theoretic model chooses a level of abstraction that extracts only those aspects of a situation of conflict that are relevant for the understanding of the conflict or cooperation (Jost and Weitzel, 2007). For the extraction of the most important aspects, several methods can be employed; however, most methods are not compatible with game theory. In this paragraph, a relatively new approach is discussed, in which game theory is combined with the conjoint modeling approach.

According to Jost and Weitzel (2007) and Samsura *et al.* (2009), any game consists of two parts, namely a descriptive part which describes the game under scrutiny, and a solution part which describes or predicts the outcomes given the description of the game. Principles from game theory are suitable for analysis of the outcomes. In the descriptive part, it is desirable to design a situation in which the structure of games can be precisely described and where people's attention can be directed to the specific, controlled features of the games (Rapoport *et al.*, 1976). Conjoint modeling approaches (e.g., Louviere, 1988) seem very suitable for describing the game; by designing hypothetical urban development projects composed from a limited set of important project- and process-characteristics, insight can be gained into the

dependencies between interactive actor decision-making and these specific characteristics.

The combination of principles from conjoint modeling and game theory in order to study interactive behavior is a relative new approach in urban development literature. It is adopted in a few other disciplines. For example, Choi and Desarbo (1993) combined principles from conjoint analysis and game theory to incorporate the reaction of competitors to new product designs, within the field of marketing. Furthermore, Chen (1998) developed a game theoretic model to find a mutually consistent dynamic system-optimal signal setting and dynamic user optimal traffic flow. Brewer and Hensher (2000), and Rose and Hensher (2004) developed what they term 'interactive agency choice experiments' between employer and employee to study adoption of participation in distributed work and group decision-making. Czap and Becker (2002) used both methods to address the problem of scheduling of operation theatres in hospitals. Bajari and Kahn (2001) and Bayer *et al.* (2004) presented equilibrium models describing how residential location choices of households aggregate to form a housing market equilibrium.

As Han (2006) concludes, these approaches begin by relating conjoint data on individual's decisions to game-theoretic models of individual's actions, information, payoffs, and strategies. Thereafter, the equilibrium concept is introduced into the conjoint model, identifying the players' most preferred strategies. From this, probable game outcomes can be calculated by using game solution concepts and observed preference data. Eventually, this gives a profound insight into the interactive choice behavior of individuals in real life situations (Han, 2006).

6.7 Summary

From chapter 5, it was concluded that discrete choice theory and game theory seem employable in the research field of industrial area redevelopment. In this chapter, these two methodological approaches are discussed in depth. In the first part, the foundations of the discrete choice theory are explained, together with several possible data collection methods. The major conclusion that results from this first part is that stated models are the most suitable for this research; revealed models show several limitations. In addition, I concluded that stated choice models are preferred over stated preference models, because of the specific decision moment in industrial area redevelopment.

In the discussion concerning game theory and its foundations, it was concluded that one specific game form – often referred to as the 2x2 game – has been used very often for conflict modeling and conflict management, and seems appropriate for application in this research because of the strong emphasis on conflict management and process governance in the research objective. Furthermore, in the comparison between related researches concerning conflict management in 2x2 games, it was found that three tools are most utilizable for solving conflicts: (1) changing the information of the involved players; (2) changing the payoffs of the players; and (3) changing the rules of the game, focusing on the sequence of decision-making and the possible allowance of communication in the game. Because the research focuses on static games of complete information, it was concluded that gaining insight in the second tool was most feasible and interesting.

Because the quality of the conflict management design depends totally on the quality of the analysis of the players' strategic behavior, it is very important to build a sound model of the situation of conflict. In the final paragraph of this chapter I concluded that – within current applications of game-theoretical approaches – little work has been done to develop models that systematically relate the characteristics of industrial areas, redevelopment plans and interactive game settings to the behavior of actors in a redevelopment process when negotiating on a plan proposal, thereby giving insight in the most important points of interest and in possible sources of conflicts. Therefore, an alternative modeling approach is advocated, in which game theory is combined with a multi-attribute trade-off technique. This functions as the foundation of a behavioral model that incorporates many of the real-world attributes, resulting in better conflict analyses and more appropriate conflict management recommendations.

CHAPTER 7

INDIVIDUAL CHOICE BEHAVIOR

7.1 Introduction

Individual choice behavior of involved parties seems to play a big role in the occurrence of several problems in Dutch industrial area redevelopment projects, and an important task to accelerate redevelopment projects lies therefore at the level of the stakeholders. To date, little work has been done to develop models that systematically relate the characteristics of industrial area redevelopment plans to the behavior of stakeholders in a redevelopment process when negotiating a plan proposal. Such models can give an early insight in the most important points of interest, in the level of consensus between involved actors, and in possible sources of conflicts, and consequently may contribute to a faster negotiation process.

The first research questions, as stated in section 5.2, is formulated as follows: What are the individual preferences of the most important involved stakeholder groups, and are these preferences mutually similar or contradictory? In this chapter, I will answer this research question; the main aim is to gain a better and more systematic insight in stakeholders' preferences when accepting or rejecting a development plan proposal, and in the (dis-) similarities between stakeholder preferences. I distinguish two stakeholder groups: the municipality and established companies.

For this, the discrete choice approach is applied. By using this approach, insight can be gained in actors' individual decision-making behavior, together with underlying

needs and interests influencing this decision-making. In chapter 6, the basic assumptions underlying this approach are discussed. In this chapter, the approach is applied on a hypothetical industrial area redevelopment project. The results of this part of the research are expected to support the testing of individual appreciation of specific development plan proposals in an early stage of industrial area redevelopment projects.

7.2 Discrete Choice Approach

The central question addressed in discrete choice modeling (e.g., Ben-Akiva and Lerman, 1985) is how product and service characteristics can be related to the utility that consumers attach to these products or services. The development plan reports on the characteristics of the redevelopment project, and therefore it is assumed that the adoption of this approach has the potential to succeed. The approach has been applied widely in many research fields, for instance in modeling spatial interactions (Barentsen and Nijkamp, 1988), urban growth (Fragkias and Seto, 2007), and transit travel choice (Guo and Ferreira, 2008). The specification of a discrete choice model involves several steps, which are discussed below.

First, a context has to be decided upon. In order to study choice behavior of stakeholders in an industrial area redevelopment process, a hypothetical project is designed, in which some assumptions were made:

- It concerns a medium-sized industrial area with mixed industrial functions, located in the Netherlands, which displays serious signs of obsolescence.
- This obsolescence has a negative impact on the results of the core business of the two most important involved stakeholder groups: the municipality and the established companies.
- To solve the current problems on the industrial area, a redevelopment process is started.
- In this process, the established project team is currently working on the composition of the development plan, which is the result of the first phase of plan development, containing preconditions and basic assumptions underlying further plan development for the area, and recording urban research, rough designs and feasibility and process studies.

The next step in constructing the choice model is to choose relevant attributes on the basis of which development plans are accepted or rejected. It is assumed that stakeholders base their decision to accept or to reject a proposal on *expected consequences* of the plan, not on the specific components of the plan. On the basis of

literature study and in depth case studies of four development plans (Ladonk/Vorst area, Boxtel; Spoorzone area, Deurne; Hoogeind area, Helmond; and Majoppeveld area, Roosendaal), a list of five attributes – each with three levels, ranked from low to high – is composed, representing the most important development plan consequences for both stakeholder groups. The attributes, listed in table 7-1, can be combined to create hypothetical plan proposal outcomes.

Table 7-1: attributes to define a hypothetical development plan

Attributes		Descriptions	Levels
1	Development speed (DS)	Expected duration of the realization of the redevelopment project.	<ul style="list-style-type: none"> • 15 years • 10 years • 5 years
2	Technical quality (TQ)	Level in which the plan satisfies the wishes and demands of the stakeholders, seen from their core business.	<ul style="list-style-type: none"> • 25% • 50% • 75%
3	Architectural quality (AQ)	Level in which the appearance of the redeveloped area improves the image of the stakeholders.	<ul style="list-style-type: none"> • 25% • 50% • 75%
4	Value development (VD)	Level in which the redevelopment leads to a higher value of the land and real estate.	<ul style="list-style-type: none"> • Low • Medium • High
5	Cost coverage (CC)	Level in which the project-related costs of a stakeholder (process costs, plan delay, temporary loss of income) are covered by short term savings.	<ul style="list-style-type: none"> • 50% • 75% • 100%

Given the attributes presented in table 7-1, in total $3^5 = 243$ different compositions of plan proposals can be formulated. This number is too large to handle. Therefore, an orthogonal fraction of the full factorial design is selected to reduce the number of compositions. A full factorial design allows unbiased estimation of all higher-order effects. Higher-order effects represent the specific effects of combinations of all attribute levels. As these combinations of three or more attributes are usually insignificant, the number of compositions can be reduced.

In this study, a design was chosen that allows only the estimation of each attribute level (main effects) and the interaction effects between the attribute ‘development speed’ and all other attributes. This resulted in a fractional design of 27 different plan proposals. To keep the number of imaginary plan proposals small, other higher-order interaction effects were not considered in this study. Next, three plan proposals are randomly combined into one choice set (see figure 7-1 for an example) with a “reject proposals” option as baseline for one choice task. In total each respondents will face 9 choice tasks.

	Plan proposal I	Plan proposal II	Plan proposal III	Reject all
Development speed	5 years	5 years	10 years	
Technical quality	75%	75%	25%	
Architectural quality	25%	50%	75%	
Value development	High	Low	High	
Cost coverage	100%	75%	75%	
Your choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 7-1: example of choice task

7.3 Data collection

Next, the different choice sets, each consisting of three imaginary plan proposals, are presented to a group of experts in urban redevelopment processes. In the case of redevelopment of industrial areas, a field of tension arises between municipalities and established companies. Despite their large involvement, both stakeholder groups accommodate relatively little expertise in industrial area redevelopment processes; they employ few experts permanently. In such processes, the decision-making of municipalities and of established companies is guided and supervised by external expertise. In the Netherlands, the intended expertise is mainly located at large consultancy firms. A considerable share of the total of approximately 20.000 Dutch consultants are working with urban (re)development aspects like financing, risk management, and stakeholders' management on a daily basis.

Because of this centralization of expertise, and after a consultation of representatives of municipalities and private entrepreneurs, the researchers decided to approach the group of consultants for the data collection, aiming to obtain highly qualified research results. Process managers were asked to assess the described choice tasks on behalf of either a municipality or an established company. From July 4th 2008 until September 12th 2008, five consultancy companies were visited in order to collect the necessary data. These five consultancy companies are ARCADIS, AT Osborne, DHV, ECORYS, and BOM, and they are assumed to largely represent Dutch expertise on industrial area redevelopment processes.

In total, 50 process managers returned the questionnaire of which 25 responded on behalf of established companies and 25 on behalf of a municipality. Because of the presumed homogeneity of the target group, this number is satisfactory to estimate a behavioral model.

7.4 Model estimation

Section 6.2 deals with the basic assumptions underlying the Discrete Choice Approach. In this section, it is mentioned that the most widely used model type within this approach is the multinomial logit (MNL) model. According to this model, the probability that choice alternative i is chosen from a given choice set A equals:

$$P(i|A) = \frac{\exp(\mu V_i)}{\sum_{i' \in A} \exp(\mu V_{i'})} \quad (7.1)$$

Where,

$P(i|A)$ is the probability that alternative i is chosen from choice set A ;

V_i is the structural utility of alternative i . Furthermore, $V_i = \beta x_i$, where β is an unknown vector of attribute weights and x_i is a vector of attribute values of alternative i ;

μ is a scale parameter, inversely proportional to the variance in the error term. When we deal with a single data set, this factor is arbitrarily set to one.

In this thesis' application of the MNL modeling approach, a plan-specific constant is included in the utility function, which represents the preference of respondents between choosing a plan and rejecting all plans. Furthermore, the effect coded attributes represent the levels of the attributes 'development speed', 'technical quality', 'architectural quality', 'value development', and 'cost coverage'. All five are three-level attributes: the first levels are coded (1,0), the second levels (0,1), and the third (-1,-1).

The parameters of the MNL model – thus the attribute weights (β 's) – were estimated by maximum likelihood estimation. The software package LIMDEP (Greene, 2003) was used to estimate the parameters. The estimated parameters of both stakeholders groups are displayed in table 7-2. Interaction effects were not displayed in this table, because they all were not significant at a 95% confidence level.

Table 7-2: Estimation of results for both stakeholder groups

		Municipality			Established company		
Attributes	Levels	Part-worth utilities	Significance	Range value	Part-worth utilities	Significance	Range value
Plan-specific constant		0.49	0.03		0.11	0.58	
Development speed	<i>15 years</i>	-0.60	0.00	0.99	-1.28	0.00	2.43
	<i>10 years</i>	0.21	0.11		0.13	0.40	
	<i>5 years</i>	0.39			1.15		
Technical quality	<i>25%</i>	-0.96	0.00	2.01	-0.96	0.00	1.98
	<i>50%</i>	-0.09	0.60		-0.06	0.71	
	<i>75%</i>	1.05			1.02		
Architectural quality	<i>25%</i>	-0.62	0.02	1.03	0.31	0.15	0.36
	<i>50%</i>	0.21	0.21		-0.26	0.11	
	<i>75%</i>	0.41			-0.05		
Value development	<i>Low</i>	-0.58	0.02	1.29	-0.55	0.01	1.21
	<i>Medium</i>	-0.13	0.51		-0.11	0.54	
	<i>High</i>	0.71			0.66		
Cost coverage	<i>50%</i>	-0.80	0.00	1.69	-0.99	0.00	2.25
	<i>75%</i>	-0.09	0.61		-0.27	0.11	
	<i>100%</i>	0.89			1.26		
Adjusted Rho-square		0.20			0.30		
Log likelihood		-236.73			-211.30		
LL null model		-300.74			-308.46		

7.4.1 Goodness-of-fit measures

For the models representing municipalities' and companies' choice behavior, the adjusted rho-square values – indicating the proportion of variability in a data set that is accounted for by a statistical model – are respectively equal to 0.20 (municipality) and 0.30 (company), indicating a fair fit of both models. The models are tested to determine whether they outperform a null model (see Ben-Akiva and Lerman, 1985). The likelihood ratio test-statistic for this test (Hensher, Rose and Greene, 2005) is:

$$-2*(LL_{null} - LL_{MNL}) \sim X^2_{(degrees\ of\ freedom)} \quad (7.2)$$

For the model of the choice behavior of the municipality, the outcome is 128.02, and for the model of the company, the outcome is 194.32. Both outcomes should be compared to the critical value of chi-square with 11 degrees of freedom at a 95%

confidence interval, which is 19.68. It can be concluded that these models perform better than the null models.

7.4.2 Results

Table 7-2 shows that for the municipality all attributes are significant. In contrast, the results for the respondent group ‘company’ reveal that the *plan-specific constant* and the attribute *architectural quality* are not significant. Regarding the plan-specific constant, this means that companies have no preference in choosing a plan over rejecting all plans. Regarding the architectural quality, the results indicate that the appearance of the industrial area is not a decisive factor for most companies.

When interpreting the significant outcomes, the plan attributes ‘technical quality’ and ‘cost coverage’ appear to be important for both stakeholder groups in accepting or rejecting a plan proposal. These attributes have a high range value, representing the difference between the part-worth utility of the low and the high level. A high level of these attributes in a plan results in a higher probability of being chosen, while a low level results in a low choice probability. Furthermore, companies find the attribute ‘development speed’ very important when accepting or rejecting a plan proposal.

Comparing these results, it is expected that the attributes ‘development speed’ and ‘architectural quality’ are valued differently by both stakeholder groups when a plan is proposed. In the next section, I explore whether these differences are significant.

7.5 Differences in choice behavior

Whether the individual choice behavior of the two stakeholder groups manifests significant differences, and what causes these possible differences, needs further exploration. When significant differences occur, it is of interest to know whether they occur because (1) they are simply the result of sampling error, since the true underlying parameters and scale factors are the same in both populations; (2) the true underlying parameters are the same but the scale factors are different; or (3) there are real differences in true parameters and scale factors (Swait and Louviere, 1993).

Because the scale factor and parameter vector are confounded in the MNL model (see Ben-Akiva and Lerman, 1985), it is not possible to attribute real differences in parameters and/or scale factors (condition 3 above) to parameter vector inequality and scale equality versus parameter vector inequality and scale inequality (Swait and Louviere, 1993). However, it is possible to estimate variance differences under

assumed parameter equality, and then test the assumption of parameter equality. Estimation of variance differences is often done through scale parameter estimation (SPE), and contrast parameter estimation (CPE) is frequently used to test parameter equality.

7.5.1 Scale parameter estimation (SPE)

Basically, two data sources have to be combined. The estimation problem – caused by the confounding scale factor and parameter vector – involves imposing an equality restriction on the taste parameters of the two data sources (i.e., $\beta_1 = \beta_2 = \beta$), and estimation of additional scale parameters (μ_1, μ_2). In that is, one scale parameter is fixed, say $\mu_1 = 1$, and the other parameter, μ_2 , is an inverse variance ratio relative to the reference data source. The null hypothesis is taste invariance across data sources, after allowing variance-/ reliability differences, which can be tested using a likelihood ratio statistic (Hensher, Louviere and Swait, 1999). Following Swait and Louviere (1993), the quantities of μ_1 , μ_2 and β can be estimated by maximizing the following log likelihood function (Swait and Louviere, 1993):

$$L_{\mu} = \sum_n \sum_{i \in C_n} f_{in} \ln P_{in} = \sum_n \sum_{i \in C_n} f_{in} \ln \left(\frac{e^{\beta W_{in}}}{\sum_{j \in C_n} e^{\beta W_{jn}}} \right) \quad (7.3)$$

Where:

P_{in} is the probability that a randomly observed individual n chooses alternative i from choice set C_n ;

F_{in} is the observed choice frequency for alternative i and individual n , and;

$W_{in} = \mu_1 X_{in}$ if $n \in S_{company}$ (μ_1 normalized to one)

$W_{in} = \mu_2 X_{in}$ if $n \in S_{municipality}$

However, using an MNL model for testing scale parameter differences results in a violation of the IID assumption, because of error structure differences between the data sources. To deal with this so-called heteroscedasticity, a nested logit model can be used, which permits differential variance between levels and/or branches within a level of the nested structure but a common variance within a branch. Estimating a

nested logit model from the two data sources obtains an estimate of the scale factor of one data set relative to that of the other. This approach was proposed by Bradley and Daly (1994) and Hensher and Bradley (1993), who called the hierarchy an artificial tree structure.

For estimating the scale factor of the municipality (MUN), relative to the scale factor of the company (COM), a nested logit structure is created. In this structure, municipality-nests and company-nests are distinguished. By creating a nest for every alternative, every alternative gets an inclusive value (IV). Because I want to know the scale factor of the municipality *relative* to that of the company, the IV's of the company-nests are set to one, and all IV's within the municipality-nests are equalized (see Louviere, Hensher and Swait, 2000). In figure 7-2, the created artificial tree structure is represented.

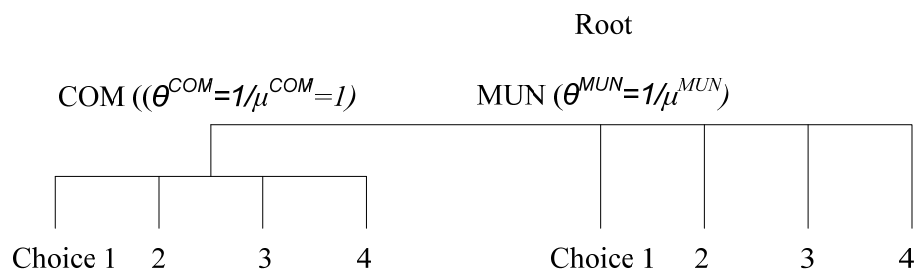


Figure 7-2: artificial nested logit structure.

To scale the variance of the unobserved effects in the municipality data set relative to the ones in the company data set, simultaneous estimation is applied, using the method of full-information maximum likelihood (FIML) (see Morikawa, 1989; Hensher and Bradley, 1993; Louviere, Hensher and Swait, 2000). The statistical program LIMDEP (Greene, 2003) is used to estimate the scale factor for the IV's of the municipality data set – relative to the scale factor of the company, which was set to unity. See table 7-3 for the results.

Table 7-3: Scale Parameter Estimation

Attributes	Levels	Combined data set (MUN+COM)		
		Part-worth utility	Std. Err.	Significance
Plan-specific constant		0.31	0.17	0.07
Development speed	<i>15 years</i>	-1.04	0.17	0.00
	<i>10 years</i>	0.17	0.11	0.13
	<i>5 years</i>	0.87		
Technical quality	<i>25%</i>	-1.06	0.20	0.00
	<i>50%</i>	-0.07	0.13	0.59
	<i>75%</i>	1.13		
Architectural quality	<i>25%</i>	-0.15	0.18	0.42
	<i>50%</i>	-0.04	0.13	0.73
	<i>75%</i>	0.19		
Value development	<i>Low</i>	-0.64	0.19	0.00
	<i>Medium</i>	-0.12	0.15	0.43
	<i>High</i>	0.76		
Cost coverage	<i>50%</i>	-1.00	0.19	0.00
	<i>75%</i>	-0.17	0.13	0.19
	<i>100%</i>	1.17		
IV parameter COM		1.0	Fixed	Fixed
IV parameter MUN		0.75	0.12	0.00
Log Likelihood Function (LL)		-460.81		
Restricted Log Likelihood (RLL)		-935.75		
<i>p</i> -value		0.00		
Adjusted Rho-square		0.26		

Goodness-of-fit measures

To test whether the restricted model with scale parameters difference outperforms the combination of both separate models, both log likelihoods are compared. For this, the likelihood ratio test-statistic is used, which results in $-2*(-935.75+460.81) = 949.88$. This should be compared to the critical value of chi-square with 12 degrees of freedom (i.e., eleven parameter estimates and one IV parameter) at a 95% confidence interval, which is 21.03. Thus, the restricted model outperforms the combined full model. From this, it is concluded that the recognition of the scale parameter difference improves the model performance.

Also, the p -value – smaller than 0.05 – indicates that the estimated NL model represents an improvement in the Log likelihood function of a model estimated with constants only. As such, it can be concluded that the parameter estimates improve the overall model fit. The estimated adjusted Rho-square value is 0.26, suggesting that the NL model explains more variation in choice compared to a model fitted with equal choice shares.

Results

Table 7-3 reveals that the estimated theta (scale factor) significantly deviates from 0.0. The second necessary test is to check whether the scale factor deviates from 1.0 (Hensher *et al.*, 2005). For this purpose, the Wald test is used:

$$Wald\ test = \frac{IV_{parameter} - 1}{std - err} = \frac{0.75 - 1}{0.12} = -2.09 \quad (7.4)$$

Assuming a 95% confidence level ($\alpha=0.05$), the critical Wald value is 1.96. The calculated Wald test value lies outside the critical bound of (+/-) 1.96. Thus the hypothesis that the estimated IV parameter is statistically equal to 1 can be rejected.

The effect of $\theta = 0.75$ for municipalities in fact is that the structural utility component of each alternative will be scaled down relative to these components from the companies. This means that the probabilities for municipalities will be less profound, and that, compared to companies, municipalities are less demanding in choosing or rejecting industrial area redevelopment plan proposals. This was expected because, as stated in Blokhuis and Schaefer (2007), choice behavior of established companies is strongly related to the operational and financial management of those companies; they gain when established in a suitable industrial area.

7.5.2 Contrast parameter estimation

In addition, I studied whether significant differences occur in part-worth utility estimates between two stakeholder groups. For this, the data sets of both groups are combined, and for every variable in the grouped data set, an additional variable was created to measure the contrast between the part-worth utilities of the two groups. This so-called contrast variable is constructed as follows:

$$Y_{in} = \text{sign}_n X_{in}$$

$$\text{sign}_n = -1 \text{ if individual } n \in \text{municipality}$$

$$\text{sign}_n = +1 \text{ if individual } n \in \text{company}$$
(7.5)

This results in two estimations of part-worth utilities (table 7-4): the upper part represents the average of both stakeholder groups, the lower part the contrasts between the groups. If the contrast parameters appear to be significantly different from zero, it can be concluded that the valuation of these parameters is different for the two data sets.

Table 7-4: contrast parameter estimates

			Data operation	Estimated results	
	Attributes	Levels		Part-worth utility	Significance
	Plan-specific constant			0.30	0.05
Original variables	Development speed	<i>15 years</i>	X_{in}	-0.94	0.00
		<i>10 years</i>		0.17	0.09
		<i>5 years</i>		0.77	<i>n.a.</i>
	Technical quality	<i>25%</i>		-0.96	0.00
		<i>50%</i>		-0.08	0.52
		<i>75%</i>		1.03	<i>n.a.</i>
	Architectural quality	<i>25%</i>		-0.16	0.35
		<i>50%</i>		-0.03	0.82
		<i>75%</i>		0.18	<i>n.a.</i>
	Value development	<i>Low</i>		-0.57	0.00
		<i>Medium</i>		-0.12	0.37
		<i>High</i>		0.69	<i>n.a.</i>
	Cost coverage	<i>50%</i>		-0.90	0.00
		<i>75%</i>		-0.18	0.14
		<i>100%</i>		1.08	<i>n.a.</i>
Contrast variables	Plan specific constant			-0.19	0.14
	Development speed (contrast)	<i>15 years</i>	Y_{in}	-0.34	0.01
		<i>10 years</i>		-0.04	0.69
		<i>5 years</i>		0.38	<i>n.a.</i>
	Technical quality (contrast)	<i>25%</i>		0.00	0.98
		<i>50%</i>		0.02	0.89
		<i>75%</i>		-0.02	<i>n.a.</i>
	Architectural quality (contrast)	<i>25%</i>		0.47	0.01
		<i>50%</i>		-0.24	0.04
		<i>75%</i>		-0.23	<i>n.a.</i>
	Value development (contrast)	<i>Low</i>		0.02	0.91
		<i>Medium</i>		0.01	0.95
		<i>High</i>		-0.03	<i>n.a.</i>
	Cost coverage (contrast)	<i>50%</i>		-0.10	0.56
		<i>75%</i>		-0.09	0.46
<i>100%</i>		0.18		<i>n.a.</i>	
Log Likelihood Function		-448.03			
Log Likelihood null model		-610.55			
Adjusted Rho-square		0.25			

Goodness-of-fit measures

For this model, the adjusted rho-square is equal to 0.25, indicating a good fit of the model. In addition, it is tested whether the model outperforms a null model. This again is tested with the likelihood ratio test statistic, the outcome of which is 325.04. This value is compared to the critical value of chi-square with 22 degrees of freedom and a 95% confidence interval (=33.92). Therefore it is concluded that this model performs better than the null model. Furthermore, the likelihood ratio test-statistic is used to test whether the model incorporating contrast parameters outperforms the basic MNL model resulting from pooling both sets.

The outcome of the test statistic is $-2*(-462.47+448.03) = 28.88$, which should be compared to the critical value of chi-square with 11 degree of freedom at a 95% confidence interval: 19.68. It can be concluded that the model with contrast parameters outperforms the standard MNL model with pooled data.

Results

As table 7-4 reveals, the estimates for ‘development speed’ and ‘architectural quality’ are significantly different for the two data sets. That is, the different respondent groups use significantly different weights for these two attributes when making their decision to accept or reject a plan proposal. Development speed is considered to be relatively more important for companies, whereas the architectural quality is valued higher by municipalities. This was expected because of the outcomes of the standard MNL model (table 7-2), and can be explained by looking at the core businesses of both stakeholder groups. The core business of companies is often related to maximizing turnover and profit, and a slow redevelopment process can influence turnover and profit negatively. Architectural quality of the location is often not directly related to the turnover of production companies. In contrast, a main aim of municipalities is to attract economic activities, and therefore want to create a pleasurable environment for companies. Furthermore, reducing the growing messiness of existing Dutch industrial areas is a recent and growingly important governmental goal. Development speed is often not an issue, because of the long-term character of these municipal goals.

7.6 Conclusions

Because of stagnation in the redevelopment of obsolete industrial areas in the Netherlands, the main focus lies on choice behavior of stakeholders regarding

development plan acceptance in an industrial area redevelopment process. The aim of this chapter is to give a better and more systematic insight in stakeholders' preferences when accepting or rejecting a development plan, in the (dis-)similarities between both stakeholder groups' preferences in making that choice, and in the most important points of interest when composing a development plan proposal. Two stakeholder groups are distinguished: municipalities and established companies.

For this, the discrete choice approach is employed. Resulting data analysis revealed that the plan attributes 'technical quality' and 'cost coverage' are important for both stakeholder groups when choosing a plan proposal. A high level of these attributes in a plan results in a high probability of being chosen, while a low level results in a low probability of being chosen.

In addition, it is demonstrated that preferences of both stakeholder groups in accepting or rejecting a development plan proposal differ significantly, on the level of the total plan as well as on the level of specific attributes. Scale parameter estimation revealed that scale factors over the total preferences of both stakeholder groups differ. Compared to companies, municipalities proved to be less demanding in accepting or rejecting industrial area redevelopment plan proposals.

By applying contrast parameter estimation, it is demonstrated that some of the parameter estimates also differ significantly between both stakeholder groups. The parameter estimates for 'development speed' and 'architectural quality' are significantly different for the two groups. Development speed is considered to be important by companies, whereas the architectural quality is valued higher by municipalities. This confirms the findings of the separate models, represented in table 7-2. The reasons for these differences are found by looking at the core businesses of both stakeholder groups.

The differences between preferences of both stakeholder groups can be a cause of the current stagnation in industrial area redevelopment processes. The results of this study can be used in an industrial area redevelopment project to test the appreciation and feasibility of specific development plan proposal compositions, assuming that it is possible to predict the consequences of such a specific development plan proposal in terms of the chosen attributes. Furthermore, the proposed model can be used in the group dynamic techniques in which alternative solutions are developed. Application of this model can result in better plan proposals and may contribute to faster plan proposal negotiations.

CHAPTER 8

MODELING CONFLICT AND COOPERATION

8.1 Introduction

In the previous chapter, individual choice behavior of stakeholders is analyzed. However, individual decision-making might be influenced when a decision-maker has to act in a multi-actor environment. Because industrial area redevelopment projects are characterized by the involvement of multiple decision-makers with both shared and contradictory interests and a strong interdependency, the interactive component should be incorporated when building an appropriate model of the decision process. Therefore, the main objective of this chapter is to explain the occurrence of cooperation and conflict within Dutch industrial area redevelopment negotiations, in order to support the establishment of an efficient meta-governance structure.

A model is developed in which the characteristics of industrial areas, redevelopment plans and interactive game settings are systematically related to the strategic behavior of stakeholders in a redevelopment process when negotiating on a plan proposal. This model is based upon the conjoint analysis modeling approach, in which game theory is integrated to analyze interactive behavior in decision-making processes with respect to the most important characteristics in industrial area redevelopment projects. This results in a model, with which conflicts and cooperative attitudes can be predicted in real-world negotiations, enabling process managers to manage situations of conflict more appropriately, or even to avoid the manifestation of the conflict at all.

8.2 From conflict to cooperation

According to Minnery (2007), analyses of structures and processes in order to support the execution of meta-governance will be effective only when they recognize the roles of both cooperation and conflict. Within urban redevelopment projects, specific interdependent relations lead to specific degrees of cooperation and conflict; this can range from highly cohesive to highly fragmented forms. In this respect, many scholars have related the level of cooperation and conflict to the interests of involved stakeholders in industrial area redevelopment projects, distinguishing between shared and contradictory interests (e.g., Schuur, 2001; Needham and Louw, 2003; Yousefi *et al.*, 2007; and Wang *et al.*, 2007).

However, to date, hierarchy and conflict are relatively neglected components of current models of governance, whereas it is a key component when studying the relations between actors involved in urban redevelopment. While most scholars do recognize the importance of hierarchy and conflict in shaping the relational context of actors, there have been very few attempts to analyze systematically how *both* cooperation and conflict play a role in negotiation processes between stakeholders. The main aim of this chapter is to explain when, how often, and why a conflictive or cooperative structure comes into being in current industrial area redevelopment projects, thereby making use of the principles of game theory.

8.3 Constructing game-theoretic experiments

Therefore, 2x2 (two players, both having two strategies), non-cooperative, non-zero sum games with perfect information are created (see section 6.4.1), and represented in strategic form. 2x2 games with ordinal payoffs are commonly used and very applicable in conflict analysis (Rapoport *et al.*, 1976; Wang and Yang, 2003; Jost and Weitzel, 2007). In this study, the players are (1) the municipality, and (2) the established company. Both players have two strategies: to act cooperatively or to act non-cooperatively. The respondents' preferences are implicitly taken into account: they individually form personal utility functions on the basis of presented hypothetical redevelopment plans. The outcome of the game depends on the choice of strategy of both players.

Because the aim is to understand how people make decisions in real situations that are analogous to non-cooperative non-constant sum games, observations must be made. Resulting conclusions should relate the observations about the way people make decisions to the features of the situation (Rapoport *et al.*, 1976). From this point of

view, any game consists of two parts, namely a descriptive part which describes the game under scrutiny, and a solution part which describes or predicts the outcomes given the description of the game. Principles from game theory are used for analysis of the outcomes. In the descriptive part, it is desirable to design situation in which the structure of ‘conflicts’ can be systematically described and where people’s attention can be directed to the specific, controlled features of the conflicts (Rapoport *et al.*, 1976). For this reason, the conjoint analysis approach is applied for describing the game. In the next section, the application of both methods and the set-up of the experiments for this research are explained in detail.

8.4 Conjoint Analysis Approach

Strategic behavior of actors is studied by presenting hypothetical redevelopment cases to respondents, in which the most important variables of an industrial area redevelopment project are varied. Respondents form their utility function based on the given hypothetical situation, and make a strategic decision on the basis of this utility function. For this, the conjoint analysis approach is adopted (e.g., Louviere, 1988). Again, several steps should be completed in order to specify a conjoint model.

First, a hypothetical project is designed, in which some assumptions are made. The assumptions are the same as used in section 7.2, except for the final assumption concerning progress of the project. In the previous individual choice experiments, the project team was working on the composition of the development plan. In this interactive choice experiment, specific, completed development plan proposals are presented to the stakeholder groups.

Second, relevant attributes and corresponding levels are chosen for the construction of the interactive decision moments that come into being when development plans are proposed. For this, an in depth literature study after social conflicts, negotiation behavior, and mediation is conducted. The most important used sources are Pruitt (1981), Pruitt and Rubin (1986), Carnevale and Pruitt (1992), Sebenius (1992), Murtoaro, Kujala, and Artto (2005), and Murtoaro and Kujala (2007). Furthermore, four redevelopment plans are analyzed. This resulted in a list of five attributes, each with three levels, ranked from low to high, representing the most important factors of an interactive decision moment. The attributes, listed in table 8-1, can be combined to create hypothetical interactive decision moments.

Table 8-1: attributes to define an interactive decision moment

Attributes	Descriptions	Levels
1 Your appraisal of the proposed development plan	A specific development plan proposal results in an individual appraisal, based on the level in which the plan connects to the demands and interests of your company. This is represented as a report mark (0-10).	<ul style="list-style-type: none">• 4• 6• 8
2 Opponent's appraisal of the proposed development plan	Same as attribute 1, but this attribute represents how you assess the level of your opponent's appraisal of the proposed development plan. This is represented as a report mark (0-10).	<ul style="list-style-type: none">• 4• 6• 8
3 Your power position	Level in which you can impose your will on your opponent.	<ul style="list-style-type: none">• Weak• Medium• Strong
4 Remaining value	Level in which extra value for both stakeholders – on top of the current appraisal – can be created by mutual plan optimization. This is expressed as a raise of the report mark, resulting from your appraisal.	<ul style="list-style-type: none">• +0• +1• +2
5 Financial risks when conflicts occur	Level of the costs that conflicting situations in the process bring along.	<ul style="list-style-type: none">• Low• Medium• High

Given the attributes presented in table 8-1, $3^5 = 243$ different possible interactive decision moments can be formulated. Again, an orthogonal fraction of the full factorial design is selected to reduce the number of compositions. In this study, a design was chosen that only allows the estimation of the main effects of each attribute (main effects). Furthermore, it is expected that the difference between own appraisals and the opponent's appraisals will affect the decision to cooperate or not. This resulted in a fractional design of 27 different interactive decision moments. An example of the total choice task is given in figure 8-1. Each respondent will face in total 9 interactive decision moments. The respondents are arbitrarily asked to adopt the role of company or municipality.

The object of the study is a medium-sized industrial area, with mixed industrial activities and mainly medium-sized companies. The area shows serious signs of obsolescence, on technical, economical, societal and spatial level. This has a negative impact on the results of the core business of your [company / municipality]. To solve the current problems on the industrial area, a redevelopment process is started. The decision-making process has arrived at a moment in which the **development plan** should be **mutually** agreed upon. Currently, two stakeholders are involved in the decision-making process: the municipality and a group of (established) companies. In this questionnaire, you represent the [municipality / established company]. It is assumed that a specific interactive decision moment arises at the moment that a specific development plan proposal is presented to the stakeholders. Such an interactive decision moment is represented by means of five variables. Based on this interactive decision moment, you can choose to act cooperatively in the project or you can act non-cooperatively. You opponent has the same choice of strategies.

	Interactive decision moment
Your appraisal of the proposed development plan	< 6 >
Your opponent's appraisal of the proposed development plan	< 8 >
Your power position	< Strong >
Remaining value	< +2 >
Financial risks when conflicts occur	< Low >

Based on the presented hypothetical interactive decision moments, your task is to:

1. rank the four possible strategy combinations, based on the attractiveness from your own role's point of view (1 = most attractive; 4 = least attractive);
2. rank the four possible strategy combinations, based on the attractiveness from your opponent's point of view (1 = most attractive; 4 = least attractive);
3. rank the four possible strategy combinations, based on your expectancy of the outcome of the game (1 = most plausible; 4 = least plausible).

1. YOUR PREFERENCE

Strategy of opponent (municipality)

		Cooperative attitude	Non-cooperative attitude
Your strategy (company)	Cooperative attitude	1	3
	Non-cooperative attitude	2	4

2. PREFERENCE OPPONENT

Strategy of opponent (company)

		Cooperative attitude	Non-cooperative attitude
Your strategy (municipality)	Cooperative attitude	3	1
	Non-cooperative attitude	4	2

3. EXPECTED OUTCOME

Strategy of opponent (municipality)

		Cooperative attitude	Non-cooperative attitude
Your strategy (company)	Cooperative attitude	3	1
	Non-cooperative attitude	2	4

Figure 8-1: example of a choice task

The combination of answers on the first two questions results in a payoff matrix, representing the payoff structure of the two players in a specific interactive decision moment. In figure 8-2, the payoff matrix resulting from the previously presented choice task example is represented. The first number in the cells represents the payoff of the company; the second number represents the payoff of the municipality.

RESULTING PAYOFF MATRIX

		Municipality	
		Cooperative attitude	Non-cooperative attitude
Company	Cooperative attitude	1 , 3	3 , 4
	Non-cooperative attitude	2 , 1	4 , 2

Figure 8-2: resulting payoff matrix from choice task example

Based on the payoff matrix, resulting from the answers on the first two questions, expected outcomes can be calculated. Four outcomes can arise: (1) players A and B adopt a cooperative attitude [CC]; (2) player A adopts a cooperative attitude, player B a non-cooperative attitude [CN]; (3) player A adopts a non-cooperative attitude, player B a cooperative attitude [NC]; and (4) both players adopt a non-cooperative attitude [NN]. In the example of figure 8-2, the players will arrive at [CC], because having a cooperative attitude is the dominant strategy for both players. The third question in the choice task is used to check whether the predictions from respondents correspond to the predictions from game theory.

8.5 Data collection

The described choice tasks are presented to the same group of industrial area redevelopment experts that was asked for the individual choice tasks. In this case, the same 50 process managers returned the questionnaire of which 25 responded on behalf of established companies and 25 on behalf of a municipality.

8.6 Results

The results of the data collection can be divided in three parts. In the first part, the possible conflicts that *can* occur in the formulated games are discussed, together with the conflicts that *actually* appear. Next, I explore whether the prediction of the respondents about the outcome corresponds to the game-theoretic prediction of the game outcome. From this, some conclusions can be drawn on the suitability of the application of game theory in this research. Finally, the third part handles possible

causes of the occurrence of conflict or cooperation. Logistic regression and ordered regression are used to gain insight into the relation between project characteristics and the outcome of the game.

8.6.1 Possible conflicts

From the literature, I found that the high level of interdependency in relations between involved stakeholder groups is regarded as one of the main reasons for the stagnation that occurs in industrial area redevelopment projects. Many scholars state that the shared and contradictory interests of involved stakeholders contribute to this stagnation (e.g., Adams *et al.*, 2001a; Needham and Louw, 2003; Yousefi *et al.*, 2007; Louw *et al.*, 2009). Based on these assumptions, it is interesting to first check whether a prisoner's dilemma arises in one of the 450 responses, because prisoner's dilemmas are games in which the players have partly shared and partly contradictory interests, resulting in a non-optimal outcome for both players. However, analysis of the data reveals that only 2 games out of the presented 450 games were interpreted as prisoner's dilemma by respondents. Surprisingly, this does not account for the problems occurring in industrial area redevelopment processes.

Knowing this, it remains interesting to consider whether the respondents exhibit opponent-sensitive behavior as a consequence of the presumed high level of interdependency, and thus whether this actually results in games in which players adjust their decision to the expected behavior of their opponent. This can be considered by representing the number of games with dominant strategies, in which respondents know what strategy to choose, regardless of the choice of the opponent. The distribution of games with dominant strategies is represented in table 8.2.

Table 8-2: dominant strategies

Dominant strategy	Player				Opponent			
	Company	Municipality	Total	%	Company	Municipality	Total	%
No	30	43	73	16%	33	35	68	15%
Yes	195	182	377	84%	192	190	382	85%
Total	225	225	450	100%	225	225	450	100%

In 377 of the 450 games (i.e., 84%), respondents claim to have a dominant strategy, demonstrating that that respondents are very distinct about their strategy choice, without regarding opponent's behavior. When looking at the expectation of the respondent about the strategy choice of his/her opponent, an even higher percentage

of dominant strategies is found (85%). This results in 324 dominant equilibrium games (72%), in which both players have a dominant strategy, leading to an unambiguous outcome. From this, it can be stated that the presumed high level of interdependency between involved stakeholders – often referred to as a main cause of problems in urban (re)development negotiations – does not result in problematic negotiation behavior; respondents appear to be very resolute in their decision-making, not considering consequences of opponents' decisions on the negotiation outcome in most cases.

The question rises what games are played instead. Data analysis reveals that 122 different game types appear, in which no dominantly occurring game type can be discovered; the results are very prevalent from this point of view. Therefore, games are examined with contradictory payoff structures for both players. In this, three game types are distinguished: (1) games in which *all* payoffs are fully contradictory; (2) games in which all *extreme* payoff combinations are contradictory (player 1's most preferred outcome coincides with player 2's least preferred outcome and vice versa); and (3) games in which *one* extreme payoff combination is contradictory (player 1's most preferred outcome coincides with player 2's least preferred outcome or the other way around). Results show that the first type of game appears 7 times in 450 observations (1.56%), the second game type occurs 25 times (5.56%), and the third type of game appears 44 times (9.78%). It is concluded that these game types – in which contradictions exist in the assessment of the games by both players – cannot be seen as a major source of conflicts in the games played.

So far, no large-scaled conflicts are found in the assessment of the decision situation by the players. Next, the occurrence of conflicts in the game-outcome is examined. After Rapoport *et al.* (1976), two possible sources of conflicts are distinguished: (1) Conflicts in finding one equilibrium, resulting in an unsteady state of the game (games in which no equilibrium or multiple equilibriums are detected); and (2) Conflicts when finding one equilibrium (is a non-cooperative attitude chosen by one or both players?).

First, the number of games with no absolute Nash equilibrium is checked, assuming that games with no absolute Nash equilibrium are conflicting, because there is always a player who can improve his/her payoff by changing his strategy, resulting in a very unstable game. However, only 2 out of 450 games contain no equilibrium; this cannot be seen as a possible source of the occurring conflicts.

Next, games with two absolute Nash equilibriums are considered, assuming that these games can be conflicting; however, this is not always the case. Out of the 450 games, only 13 games ended with two Nash equilibriums (3%). Analysis of these thirteen cases reveals that 5 cases result in one Pareto-dominant strategy, ending with the most optimal payoff for both players. The resulting eight games were studied with the maximin approach; this revealed that these eight games all result in mutual cooperation. However, in three of these eight games, this mutual cooperation was not optimal from a payoff point of view; both players end up with the third-best payoff. Still, this is a very small part of the total set of games (1%).

Finally, the number of games with one absolute Nash equilibrium is checked, assuming that games with one Nash equilibrium do not automatically result in conflict, because the choice of optimal strategy is clear. Most of the games – 435 out of 450 games – result in one absolute Nash equilibrium (97%). Game theory predicts an outcome for these games. The distribution of the four possible outcomes over the 435 games with one Nash equilibrium is represented in table 8-3.

Table 8-3: distribution of the outcome of games with one Nash equilibrium, predicted by using game-theoretic principles

	Total		Company		Municipality	
Outcome of games with one Nash equilibrium	Freq.	%	Freq.	%	Freq.	%
CC (cooperative – cooperative)	179	41%	94	43%	85	39%
CN (cooperative – non-cooperative)	104	24%	44	20%	60	28%
NC (non-cooperative – cooperative)	114	26%	55	26%	59	27%
NN (non-cooperative – non-cooperative)	38	9%	24	11%	14	6%
Total	435	100%	217	100%	218	100%

Out of the 435 games with one pure Nash equilibrium, 179 games (41%) result in no conflict. This is a substantial part. Furthermore, respondents end up at mutual cooperation more often when playing the role of company. Secondly, 218 out of the 435 cases with one pure Nash equilibrium (50%) result in an outcome in which the parties choose contradictory strategies (CN or NC). Respondents adopting the role of municipalities predict the occurrence of such situations of partial opposition more often than companies. Finally, 38 out of the 435 cases result in a game of complete opposition: 9%. This is a relatively low share. It is interesting that the respondents playing the company-role predict complete opposition more often than the municipalities. Companies end up more often with strategies that are the same for both players (CC and NN). In total, out of all games with one pure Nash equilibrium, 59% of all games contain a certain level of conflict.

Previous analyses on games with one Nash equilibrium are based on predictions by game theory. In the questionnaire, respondents also gave a prediction on the outcome of the games. The distribution of the respondents' predictions of the outcome of the games is represented in table 8-4.

Table 8-4: distribution of the outcome of games with one Nash equilibrium, predicted by respondents

Expected outcome (respondent)	Total		Company		Municipality	
	Freq.	%	Freq.	%	Freq.	%
CC (cooperative – cooperative)	203	47%	106	49%	97	44%
CN (cooperative – non-cooperative)	73	17%	26	12%	47	22%
NC (non-cooperative – cooperative)	94	21%	38	17%	56	26%
NN (non-cooperative – non-cooperative)	65	15%	47	22%	18	8%
Total	435	100%	217	100%	218	100%

In total, respondents expect that – in 203 out of 435 games (47%) – stakeholders will have no conflict. This is a substantial part, even bigger than the predictions by game theory. Respondents in the role of company predict CC more often than municipalities. The percentage of games with partial opposition, predicted by respondents, is 38% (167 games). Again, respondents adopting the role of municipality end up with partial opposition more often than the companies. Finally, in 65 out of the 435 games (=15%), respondents expect complete opposition between stakeholders. This is a larger percentage than the predictions by game theory. Companies account for the biggest part of these complete contradictory games. In total, 53% of all games results in some sort of conflict.

8.6.2 Correspondence of the outcomes

Knowing this, it is interesting to see how often the outcome-predictions by the respondents match the predictions by game theory. This can be supportive to drawing some conclusions about the suitability of the application of game theory in this research. The results of the comparison of the outcome-predictions are represented in table 8-5.

Table 8-5: comparison of the outcome-predictions of game theory versus respondents

Correspondence of the outcome-prediction	Total	Table 8-3	%	Company	Municipality
Corresponding prediction of “CC”	158	179	88%	80	78
Corresponding prediction of “CN”	64	104	62%	21	43
Corresponding prediction of “NC”	81	114	71%	33	48
Corresponding prediction of “NN”	28	38	74%	20	8
Total	331	435	76%	154	177

Respondents predict the same outcome as game theory in 76% of all cases with one absolute Nash equilibrium. This is relatively high, indicating that game theory is a suitable tool for application in this research. Furthermore, games with two Nash equilibriums and one Pareto-optimal outcome are also analyzed. In all of these five games, the prediction of the game-outcome by the respondent corresponds to the prediction by game theory. The high level of correspondence between the predictions of respondents and of game theory can be explained by the fact that the games are interpreted as relatively easy. The high level of dominant strategies confirms this (see table 8-2).

8.6.3 Causes of occurrence of cooperation and conflicts

In the previous part, it was concluded that most games contain one absolute Nash equilibrium. From this, it can be concluded that finding the equilibrium is not a source of conflict. Of all the games with one Nash equilibrium, a large part results in mutual cooperation: a no-conflict game. Still, almost 60% of these games result in a conflict – partial or complete opposition. It is interesting to analyze the occurrence of conflict or cooperation more in detail, and try to relate this to specific project characteristics by means of logistic regression analysis. In the following analysis, the dependent variable is ‘the occurrence of mutual cooperation’, and both predictions by game theory and by respondents are included.

Logistic regression model of mutual-cooperation games

In this application, a constant is included in the utility function, which is equal to the mean of the reference group. Furthermore, the dummy coded attributes represent the levels of the five attributes (see table 8-1), completed with a sixth attribute; the absolute difference between both players’ appraisal of the proposed development plan. This attribute is added because initial analyses revealed a very large influence of

the first two attributes on the occurrence of mutual cooperation; a further insight in the effects of these attributes on the dependent variable was necessary to improve the explicability of the model. All are three-level attributes, of which the lowest level functions as reference group. The parameters of the model were estimated by maximum likelihood estimation, and are displayed in table 8-6.

Table 8-6: Estimation of results for both stakeholder groups – reaching mutual cooperation

			Game theory			Respondent		
Attributes		Levels	Part-worth utilities	Significance	Range value	Part-worth utilities	Significance	Range value
	Constant		-0.70	0.10		-0.70	0.05	
	Company		0.23	0.31		0.23	0.31	
1	Your appraisal of the proposed development Plan	4			2.00			2.08
		6	0.81	0.01		0.90	0.00	
		8	2.00	0.00		2.08	0.00	
2	Opponent's appraisal of the proposed development plan	4			1.45			1.22
		6	0.23	0.44		0.07	0.80	
		8	1.45	0.00		1.22	0.00	
3	Your power position	<i>Weak</i>			0.40			0.50
		<i>Medium</i>	0.40	0.18		0.50	0.08	
		<i>Strong</i>	0.21	0.48		0.37	0.20	
4	Remaining value	+0			0.39			0.45
		+1	-0.08	0.78		0.13	0.66	
		+2	0.31	0.29		0.45	0.11	
5	Financial risks when conflicts occur	<i>Low</i>			0.24			0.32
		<i>Medium</i>	-0.18	0.51		-0.32	0.24	
		<i>High</i>	-0.24	0.40		-0.15	0.59	
6	Difference between both players' appraisal of the proposed plan	0			3.01			2.74
		2	-1.66	0.00		-1.35	0.00	
		4	-3.01	0.00		-2.74	0.00	
	Pseudo Rho-square		0.24			0.22		
	LL function		-222.65			-234.51		
	LL null model		-294.67			-300.55		

The results of the logistic regression of both the predictions by game theory and by the respondents reveal large similarities. In general, three attributes appeared to be significant, of which the variable “Absolute difference between both players’ appraisal of the proposed plan” has the highest range value, and therefore seems most

important in reaching mutual cooperation. Furthermore, a player's own appraisal is more important in choosing mutual cooperation than the opponent's appraisal. Interpreting the results, it can be concluded that the chances of reaching the equilibrium CC decrease substantially when large differences between both players' appraisals exist, and that having similar appraisals leads to a higher chance of reaching mutual cooperation. Next, the results show that both parties having a high appraisal leads to a higher chance of reaching CC. It can be conclude that reaching mutual cooperation is most likely in situations in which both players highly appraise the proposed plan.

Goodness-of-fit

For the estimations, represented in table 8-6, the pseudo rho-square values – indicating the proportion of variability in a data set that is accounted for by a statistical model – are 0.24 and 0.22, indicating a fair fit of all estimations. Secondly, it is tested whether these estimations outperform estimations within a null model (see Ben-Akiva and Lerman, 1985), using the likelihood ratio test-statistic (Hensher, Rose and Greene, 2005). This model's estimations reveal better results than estimations of null models.

Ordinal regression model

Application of standard logistic regression gives a good insight in the causes of the occurrence of mutual cooperation. However, this analysis can be refined because, actually, the dependent variable is the level of conflict, with values of (1) no opposition [CC], (2) partial opposition [CN / NC], and (3) complete opposition [NN]. By using an ordinal regression model, specifically developed for ordinal data where the distances between categories are unknown, the ordinal categories can directly be used as dependent variable.

In ordinal regression, an underlying score is estimated as a linear function of the independent variables and a set of cut-off points. The probability of observing outcome i corresponds to the probability that the estimated linear function, plus random error term ε , lies within the range of the cut-off points estimated for the outcome (StataCorp, 1999):

$$\Pr(\text{outcome}_j = i) = \Pr(\kappa_{i-1} < \sum_{i=1}^k \beta_i x_{ij} + \varepsilon \leq \kappa_i) \quad (8.1)$$

The regression coefficients $\beta_1, \beta_2, \dots, \beta_k$, which are related to the physical characteristics (x_{ij}), together with the cut-off points $\kappa_1, \kappa_2, \dots, \kappa_{I-1}$, where I is the number of possible outcomes, are estimated (Train, 2003). κ_0 is taken as $-\infty$ and κ_I is taken as $+\infty$. In this research, three levels of opposition are distinguished; respondents end up at a level of opposition on the basis of the level of the linear function plus random error term. If the level value lies above some cut-off, which is labeled κ_1 , the respondent chooses the answer “no opposition”; if it lies below κ_1 but above another cut-off κ_2 , then the answer is “partial opposition”. And if the value lies below κ_2 , the answer is “complete opposition”. It is assumed that ε has a logistic distribution. The probabilities enter the log-likelihood function as usual, and maximization of the likelihood function provides estimates of the parameters (see table 8-7).

Table 8-7: estimation results of ordinal regression model.

			Game theory			Respondent		
Attributes		Levels	Part-worth utilities	Significance	Range value	Part-worth utilities	Significance	Range value
	Company		0.01	0.97		-0.20	0.30	
1	Your appraisal of the proposed development plan	4			2.11			2.09
		6	1.06	0.00		0.95	0.00	
		8	2.11	0.00		2.09	0.00	
2	Opponent's appraisal of the proposed development plan	4			1.78			1.67
		6	0.76	0.01		0.64	0.02	
		8	1.78	0.00		1.67	0.00	
3	Your power position	<i>Weak</i>			0.27			0.70
		<i>Medium</i>	0.21	0.42		0.70	0.01	
		<i>Strong</i>	0.27	0.29		0.49	0.05	
4	Remaining value	+0			0.24			0.54
		+1	0.00	0.99		0.22	0.36	
		+2	0.24	0.36		0.54	0.03	
5	Financial risks when conflicts occur	<i>Low</i>			0.21			0.17
		<i>Medium</i>	-0.21	0.40		-0.15	0.53	
		<i>High</i>	-0.19	0.47		0.02	0.95	
6	Difference between both players' appraisal of the proposed plan	0			1.81			1.73
		2	-1.25	0.00		-1.00	0.00	
		4	-1.81	0.00		-1.73	0.00	
Game Theory			Coefficient		St Err			
/cut1: complete opp – partial opp			-1.81		0.44			
/cut2: partial opp – no opposition			1.42		0.44			
Respondent			Coefficient		St Err			
/cut1: complete opp – partial opp			-0.74		0.40			
/cut2: partial opp – no opposition			1.52		0.41			
Observations			435			435		
Pseudo Rho-square			0.17			0.15		
Log likelihood function			-334.01			-373.31		
Log likelihood null model			-402.19			-438.15		

A positive coefficient indicates an increased chance that a subject with a higher score on the independent variable will be observed in a higher no-opposition category, and vice versa. All significant attributes, except attribute 6, contribute to a higher chance of no opposition, when the level score increases. Again, attributes 1, 2, and 6 – own

appraisal, opponent's appraisal, and difference between both players' appraisals – appear to be most influential. Furthermore, attribute 3 and attribute 4 – power position and remaining value which can be achieved by mutual plan optimization – affect the outcome in the model with respondents' predicted outcomes. This model can be used to calculate predicted odds of having a certain level of conflict in situation which are characterized by specific attribute levels.

Goodness-of-fit

For the estimations, represented in table 8-7, the pseudo rho-square values – indicating the proportion of variability in a data set that is accounted for by a statistical model – are respectively 0.15 and 0.17 for the game-theoretic and respondents' predictions, indicating an acceptable fit of the estimations. Secondly, testing whether the estimations outperform estimations with a null model, using the likelihood ratio test-statistic, produced good results. Thirdly, the explanatory power of the model is tested (see Gould, 2006). The game-theoretic model says that for an observation, the probability of being observed what was observed conditional on the estimates is $\exp(LL/Obs) = \exp(-334.01/435) = 0.464$. That number is larger than 0.33 – being the probability used when one has no idea what category an observation belongs to – revealing that the model has explanatory power. For the respondents' model, this results in $\exp(-373.31/435) = 0.424$, also being larger than 0.33.

Robustness analysis

Because each respondent faced nests of nine choice sets, a clustering in the data set has to be dealt with. In order to retrieve the effects of this clustering of the data on the outcomes of the analysis, I want to distinguish between effects within clusters and effects between clusters by partitioning the variance in scores in an aggregate level and in a respondent level. In short, I want to calculate how much of the variability in the choices is attributable to the presented choice set, and how much to the individual decision-maker. By applying the variance component model, the randomness can be split in a 'personal part' – accounting for the variance attributable to the individuals – and a 'rest part' – accounting for the variance attribute. Application of the variance component model indicates that the influence of the personal / individual characteristics on the outcome of the game is very low. This confirms the presumed homogeneity of the respondents.

Furthermore, the data set consists of 450 observations, divided over 27 hypothetical decision moments. This means that each decision moment is assessed approximately 16 times by different respondents adopting different roles: 8 times by respondents adopting the role of company, and 8 times by respondents adopting the role of municipality. It is possible to get insight into the clarity of the choice task by examining the level of conformity in the answers per decision moment. Analysis shows that there is a high level of conformity in the choices in 18 out of the 27 decision moments. These 18 decision moments are located at the extremes of the total range of decision moments; situations with mainly low levels per attribute and situations with mainly high levels per attribute are assessed univocally. From this it can be concluded that the choice task was understandable for the respondents. This is confirmed by using only the data from these 18 highly conformed decision moments in the logistic regression, resulting in highly resembling parameter estimations.

8.7 Conclusions

A growing level of interdependency among involved stakeholders, resulting in conflicting interactions, is identified in the literature as one of the most important reasons for the occurring stagnation in industrial area redevelopment. In this chapter, the explicit interaction between these involved stakeholders is modeled as an interdependent process, using a relative novel approach in which conjoint analysis and game theory are combined, in order to explain the occurrence of cooperation or conflict within Dutch industrial areas redevelopment negotiations.

The current interactive and interdependent negotiations in industrial area redevelopment, often resulting in problematic negotiation outcomes, seem to resemble a prisoner's dilemma (e.g., Needham and Louw, 2003), because the stakeholders could gain important benefits from cooperating and suffer when failing to do so, but find it difficult or expensive to coordinate their activities to achieve cooperation. However, it can be concluded that the expectation that the occurring interaction problems resemble prisoner's dilemmas is unfounded; less than 1% of all played games resulted in a prisoner's dilemma. Furthermore, the interaction results very often in a dominant equilibrium (in 72% of all played games), leading to the conclusion that the presumed high level of interdependency between involved stakeholders – often referred to as a main cause of problems in urban (re)development negotiations – does not result in problematic negotiation behavior; respondents appear to be very resolute in their decision-making, not profoundly considering the consequences of the decisions of their opponents on the negotiation outcome.

Data analysis shows that there is one major source of conflicts; stakeholders choosing not to cooperate based upon the presented negotiation setting. Other possible sources of conflict, like difficulties in reaching a stable outcome or incomprehensibility of the negotiation setting, proved to have a limited contribution to the occurrence of conflicts. A more in-depth analysis of negotiation settings ending up in mutual cooperation revealed that the appraisal of both stakeholders for the proposed development plan is the most influential factor, together with an eventual absolute difference between both players' appraisals. This leads to the conclusion that the content of proposed plans is very important in such negotiations; factors like power and risks play a secondary role. An important recommendation to process managers is therefore to pay special attention to the preparation of redevelopment plans.

A more refined model using ordinal regression reveals roughly the same results. However, in this model, the stakeholder's power position appears to be significantly influencing the outcome of the game; stakeholders having a relatively weak power position within negotiations tend to prefer a non-cooperative attitude. Factors determining the relative power position of stakeholders in urban redevelopment projects are investigated in for example Van Leengoed *et al.* (2008) and Janssen (2009). Furthermore, having some 'change' can also be beneficial for achieving mutual cooperation. If stakeholders have the prospect of achieving extra value in negotiations concerning plan optimization, they tend to be more willing to act cooperatively.

Concluding, an empirically testable measurement tool is presented in this chapter, with which conflicts and cooperative attitudes can be predicted in given settings. This is a main advantage, because once we understand the causes for a conflict, we are able to anticipate the behavior of the parties and manage the situation of conflict more appropriately from the beginning or even avoid the manifestation of the conflict at all. Furthermore, when conflicts are expected or actually occurring, the model can be used in a sensitivity analysis, in order to estimate the effect of different measures on an increase of the chances of ending up at mutual cooperation.

Discussion

Often, the utilization of game theory in similar studies is criticized because of the assumption of fully rational behavior – supposedly not correctly reflecting real-world behavior – and because of the often resulting outcome with multiple equilibriums – in which it is difficult to draw conclusions. However, in this case, predominantly unique outcome predictions are found, often with dominant strategies and dominant

equilibriums, also largely reflecting the predictions of the respondents. Therefore, it is concluded that the application of game theory in order to model interactions between stakeholders involved in industrial area redevelopment processes proved to be successful. Furthermore, this study employs experimental data to gain insight in the interaction between stakeholders in industrial area redevelopment processes. Insight in real-world cases can gain additional information; information that remains concealed by using solely experimental data. It seems interesting to see whether the findings of this study correspond to real-world cases. Finally, and related to this ‘hiatus’, there is no insight in the representativeness of the chosen profiles in comparison to real world cases. However, analyses can be adapted very easily when having this insight; the data set can be reduced to the number of profiles that match real world cases.

CHAPTER 9

EXECUTING META-GOVERNANCE

9.1 Introduction

In this research, meta-governance is regarded as the most promising governance mode for application in industrial area redevelopment projects. Meta-governance is defined as the way in which a central governing agency gives direction to an industrial area redevelopment, thereby taking into account the interests of all public and private parties involved and the common interest, aimed at preventing conflict occurrence and guaranteeing a certain predefined result. Following on this, it is assumed that a central governing agency is able to steer decision-making behavior of involved actors, thereby exercising guided influence in a process, in order to prevent or solve decisional conflicts, and to achieve a collective benefit that could not be obtained by governmental and non-governmental forces acting separately. Several financial, legislative, fiscal, communicative, or planning tools can be supportive in achieving this.

However, to date, a lack of insight exists in the application of meta-governance, in which one central governing agency is responsible for preventing or solving conflict occurrences and for the creation of mutual consensus. In this chapter, the design of a tool that supports the decision-making of such a central governing agency is presented, thereby building forth on the results of the previous two chapters. Specifically, I want to give an adequate answer to the central research question: *What*

interventions should a regional governing agency utilize in order to prevent conflict occurrence in industrial area redevelopment projects?

Therefore, I first discuss relevant literature on process management in industrial area redevelopment. The goal of this step is to create a basis with which the resulting insights and impacts from the created tool can be compared. The results of the individual and interactive choice models are summarized in the subsequent paragraph, after which the tool for supporting the decision-making of the regional governance agency is presented. This tool is based upon the findings of the individual and interactive choice models, and it enables governing agencies to (1) predict conflicts in specific industrial area redevelopment processes, (2) verify whether a specific expected conflict can be prevented or solved by altering aspects within the negotiation setting, and (3) derive what specific (real-world) interventions have the largest contribution to preventing or solving a specific expected conflict.

Subsequently, the tool is put into practice through a small-scaled experimental application. This results in an insight in the functioning of the tool, and in the interventions that are recommended most often. Finally, an overview of the currently available intervention tools is presented. This overview is distracted from literature. Using this list of available tools, conclusions can be drawn concerning similarity between the recommendations resulting from the tool, and available intervention possibilities. Eventually, potential inadequacies in the current use of intervention tools are highlighted.

9.2 Process management in industrial area redevelopment projects

Several authors discuss preferred ways to manage industrial area redevelopment processes in the Netherlands (e.g., BCI and BRO, 1999; Decisio and ETIN, 2003; and Gordon, 2006). BCI and BRO (1999) emphasize the importance of accurately distinguishing involved actors and their interests, gaining insight in costs and benefits, and controlling the distribution of value development. Decisio and ETIN (2003) distinguish between affairs that can be controlled by a process manager, and affairs that cannot be controlled. Personal factors like trust and capacities of involved actors are hard to control. The three most important controllable factors are (1) anticipating on the needs and interests of involved actors, (2) creating clarity concerning costs and financial aspects, and (3) creating an efficient and effective negotiation environment. Finally, Gordon (2006) distinguishes seven variables on which a process manager should steer, based upon Bekkering *et al.* (2001): theme, entrance, timing, tempo, scenery, toll, and tone.

9.2.1 Involved actors and their interests

Interestingly, these studies collectively state that it is important to anticipate on the needs and interests of involved actors. BCI and BRO (1999) presented an overview of the most important involved actors, together with their material and immaterial interests. As an addition, BCI (2005) presented an overview of the motives for actors to become involved in redevelopment of obsolete industrial areas. Their findings are combined and summarized in table 9-1.

Table 9-1: overview of interests and motives of involved actors (after BCI and BRO, 1999; BCI, 2005)

	Immaterial interests	Material interests
Municipality	<ul style="list-style-type: none">- Creating space for employment- Vital urban economy- Improving the spatial and environmental quality- Intensive space usage / exploiting scarce spaces- Pursuing sustainability / sustainable management- Improvement of the city image- Contacts with private parties- Improving safety	<ul style="list-style-type: none">- Financial feasibility of the plan- Private investments- Rising yields from property taxes- Rising land prices in city
Entrepreneur	<ul style="list-style-type: none">- Realizing better company conditions- Improvement of company surroundings- Sustainable management- Improvement of the company image	<ul style="list-style-type: none">- Rising value of real estate- Cost savings through better functioning of company- Cost savings through better management

The mainly diverging motives of the involved actors can still serve as a point of departure for a mutual consensus building approach of industrial area redevelopment. Most important common interests are (BCI, 2005):

- Realizing and maintaining quality on existing industrial areas:
 - o For municipalities: realizing societal tasks;
 - o For entrepreneurs: maintaining their position as a user and as a property owner.
- Exploiting space on existing industrial areas:
 - o For municipalities: accommodating demand for space for economic activities and employment;
 - o For entrepreneurs: possibilities for extension of the company.

From the viewpoint of entrepreneurs, it can be concluded that the company environment and the company surroundings are very important. Connection to the company processes, image of the area, and available facilities determine the suitability of the company environment. Furthermore, quick redevelopment results and continuity of company processes during redevelopment are important factors for entrepreneurs (BCI, 2005).

9.3 Outcomes of choice models

However, redevelopment of obsolete industrial areas stagnates, despite the possibilities for a mutual industrial area redevelopment approach. Conflicts arise during negotiations between municipalities and entrepreneurs, and there is no appropriate governance structure for streamlining this. Therefore, the goal of the interactive choice model, presented in chapter 8, was to predict the occurrence of conflict within Dutch industrial area redevelopment negotiations. For this, an experiment was designed in which the five most important characteristics of industrial area redevelopment negotiations are systematically related to the strategic behavior of two stakeholder groups – municipalities and established companies – in a redevelopment process, when negotiating on a plan proposal.

Through data analysis, it was found that the stakeholder's power position significantly influences the outcome of the game; stakeholders having a relatively weak power position within negotiations tend to prefer a non-cooperative attitude. Furthermore, having some 'change' can also be beneficial for achieving mutual cooperation. If stakeholders have the prospect of achieving extra value in negotiations concerning plan optimization, they tend to be more willing to act cooperatively. However, the appraisal of both stakeholders for the proposed development plan proved to be the most influential factor in predicting the occurrence of conflict or cooperation, together with an eventual absolute difference between both players' appraisals.

9.3.1 Strategic conflict management

Based upon these insights in the strategic behavior of players and in the possible causes for conflicts, interventions can be designed. These interventions can serve as input in supporting the decision-making of a central governing agency. The main objective of this agency is to support the establishment of cooperation between relevant players, reducing the possibility on conflict occurrences and accelerating the real-world realization of industrial area redevelopment projects.

As the interactive choice model is based upon the premises of game theory, focus lies on interventions that are recognized within the field of game theory. In section 6.5.2, it was concluded that three major tools for altering conflicting games can be distinguished: (1) changing the information of the involved players; (2) changing the payoffs of the players; and (3) changing the rules of the game, focusing on the sequence of decision-making and the possible allowance of communication in the game. Furthermore, it was concluded that the second tool seems most appropriate to focus on in this research.

9.3.2 Individual choice

Combining the findings from the interactive choice model with the most appropriate tool for altering conflicting games, it can be concluded that gaining insight into the individual preferences of involved stakeholders is of major importance. In chapter 7, these individual preferences are analyzed, and the results can be used in this part.

Resulting data analysis showed that the plan attributes ‘technical quality’ and ‘cost coverage’ are important for both stakeholder groups when choosing a plan proposal. A high level of these attributes in a plan results in a high probability of being chosen, while a low level results in a low choice probability. Secondly, the parameter estimates for ‘development speed’ and ‘architectural quality’ are different for the two groups. Development speed is considered to be important for companies, whereas the architectural quality is valued higher by municipalities. The results of this experiment can be employed to test the appreciation of specific development plan proposal compositions, and are used in this research to derive what specific interventions contribute most to preventing or solving appearing conflicts.

9.4 Model for supporting decision-making of governing agencies

These outcomes form the basis of an empirically testable measurement tool, with which conflicts and cooperative attitudes can be predicted in given settings. Furthermore, when conflicts are expected or actually occurring, the model can be used in a sensitivity analysis, in order to estimate the effect of individually oriented measures on an increase of the chances of ending up at mutual cooperation. This information is used for supporting the decision-making of a governing agency. The conceptual framework of the decision-making of this agency is represented in figure 9-1.

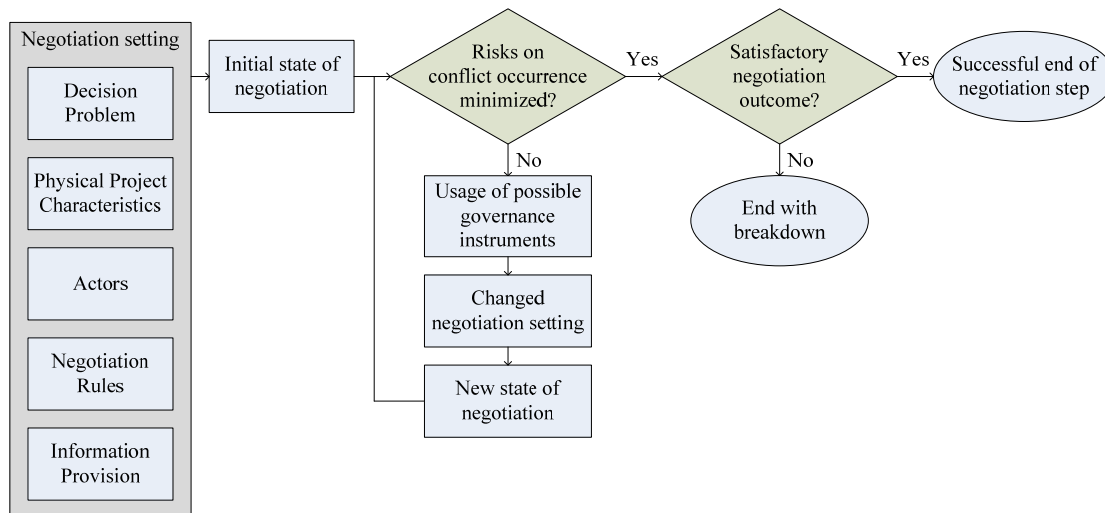


Figure 9-1: conceptual framework of the decision-making of the governing agency

As stated in section 3.6.1, regional development companies are regarded as most appropriate actors for playing the role of central governing agency in the execution of the redevelopment task. Main objective of the governing agency is to minimize the possibility of conflict occurrence through the use of minimal resources. The governing agency does not change the behavior or opinions of involved actors; it influences the negotiation setting. This research supports the decision-making of this governing agency in two ways. First, the risks on conflict occurrence can be calculated for a given negotiation setting. And secondly, in situations in which a conflict is expected, the model calculates the effects of several intervention tools on solving the expected conflict.

9.5 Experimental application of the decision-support model

In the data-collection underlying the game-theoretic experiment, 27 games are presented to two stakeholder groups: municipalities and established companies. Each individual response is interpreted in two ways: by using game-theoretic assumptions, resulting in a prediction of the game-outcome; and by using the individual predictions of the game-outcome of the respondents. Thus, for each game, four prediction of the level of conflict are collected: (1) the municipality is the player, and the outcome is predicted by using game-theoretic assumptions; (2) the municipality is the player, and the outcome is predicted by the respondent; (3) the company is the player, and the outcome is predicted by using game-theoretic assumptions; and (4) the company is the player, and the outcome is predicted by the respondent. Using the ordinal regression estimations (table 8-7), the collectively expected level of conflict can be calculated for

all 27 games. As mentioned in paragraph 8.6.3, three levels of opposition are distinguished in this research; respondents choose a level of opposition on the basis of the level of the linear function plus random error term. If the level value lies above some cut-off, which is labeled κ_1 , the respondent chooses the answer “no opposition”; if it lies below κ_1 but above another cut-off κ_2 , then the answer is “partial opposition”. And if the value lies below κ_2 , the answer is “complete opposition”. In table 8-7, the levels of the cut-off points are represented: $\kappa_{1\text{ GT}} = -1.81$, $\kappa_{2\text{ GT}} = 1.42$, $\kappa_{1\text{ RESP}} = -0.74$, and $\kappa_{2\text{ RESP}} = 1.52$. In the total set of 27 games, 17 games result in partial or complete opposition in each of the four predictions, equaling 63%.

The aim of this research is to demonstrate how conflicts can be solved or prevented by equaling both players’ appraisals. This delineation is supported by the observation that out of the 17 conflicting games, only 3 games (18%) are characterized by an equal appraisal of the plan proposal. Furthermore, out of the 10 non-conflicting games, 6 games (60%) have an equal plan proposal appraisal. A second delineation is that the equaling of both players’ appraisals should be put into practice using *minimal resources*. Therefore, focus is on games that have a *small* difference between the plan proposal appraisals of the both players. Games with large appraisal differences (one player has a low appraisal, while the other has a high appraisal) are excluded; it is assumed that these large differences are not reconcilable through the use of minimal resources.

From the total set of 17 conflicting games, 8 conflicting games are characterized by a small difference between both players’ appraisals. These 8 games (see table 9-2) are used in this experimental application, the aim of which is to find out how often the predicted conflicts can be solved by equaling the appraisals of both players.

Table 9-2: conflicting games with a small appraisal difference

Game	Appraisal player	Appraisal opponent	Power position	Remaining value	Financial risks
1	Low (4)	Medium (6)	Weak	Medium (+1)	High
2	Low (4)	Medium (6)	Medium	High (+2)	Medium
3	Low (4)	Medium (6)	Strong	Low (+0)	Low
4	Medium (6)	Low (4)	Weak	Medium (+1)	Medium
5	Medium (6)	Low (4)	Medium	High (+2)	Low
6	Medium (6)	Low (4)	Strong	Low (+0)	High
7	Medium (6)	High (8)	Weak	Low (+0)	High
8	High (8)	Medium (6)	Weak	Low (+0)	Medium

Equaling both players' appraisals by raising the appraisal of the player with the lower appraisal results in 8 different games, of which the chances of ending up at conflict can be calculated by using the regression estimates from table 8-7. For all 8 changed games, the resulting utility is represented in table 9-3, for each of the four possible outcome predictions.

Table 9-3: calculated utility values of altered games

Changed games	Player=company Prediction by game theory	Player=company Prediction by respondents	Player=municipality Prediction by game theory	Player=municipality Prediction by respondents
1a	1,64	1,63	1,63	1,83
2a	2,07	2,48	2,06	2,68
3a	2,10	1,88	2,09	2,08
4a	1,62	1,46	1,61	1,66
5a	2,28	2,63	2,27	2,83
6a	1,91	1,90	1,90	2,10
7a	3,71	3,58	3,70	3,78
8a	3,69	3,41	3,68	3,61

This utility should be compared to the thresholds that are represented in table 8-7. The use of these thresholds – or cutoff points – is explained in earlier in this paragraph, and in paragraph 8.6.3. For the game-theoretic predictions, all games with a utility higher than 1,42 result in no conflict, and for the respondents' predictions, all games with a utility higher than 1,52 results in no conflict. Therefore, I can conclude that out of the 32 predictions of the outcome of the changed game, only 1 ends up in conflict; in all other games, the change results unanimously in a no-conflict game, proving the effectiveness of altering payoffs in order to avoid conflicts.

9.5.1 Equaling appraisals

The question remains how the equaling of appraisals can be put into operation, thus answering the question what changes in plan proposals contribute to solving the discovered conflicts. Here, the results of the individual choice experiment can be used. A total of 243 possible plan proposals can be created using the five attributes, each having three possible levels (see table 7-1). Of these possible plan proposals, the appraisal of both municipalities and established companies are calculated using the part-worth utility estimates from table 7-2. After calculating the appraisals, these numeric valuations are transformed into report marks, ranging from 0 to 10. This is

done, because – in the interactive choice experiment – the plan proposal appraisals are leveled using report marks (low: 4, medium: 6, and high: 8). In order to connect to this experimental setup, the plan proposals are arbitrarily classified with report marks (x) between 0 and 4 ($0 \leq x \leq 4$) as ‘low’, plan proposals with report marks between 4 and 7 ($4 < x \leq 7$) as ‘medium’, and plan proposals with report marks between 7 and 10 ($7 < x \leq 10$) as ‘high’.

In this large set of plan proposals, focus is on plan proposals that are valued differently by both players (thus ending up in different valuation classes), and – using this set of plan proposals – it is attempted to find ways to improve the appraisal for one player without altering the appraisal of the other. Out of the total set of 243 possible plan proposals, I found that there are 82 cases matching these restrictions: 29 cases in which the plan proposal appraisal of the municipality end up in a lower value class than the company, and 53 cases in which the company’s plan proposal appraisal ends up in a lower value class compared to the municipality.

These 82 cases are used to check whether the differences in both players’ appraisals can be diminished by raising one attribute of the plan proposal with one level, because of the precondition of usage of minimal resources. Raising the level of one attribute results in a new plan proposal, of which the appraisals of both players can be calculated and compared. Furthermore, it is interesting to examine what attributes contribute most often to equaling the appraisals of both players.

Executing these steps results in the conclusion that – out of the 29 problematic cases in which the municipality has a lower plan proposal appraisal – the appraisals cannot be equalized through raising one attribute with one level in only 4 cases (= 14%). Furthermore, out of the 53 problematic cases in which the established company has a lower plan proposal appraisal, the appraisals cannot be equalized in only 10 cases (= 19%). This supports the assumption that the use of minimal resources can contribute to solving conflicts.

In $25 + 43 = 68$ cases it is possible to equal both players’ appraisals by adapting one attribute with one level. In table 9-4, a summary is given on how often adapting each attribute with one level (low-medium / medium-high) contributes to equaling the players’ appraisals. In most cases, the players’ appraisals can be equalized by raising the level of different attributes. However, in some cases, there is only one solution; raising this one specific attribute exclusively solves the conflict. This is represented in the column ‘only solution’.

Table 9-4: contribution of all attributes to equaling the players' appraisals

<i>Attributes</i>	Disadvantage: municipality (25 cases = 100%)			Disadvantage: established company (43 cases = 100%)		
	<i>Total</i>	<i>%</i>	<i>Only solution</i>	<i>Total</i>	<i>%</i>	<i>Only solution</i>
Development speed	2	8%	0	37	86%	10
Slow-Regular	1		0	16		6
Regular-Fast	1		0	21		4
Technical quality	13	52%	3	14	33%	0
Low-Medium	4		2	5		0
Medium-High	9		1	9		0
Architectural quality	12	48%	5	4	9%	1
Low-Medium	11		5	0		0
Medium-High	1		0	4		1
Value development	10	40%	1	11	26%	0
Low-Medium	4		0	5		0
Medium-High	6		1	6		0
Cost coverage	7	28%	1	17	40%	1
Low-Medium	0		0	6		0
Medium-High	7		1	11		1
TOTAL	44		10 (23%)	83		12 (14%)

It can be concluded that – in cases in which the municipality values the proposed plan lower than the company – raising the levels of the attributes *technical quality*, *architectural quality*, and *value development* results most often in an equaling of both players' appraisals. Furthermore, the attribute *architectural quality* functions most often as the only solution. Reciprocally, in cases in which the company has a lower plan proposal appraisal, raising the levels of the attributes *development speed*, *technical quality*, and *cost coverage* most often results in an equal plan proposal appraisal. Increasing the *development speed* is also often the only solution available, further increasing its importance. In the next section, several recommendations are given how to put these findings into operation.

9.6 Practical recommendations

In the previous section, it was demonstrated that all five attributes can contribute to solving differences in plan proposal appraisals; three attributes are most important in situations in which the municipality has a disadvantage, and three attributes can help solve appraisal differences in situation in which companies have a lower plan proposal appraisal. However, changes in the levels of these attributes do not occur automatically; this requires practical, governing interventions. In this paragraph,

several possible governing interventions are suggested, that can lead to a rising of the attribute levels, together with already available tools for putting this into practice.

9.6.1 Disadvantage: municipality

Technical quality

Technical quality of a plan proposal is defined as the level in which the plan satisfies the wishes and demands of the stakeholders, from the viewpoint of their core business. For municipalities, the core business in the redevelopment of industrial areas is to attract and retain companies on their industrial areas. Thus, municipalities should offer companies a business environment that suits their core business. For this, it is wise to focus on attracting companies from clustered business sectors when redeveloping industrial areas, because the needs and wishes of companies differ strongly amongst business sectors (e.g., Pen, 2002). Research on regional coordination of industrial area policies on municipal level (e.g., Van der Velden and In het Ven, 2006; and Janssen-Jansen, 2009) gives more insight in ways to successfully apply business clustering on municipal industrial areas. Demands of the companies within specific business clusters are extensively discussed in Pen (2002).

From literature, several tools are distinguished that can support the adaption of the technical quality of industrial areas. The most important tools that can be applied by a regional governing agency are as follows:

- Provincial structure vision (Gordon, 2006; VROM-raad, 2006; THB, 2008);
- Preparatory decree (Gordon, 2006);
- Municipal zoning plans (Gordon, 2006; VROM-raad, 2006; THB, 2008);
- Project decree (Gordon, 2006); and
- Adaption of environmental legislation (BCI 2001).

Architectural quality

For insight in ways to raise the architectural quality of a plan, the research of Kolman (2003) can be applied. As architectural quality is defined as the level in which the appearance of the redeveloped area improves the image of the stakeholders, we focus on the recommendations of Kolman (2003) concerning ‘perception value’, in which the following – changeable – factors are decisive: social safety, reduction of noise and smell, harmonization with the surrounding landscape, and architecture of the buildings.

Two major tools are available for influencing and directing the level of architectural quality on industrial areas (Gordon, 2006): spatial quality plans, and building codes for the external appearance of buildings.

Value development

Finally, influencing the value development of real estate is important for municipalities. This is related to two material interests of the municipality, as mentioned in table 9-1: rising yields from property taxes, and rising land prices in the city. However, to date, there is little insight in value drivers for industrial real estate. In the field of residential areas, Jansen and Lee (2009) measured the increase in real estate value in the city of Eindhoven over the last 6 years, and related this to several value characteristics. Additional research is necessary for supporting conclusions concerning value development of industrial real estate.

9.6.2 Disadvantage: company

Development speed

When regarding the cases in which the company has a lower plan proposal appraisal, raising the development speed often offers a solution. When aiming for raising the development speed of industrial area redevelopment projects, we can distinguish several possible actions. First, the legal procedures can be shortened; local, regional and national governmental bodies can contribute to this, for instance by granting legal exemptions. Furthermore, mobilizing extra process management capacity is also an option for speeding up the development process. Finally, subsidies can be supplied in order to solve problematic sub-projects, for instance for buying out large companies that cause problems in the planning process.

The most appropriate available tools for putting this into practice are the following:

- Project decrees (Gordon, 2006);
- Exemptions concerning zoning plan conditions (Gordon, 2006);
- Urban reallocation of land (BCI, 2001);
- Municipal order to force landowners to cooperate in industrial area redevelopment projects (BCI, 2001);
- Expropriation of opposing landowners (BCI, 2001; Gordon, 2006); and
- Act on Municipal Right of First Refusal (BCI, 2001; Gordon, 2006).

Technical quality

Raising the technical quality of the plan proposal from a company's point of view also results often in an equaling of the appraisals of both players. For companies, the demands concerning technical quality are extensively examined in B&A (1997) and in Pen (2002). B&A (1997) give an overview of the most important location-factors for four business sectors: industry, trading, transport, and services industries. Accessibility, parking, loading and unloading, telecom services, quality of the building, and availability of qualified personnel are most important factors for these different business sectors. Pen (2002) extended this list, resulting in a ranking of the 46 most important technical features of industrial areas. These lists of features can be used in fine-tuning supply and demand. Available tools for directing this are already mentioned in the previous section on technical quality.

Cost coverage

Finally, raising the cost coverage for companies can also lead to balancing the appraisals of both players. In this, two types of costs can be distinguished: process costs and relocation costs. Providing subsidies for covering process and/or relocation costs can induce a rise in the plan proposal appraisal of the company, eventually solving the expected conflict.

In the literature, cost coverage is often mentioned as the biggest bottleneck in industrial area redevelopment (e.g., PWC, 2003; SenterNovem, 2005; VROM-raad, 2006; and THB, 2008). Therefore, many ideas have been proposed and put into use to reduce the consequences of this bottleneck in redevelopment. Some of the most effective ideas are as follows:

- Levy taxes on profits (Gordon, 2006).
- Raise land prices (VROM-raad, 2006; THB, 2008).
- Make voluntary contributions (Gordon, 2006; VROM-raad, 2006; PBL, 2009).
- Establish business improvement districts (Gordon, 2006; THB, 2008; PBL, 2009).
- Uncouple landownership from building rights (BCI, 2001).
- Divide regional and municipal funds among several projects.
- Provide subsidies (PBL, 2009).
- Establish funds (THB, 2008; PBL, 2009).
- Implement fiscal measures (PWC, 2003).

9.7 Conclusions

In this chapter, a model is created that supports the decision-making of a central governing agency. This model is based upon results of two experiments. In one experiment, a game-theoretic model is created with which conflict occurrences can be predicted, together with the main indicators of occurring conflicts. This revealed that the individual preferences of involved actors, and the level to which these preferences are satisfied, are very influential in predicting conflicts. In the other experiment, a model is presented of the individual choice behavior of involved actors, giving insight in their personal preferences and objectives.

The model that supports the decision-making of a meta-governance agency, presented in this article, consists of three major steps:

1. Giving assistance in assessing the initial state of the negotiation: for each specific industrial area redevelopment, the chances of ending up at conflict can be calculated;
2. Calculating whether the possible conflict occurrence can be prevented by marginally changing the payoffs of both players, focusing on games in which difference between both players' appraisals exist;
3. Indicating how the equalizing of appraisals can be put into practice: what changes in plan proposals contribute to solving the conflicts that we found in the first part?

For testing the model, we used the data from the two experiments. In the total set of 27 games, 17 games result in conflict, equaling 63%. Because we focus on games in which a small difference between both players' appraisals exists, I selected 8 games out of the set of 17 conflicting games, and of these 8 games, I equaled the appraisals of both players by raising the payoff of the underlying player. For each game, I used 4 predictions to check whether the altered games would end up in conflict, and out of these $4 \times 8 = 32$ predictions, 31 resulted in a no-conflict game. Therefore, it is concluded that altering payoffs in games in order to avoid conflicts is very effective in these games.

Furthermore, I give insight in how the equaling of appraisals can be put into operation, thus answering the question what changes in plan proposals contribute to solving the discovered conflicts, and what tools can be applied. For this, the results of the individual choice modeling experiment are used. Out of the 82 discussed cases, I found that it is possible to diminish differences in both players' appraisals by raising one attribute of the plan proposal with one level in 68 cases (= 83%). This supports

the assumption that the use of minimal resources can contribute to solving conflicts. For these 68 cases, several recommendations are given on how to put these findings into operation; several governing interventions are suggested for solving the different conflicting situations.

In cases in which the municipality values the proposed plan lower than the company – raising the levels of the attributes *technical quality*, *architectural quality*, and *value development* results most often in an equaling of both players' appraisals. Furthermore, the attribute *architectural quality* functions most often as the only solution. Reciprocally, in cases in which the company has a lower plan proposal appraisal, raising the levels of the attributes *development speed*, *technical quality*, and *cost coverage* most often results in an equal plan proposal appraisal. Increasing the *development speed* is also often the only solution available, further increasing its importance. These outcomes largely coincide with the findings of BCI and BRO (1999) and of BCI (2005) (see table 9-1).

In general, tools are already available for executing interventions on above-mentioned attributes. Thus, focus should be on actual execution of the governance task, not on adding tools to the existing instrumental palette. This coincides with the findings of THB (2008), concluding that the stagnation of the execution of industrial area redevelopment is caused by problematic process coordination, not by a lack of legal tools. However, there is not enough insight in value development of industrial real estate. This needs some additional insights.

Discussion

In this research, several delineations are suggested, in order to make the model definable. These delineations bring about that not all conflicting situations can be studied and solved with this model. For instance, it gives insight only in games in which a difference in both players' plan proposal appraisals exists. For other games, other solutions should be sought. Furthermore, because we focus on the intervention 'changing the payoffs of the players', the effectiveness of other governance interventions remains unclear. From literature, we found that the use of information or game rules can also contribute to solving conflicts. Especially the role of information is interesting; this requires some further research. On the other hand, the choice for focusing on the payoff-tool can be supported by regarding the outcomes from chapter 7, in which the players' payoffs are designated as being most influential in predicting conflicts.

In addition, the presented model is based upon information that is gathered using experimental and hypothetical settings. Gaining insight in real-world cases can gain extra valuable information. It seems interesting to study whether this model corresponds to real-world interactions and environments; this should be dealt with in future research.

CHAPTER 10

CONCLUSIONS

10.1 Background to the study

With a sizable stock of industrial areas that are abandoned or otherwise obsolete, the Netherlands is confronted with a lot of debate on redevelopment. Currently, industrial area redevelopment in the Netherlands stagnates because the arising interdependent negotiations often result in conflict. To date, there is no adequate organizational structure for preventing or solving the occurrence of these conflicts. Therefore, I postulate that a lack of process governance is the main cause for the occurring stagnation. The general research objective is to provide a theoretical basis for the support of a regional governing agency in managing an industrial area redevelopment process, thereby making use of insights from other fields of research.

In this thesis, a modeling approach was developed that can assist regional governing agencies in predicting the strategic behavior of involved actors in industrial area redevelopment, and in observing possible conflict occurrences. Furthermore, the resulting model produces recommendations concerning the application of the most appropriate intervention tools in different conflicting situations. This approach can be used for managing the interdependent redevelopment process, in order to solve the occurring stagnation. From a methodological point of view, the modeling approach entails a combination and integration of discrete choice modeling, conjoint analysis approaches and game theoretic modeling.

In this chapter, these modeling efforts are summarized, and the most important findings are reviewed. Also discussed are the strengths and limitations of the approach and some possibilities for future research.

10.2 Summary of the study

In the first part of this thesis, a literature review is presented. Chapter 2, which discusses the industrial areas in the Netherlands, stresses that industrial areas are important for realizing sustainable economic growth in the Netherlands. Industrial areas play an important role in accommodating employment, in stimulating local and regional economies, and in creating a high value added. Furthermore, I postulate that process features have a significant influence on the outcome of industrial area (re)development projects.

Subsequently, the most important problem aspects of the current industrial area planning approach are discussed, together with several causes of these problems. It is argued that most of these problematic failures can be traced back to one main problem: the rapid obsolescence of the existing stock of industrial areas. The dimensions of the Dutch industrial area redevelopment task affirm this.

This creates a large necessity for redevelopment. However, based upon the disappointing figures on yearly realized redevelopment projects and on the low spatial yields of actually realized redevelopment projects, it is concluded that the execution of industrial area redevelopment projects stagnates. When starting up a redevelopment project in the increasingly complex and rapidly changing environment, interdependent negotiation processes within and among organizations appear to be problematic, consuming substantial time and effort. Focus within this research lies therefore on studying, supporting and accommodating the consensus-building process within redevelopment projects.

The point of departure in this research is the postulate that the main cause of the occurring stagnation in industrial area redevelopment is the absence of a well-functioning process governance system. Several authors support this statement; they posit that the regional arena is the appropriate level for executing such governance. Because of a lack of insight into effective ways to implement a governance system, and because of the presumed advantages related to the acceleration of industrial area redevelopment processes when gaining this insight, the general research objective is as follows: *'To explore ways to effectively support the governance of involved*

stakeholders' choice behavior, and to stimulate the current decision-making processes in industrial area redevelopment projects'.

Thus, governance – and especially meta-governance – entails a promising application to the complex industrial area redevelopment projects. Several best-practice industrial area redevelopment projects reveal that centrally governing such alliances contributes to project success. The aim of meta-governance within industrial area redevelopment projects is to establish cooperation between relevant parties, in order to realize a number of functions and purposes from a public, social importance, through the establishment of one central governing agency, responsible for the management of the decision-making process. In Dutch industrial area redevelopment, regional development companies seem most appropriate for executing this central governance role.

Assuming that meta-governance can be a solution to the occurring problems in the Dutch industrial area redevelopment market, it is essential to analyze the consensus-finding processes, as well as causes of tension and conflict, in order to theoretically support governing agencies in managing decision-making processes. Therefore, the specific goal of the research is to better understand how individual and interactive decision-making of the most important actors in industrial area redevelopment processes can be modeled, in order to analyze and predict the occurrence of cooperation or conflict, and how this decision-making can be influenced by a regional governing agency. A better understanding of these processes is a key requirement for the development of a decision support tool for this regional governing agency, in order to support the acceleration of industrial area redevelopment projects.

A formal model of the collaborative decision process has not been developed for this domain, incorporating a governance approach. Therefore, several available techniques for analyzing both individual and interactive decision-making are explored in the second part of this thesis. From this, it is concluded that the discrete choice approach seems applicable for modeling individual choice behavior of actors. Furthermore, the application of game theory seems very interesting for modeling interactive and interdependent choice behavior. In order to make a game-theoretic model that is suitable for studying interactions in industrial area redevelopment, a relatively new approach is advocated in which game theory is combined with a multi-attribute trade-off technique.

Eventually, the application of game theory leads to an insight in the occurrence of conflicts, and in the causes of these conflicts. The 2x2 game is regarded as most

appropriate for application in this research because this game type has been used very often in conflict modeling and conflict management, and it suits the real world negotiation processes in which two players are involved, each roughly having two strategies. Within 2x2 games, three tools are most utilizable for solving conflicts: (1) changing the information of the involved players; (2) changing the payoffs of the players; and (3) changing the rules of the game, focusing on the sequence of decision-making and the possible allowance of communication in the game. Because the research focuses on static 2x2 games of complete information, it is concluded that gaining insight in the second tool is most feasible and interesting.

In the third part, the results are represented. In chapter 7, the individual choice behavior of involved actors is modeled, thereby giving a better and more systematical insight in stakeholders' preferences when accepting or rejecting a development plan, in the (dis-) similarities between both stakeholder groups' preferences in making that choice, and in the most important points of interest when composing a development plan proposal. Resulting data analysis showed that the plan attributes 'technical quality' and 'cost coverage' are important for both stakeholder groups when choosing a plan proposal. A high level of these attributes in a plan results in a high probability of being chosen, while a low level results in a low choice probability. Besides this, companies find the attribute 'development speed' very important when choosing a plan, and municipalities value 'architectural quality' highly. Furthermore, municipalities proved to be less demanding in accepting industrial area redevelopment plan proposals.

In chapter 8, the interaction between involved stakeholders is modeled as an interdependent process, using a relative novel approach in which conjoint analysis and game theory are combined, in order to explain the occurrence of cooperation or conflict within Dutch industrial areas redevelopment negotiations. Data analysis reveals that there is one major source of conflicts; stakeholders choosing not to cooperate based upon the presented negotiation setting. A more in-depth analysis of negotiation settings ending up in mutual cooperation demonstrated that the appraisal of both stakeholders for the proposed development plan is the most influential factor, together with an eventual absolute difference between both players' appraisals. This leads to the conclusion that the content of proposed plans is very important in such negotiations; factors like power and risks play a less strong role.

In chapter 9, a model is created that supports the decision-making of a central governing agency. This model is based upon the results of the individual and interactive choice models, giving recommendations on how to put meta-governance

into practice in industrial area redevelopment. The model consists of three major steps: (1) giving assistance in assessing the initial state of the negotiation; (2) calculating whether the possible conflict occurrence can be prevented by marginally changing the payoffs of both players; and (3) indicating how the equalizing of appraisals can be put into practice. This final step gives insight in the contribution of specific changes in plan proposals to solving the conflicts that are discovered in the first part.

After testing the model, it is concluded that altering payoffs in games in order to avoid conflicts is very effective in these games. Furthermore, these payoffs can often be altered through the use of minimal resources. In cases in which the municipality values the proposed plan lower than the company – raising the levels of the attributes *technical quality*, *architectural quality*, and *value development* results most often in an equaling of both players' appraisals. Furthermore, the attribute *architectural quality* functions most often as the only solution. Reciprocally, in cases in which the company has a lower plan proposal appraisal, raising the levels of the attributes *development speed*, *technical quality*, and *cost coverage* most often results in an equal plan proposal appraisal. In general, tools are already available for executing interventions on above-mentioned attributes. Thus, focus should be on actual execution of the governance task, not on adding tools to the existing instrumental palette.

Concluding, a model is created with which it is possible to give recommendation concerning the decision-making of a central governing agency in different possible industrial area redevelopment negotiations. It entails a new, structured way of solving conflicts, which is empirically testable, and delivers some real world recommendations.

10.3 Discussion

The aim of this thesis was to present a theoretical basis for the support of regional governing agency in managing industrial area redevelopment processes. As the execution of governance in urban development appeared to be largely absent in the literature, a new approach has been developed in this research. Through the generation of game situations, insight is gained in the occurrence of conflicts. Next, possible interventions are designed, making use of individual choice model results. This new approach towards process governance is regarded as challenging for both scientifically and practically oriented readers.

From a scientific point of view, the most important contributions are twofold. The first major contribution is the general framework for studying decision-making of involved actors in an interdependent negotiation environment, distracted from several other research fields. In this, it is shown that the application of game theory for modeling the interactions between stakeholders involved in industrial area redevelopment processes proved to be successful, despite the criticism in many studies concerning the utilization of game theory in this field. Furthermore, discrete choice models proved to be suitable for gaining insight in individual actors' preferences. The total framework entails a new approach for structurally and thoroughly analyzing conflicts in urban development processes, with the opportunity to regard possible solution concepts. The second major contribution is the consideration that process governance can be regarded as steering the decision-making of involved actors, thereby exercising guided influence in a process in order to prevent or solve decisional conflicts, and to achieve a collective benefit that could not be obtained by governmental and non-governmental forces acting separately. The expected necessary collaboration between public and private actors fits within the new planning practice, for which – to date – a formal model of the collaborative decision process has not been developed for this domain. This research contains a first attempt to fill this gap in literature.

From a practical point of view, some recommendations are presented concerning primary actions in executing process governance. It seems that the developed governance decision support model is a potentially valuable tool to predict conflicts in interdependent industrial area redevelopment processes. Furthermore, the model calculates the effects of several intervention possibilities when conflicts are expected to occur. Therefore, it is reasonably expected that making the tool operational can lead to an acceleration of the process.

However, the objective was not to develop a fully operational, specific model for solving the stagnation of industrial area redevelopment. It was rather intended to explore and investigate the appropriateness of several individual and interactive choice models, in order to support governance through the design of process interventions. The focus is on models that potentially could be further elaborated on and applied to related problems within urban development projects. Therefore, the results can best be interpreted as a building block within the development of a decision support system for governing agencies. Improvement of the models is necessary and important for extending and revising the intervention 'toolbox'. In my opinion, there are two ways to achieve this: intensifying currently employed models, or incorporating qualitative insights. This is discussed in the next paragraph.

10.4 Future research

The first way to achieve improvement of the models is to intensify the currently employed models. First, the choice for attributes in both choice models can be given a more solid ground. Furthermore, the chosen discrete choice model is not the most sophisticated model. Recently, other models (e.g., Nested Logit Models, Mixed Logit Models – see Train, 2003) are developed in order to give a more profound insight in the choices of individuals. Another aspect that can be improved is the quality of the models' input; raising the number of respondents, together with spreading the background of these respondents, can result in models that reflect real world behavior more closely.

In the interactive choice model, some additions can be useful. In this research, not all conflicting situations can be studied and solved. For instance, it gives insight only in games in which a difference in both players' plan proposal appraisals exists. For other games, other solutions should be sought. And, because I focused on the intervention 'changing the payoffs of the players', the effectiveness of other governance interventions remains unclear. From literature, we found that the use of information or game rules can also contribute to solving conflicts. Studying the possible role of these two intervention tools seems desirable and interesting; this requires further research in which the application of other game classes and solution concepts is explored.

Second, qualitative insights can be incorporated in order to obtain a more comprehensive view on actors' decision-making. This study largely employs a quantitative approach, in which experimental data is used to gain insight in the interaction between stakeholders in industrial area redevelopment processes. Insight in real-world cases can gain additional information; information that remains concealed by using solely experimental data. It seems interesting to see whether the findings of this study correspond to real-world cases. A good example of a study which incorporates qualitative and quantitative approaches in analyzing and dissolving conflicts in a real world construction project is Bana *et al.* (2001). This study entails an outcome-oriented approach for conflicting complex projects, in which linear programming and multi-criteria decision analysis is applied in order to search for and test feasible compromising solutions.

Furthermore, gaming and simulation seem interesting for gaining additional insight in choice behavior of involved actors in industrial area redevelopment. At Delft University, significant progress is made in studying the possibilities of using gaming and simulation in supporting management of urban development. For instance, the

Urban Decision Room (e.g., Van Loon and Wilms, 2006; Van Loon, Heurkens and Bronkhorst, 2008; Heurkens, 2008) is a very interesting development in supporting multi-actor decision-making in complex urban (re)development projects using simulation. This Urban Decision Room can be defined as an interactive computer simulation, which can be used by multiple actors, aiming for the generation of alternative outcomes of complex planning decisions. Furthermore, the group of Igor Mayer has produced several very interesting articles on the use of gaming-simulation in urban development (e.g., Mayer and De Jong, 2004; Mayer *et al.*, 2005).

Eventually, more profound models of decision-making of actors, resulting in strategies for a governing agency, can be used as input in development scenarios. These scenarios can be used to provide insight in future uncertainty, and as industrial area redevelopment projects cover a long period of time, this seems interesting. Using the insights in possible future images, the decision-making of a governing agency can be supported on an even higher level.

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SUMMARY

Governing Multi-Actor Decision Processes in Dutch Industrial Area Redevelopment

In the first part of the thesis, a literature review is presented. In this literature review, industrial areas in the Netherlands are discussed, leading to the conclusion that industrial areas are important for realizing sustainable economic growth in the Netherlands. Industrial areas play an important role in accommodating employment, in stimulating local and regional economies, and in creating a high value added. Furthermore, I conclude that process features have a significant influence on the outcome of industrial area (re)development projects.

Subsequently, the most important problem aspects of the current industrial area planning approach are discussed, together with several causes of these problems. It is argued that most of these problematic failures can be traced back to one main problem: the rapid obsolescence of the existing stock of industrial areas. The dimensions of the Dutch industrial area redevelopment task affirm this.

This creates a large necessity for redevelopment. However, based upon the disappointing figures on yearly realized redevelopment projects and on the low spatial yields of actually realized redevelopment projects, it is concluded that the execution of industrial area redevelopment projects stagnates. When starting up a redevelopment project in the current increasingly complex and rapidly changing environment, interdependent negotiation processes within and among organizations appear to be problematic, consuming substantial time and effort. Focus within this research lies therefore on studying, supporting and accommodating the consensus-building process within redevelopment projects.

The point of departure in this research is the postulate that the main cause of the occurring stagnation in industrial area redevelopment is the absence of a well-

functioning process governance system. Several authors support this statement; they posit that the regional arena is the appropriate level for executing such governance. Because of a lack of insight into effective ways to implement a governance system, and because of the presumed advantages related to the acceleration of industrial area redevelopment processes when gaining this insight, the general research objective is as follows: *'To explore ways to effectively support the governance of involved stakeholders' choice behavior, in order to stimulate the current decision-making processes in industrial area redevelopment projects'*.

Thus, governance – and especially meta-governance – is a promising approach for application to complex industrial area redevelopment projects. Several best-practice industrial area redevelopment projects reveal that centrally governing such alliances contributes to project success. The aim of meta-governance within industrial area redevelopment projects is to establish cooperation between relevant parties, in order to realize a number of functions and purposes from a public, social importance, through the establishment of one central governing agency, responsible for the management of the decision-making process. In Dutch industrial area redevelopment, regional development companies seem most appropriate for executing this central governance role.

Assuming that meta-governance can be a solution to the occurring problems in the Dutch industrial area redevelopment market, it is essential to analyze the consensus-finding processes, as well as causes of tension and conflict, in order to theoretically support governing agencies in managing decision-making processes. Therefore, the specific goal of the research is to better understand how individual and interactive decision-making of the most important actors in industrial area redevelopment processes can be modeled, in order to analyze and predict the occurrence of cooperation or conflict, and how this decision-making can be influenced by a regional governing agency. A better understanding of these processes is a key requirement for the development of a decision support tool for this regional governing agency, in order to support the acceleration of industrial area redevelopment projects.

A formal model of the collaborative decision process has not been developed for this domain, incorporating a governance approach. Therefore, several available techniques for analyzing both individual and interactive decision-making are explored in the second part of the thesis. From this, it is concluded that the discrete choice approach seems applicable for modeling individual choice behavior of actors. Furthermore, the application of game theory seems very interesting for modeling interactive and interdependent choice behavior. In order to make a game-theoretic model that is

suitable for studying strategic interactions in industrial area redevelopment, a relatively new approach is advocated in which game theory is combined with a multi-attribute trade-off technique.

Eventually, the application of game theory leads to an insight in the occurrence of conflicts, and in the causes of these conflicts. The 2x2 game is regarded as most appropriate for application in this research because this game type has been used very often in conflict modeling and conflict management, and it suits the real world negotiation processes in which two players are involved, each roughly having two strategies. Within 2x2 games, three tools are most utilizable for solving conflicts: (1) changing the information of the involved players; (2) changing the payoffs of the players; and (3) changing the rules of the game, focusing on the sequence of decision-making and the possible allowance of communication in the game. Because the research focuses on static 2x2 games of complete information, it is concluded that gaining insight in the second tool is most feasible and interesting.

In the third part, the results are represented. Firstly, the individual choice behavior of involved actors is modeled, thereby giving a better and more systematical insight in stakeholders' preferences when accepting or rejecting a development plan, in the (dis) similarities between both stakeholder groups' preferences in making that choice, and in the most important points of interest when composing a development plan proposal. Resulting data analysis showed that the plan attributes 'technical quality' and 'cost coverage' are important for both stakeholder groups when choosing a plan proposal. A high level of these attributes in a plan results in a high probability of being chosen, while a low level results in a low choice probability. Besides this, companies find the attribute 'development speed' very important when choosing a plan, and municipalities value 'architectural quality' highly. Furthermore, municipalities proved to be less demanding in accepting industrial area redevelopment plan proposals.

Secondly, the interaction between involved stakeholders is modeled as an interdependent process, using a relative novel approach in which conjoint analysis and game theory are combined, in order to explain the occurrence of cooperation or conflict within Dutch industrial areas redevelopment negotiations. Data analysis reveals that there is one major source of conflicts; stakeholders choosing not to cooperate based upon the presented negotiation setting. A more in-depth analysis of negotiation settings ending up in mutual cooperation demonstrated that the appraisal of both stakeholders for the proposed development plan is the most influential factor, together with an eventual absolute difference between both players' appraisals. This

leads to the conclusion that the content of proposed plans is very important in such negotiations; factors like power and risks play a secondary role.

Thirdly, a model is created that supports the decision-making of a central governing agency. This model is based upon the results of the individual and interactive choice models, giving recommendations on how to put meta-governance into practice in industrial area redevelopment. The model consists of three major steps: (1) giving assistance in assessing the initial state of the negotiation; (2) calculating whether the possible conflict occurrence can be prevented by marginally changing the payoffs of both players; and (3) indicating how the equalizing of appraisals can be put into practice. This final step gives insight in the contribution of specific changes in plan proposals to solving the conflicts that are discovered in the first part.

After testing the model, it is concluded that altering payoffs in games in order to avoid conflicts is very effective in these games. Furthermore, these payoffs can often be altered through the use of minimal resources. In cases in which the municipality values the proposed plan lower than the company – raising the levels of the attributes *technical quality*, *architectural quality*, and *value development* results most often in an equaling of both players' appraisals. Furthermore, the attribute *architectural quality* functions most often as the only solution. Reciprocally, in cases in which the company has a lower plan proposal appraisal, raising the levels of the attributes *development speed*, *technical quality*, and *cost coverage* most often results in an equal plan proposal appraisal. In general, tools are already available for executing interventions on above-mentioned attributes. Thus, focus should be on actual execution of the governance task, not on adding tools to the existing instrumental palette.

Concluding, a model is created with which it is possible to give recommendations concerning the decision-making of a central governing agency in different possible industrial area redevelopment negotiations. It entails a new, structured way of solving conflicts, which is empirically testable, and delivers some real world recommendations.

CURRICULUM VITAE

Erik Blokhuis was born on July 14th, 1981, in Oldenzaal, the Netherlands. In 1998, he started his study at the Department of Construction Technology at the Technical College in Enschede. After obtaining the Bachelor certificate, he continued his education at the Department of Architecture, Building and Planning of the Eindhoven University of Technology. He obtained his Master degree in Construction Management and Urban Development in 2005. In his graduation project, he developed a tool in conjunction with the Dutch Ministry of Finance, aiming to improve the formulation of contracts in large infrastructural projects.

After his graduation, he decided to continue as a PhD candidate in the Construction Management and Urban Development group. During his PhD, he co-founded the PhD Network of the Department of Architecture, Building and Planning in 2006. He was also involved in organizational activities within the group of Construction Management and Urban Development. Furthermore, he combined research activities with teaching Master students as well as guiding Master students in their final graduation project.

His research interests lie in the integration of the fields of urban development and business management. Specifically, areas of interest are urban development process engineering, stakeholder behavior and - management, strategic decision-making processes, and application of state-of-the-art modeling techniques. After his PhD, he wants to further elaborate on these areas of interest within the Construction Management and Urban Development group.

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