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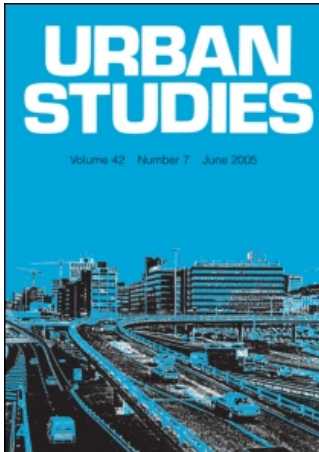
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# A Comparative Institutional Evaluation of Public–Private Partnerships in Dutch Urban Land-use and Revitalisation Projects

Peter Nijkamp, Marc van der Burch and Gabriella Vindigni

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**Summary.** In the spirit of the devolution of public policy, we have recently witnessed an increasing popularity of decentralised forms of decision-making in urban land-use policy, in which both local (or regional) authorities and the private sector play a more prominent joint role in the preparation and implementation of urban development projects. The paper describes the pathway to a more institutional multi-actor mode of urban land-use and revitalisation projects within the framework of deregulated land markets and maps out various relevant aspects of competitive land use. In particular, an attempt is made to identify the crucial ‘drivers’ of this complex decision-making process in an urban context, against the background of revitalisation objectives for modern cities. The literature suggests, in particular, that the institutional constellation, the financial viability and the presence of spatial externalities may act as critical factors for public–private partnerships. This proposition is tested in the paper by means of a comparative study on nine carefully selected urban development projects—more specifically, nine types of public–private partnerships—in The Netherlands. After the design of a systematic database on these projects, a particular type of qualitative fuzzy classification analysis originating from artificial intelligence, known as rough set analysis, is deployed to assess and identify the most important factors that are responsible for successes and failures of recent development plans in Dutch cities. This approach allows us to pinpoint the most critical policy variables.

## 1. New Urban Policy Challenges

Cities have always been a powerhouse of economic activity and a source of innovation (see Balchin *et al.*, 2000; Bertuglia *et al.*, 1998; and O’Sullivan, 2000). The urban economics literature has convincingly demonstrated that agglomeration economies offer clear locational advantages to urban modes of living and working (Glaeser, 1999). The ‘new economic geography’ has even positioned urban economics in the centre of international trade and networks (see, for

example, Fujita *et al.*, 1999). The emergence of new economic opportunities for the city—or, in general, for large metropolitan areas—has prompted a world-wide debate on the ‘new mission’ of urban governments in our age. A repositioning of urban policy seems to be at stake, in which the interface between the public and the private sectors in particular is of critical importance. The competitive advantage of cities—in terms of their potential to create socioeconomic progress—is

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largely contingent upon their ability to attract efficiently operating firms which, through their sense of entrepreneurial spirit, are capable of producing an added value out of their urban location. Several years ago, Benjamin Chinitz stated: "An urban area full of competitive industries is likely to create new business and more growth" (Chinitz, 1961; quoted in Donald, 1997, p. 338). The question is, however, whether current urban policies generate appropriate seedbed conditions for a favourable repositioning of the city (see also Bertuglia *et al.*, 1997; and Sivitanidou, 1997).

Several background factors may be mentioned which necessitate a re-orientation of urban policy. First, cities are increasingly becoming nodes in a broader—often international—network economy (Castells, 1996). They transcend the borders of the regional and national territory and are increasingly becoming players in an international competitive arena. Next, the functional transformation of the traditional industrial structure of urban areas towards a service and ICT orientation means a radical change in urban policy-making; urban economic processes become more volatile and business firms tend to become increasingly footloose. A major challenge for urban administrations is not only to attract new firms, but also to keep existing business life within the urban area—a phenomenon also clearly witnessed in modern 'edge city' development (see Garreau, 1988; and Medda, 2000). As a consequence, modern cities—as functioning economic and administrative entities—are more and more subject to interurban competition in which the city administration is an important—but not exclusive—stakeholder.

In many countries this has led to a call for more local competence and decentralisation of administrative power. This devolution process has made cities more aware of the need to develop tailor-made urban strategies and to create proper incubator conditions for existing and new businesses. Essentially, the urban investment climate is a decisive factor for effective policy-making in a modern city (Adair *et al.*, 1999). Consequently, the bal-

ance between private and public investments is a critical condition for success in modern urban administration.

Against this background, the present paper aims to identify and investigate critical success factors for urban restructuring on the basis of a comparison of qualitative features of various public-private partnerships (PPP) in urban revitalisation and transformation projects. A PPP means that the administrative decision on a particular urban development plan is not exclusively a public responsibility, but is also a result of private and public negotiation and agreement processes. This means in general the involvement of a multiplicity of stakeholders, with different policy objectives and targets. Urban restructuring tends to become a multi-actor task in modern land-use planning.

Clearly, this change in views on the competence of the public sector has prompted an intensive debate on traditional arguments in favour of government intervention (such as paternalism, presence of externalities, equity motives, ecological and conservation motives, and scale advantages in natural monopolies). The traditional intervention measures of the government were: price instruments (taxation, subsidies), regulation (prohibitions, incentives) and public works under government responsibility. A clear judgement of the performance of the public sector was, however, usually hampered by the involvement of the political process (see Downs, 1957; and Frey, 1983), in particular, the lack of incentives in efficiency improvement, the influence of the election process and the robust and influential position of civil servants. It goes without saying that nowadays the city administration is faced with rather complex institutional problems in a PPP context, where it has to demonstrate its managerial and innovative competence. Seen from this perspective, this paper seeks to identify the critical success factors for urban development plans (in particular, public-private revitalisation projects), by a comparative case-study analysis of nine Dutch urban PPP initiatives. After a general sketch of the recent re-orientation of urban policies, we

will present a comparative study of these projects. In view of the small sample size and the qualitative (often nominal or non-numerical) information on the performance of such projects, a new meta-analytical tool—rough set analysis—is applied. Several empirical results are presented and the paper concludes with some policy lessons.

## 2. New Urban Pathways

In the light of the dynamic developments of modern cities outlined in section 1, the urban facilities market deserves a closer look. Urban facilities are produced nowadays in different institutional configurations and with different socioeconomic objectives. However, in most cities, the efficient supply of public goods is being increasingly brought under a market-based regime, in order to stimulate flexibility and innovativeness. This orientation towards the market sector also leads to the need to get private stakeholders involved in the development of the urban economy. These stakeholders may be project developers, banks, exploitation companies or institutional financiers. Consequently, financial viability and profitability become *leitmotifs* for urban development plans (see Harding *et al.*, 1994). The general expectation is that a market orientation for urban development plans will create more flexibility, efficiency, efficacy, innovativeness and socioeconomic spillovers. Clearly, market imperfection should not be overlooked (such as high entry costs, high information costs, negative external costs or monopolisation). It is, of course, a major challenge for urban administrations to strike a balance between different (often conflicting) motives in a complex urban setting (see Healey *et al.*, 1992).

The urban activity pattern in a sustainable society has to reach an equilibrium between economic, socio-cultural and ecological functions. This is not only necessary for internal urban policy, but also for the external marketing policy of the city (Kotler *et al.*, 1993). A city marketing strategy is a common vehicle in an open competitive environ-

ment and should address the business sector, on reflecting the entrepreneurial attitude of the urban administration and with a view to global developments. Ashworth and Voogd define 'city marketing' as follows

Specific planning actions designed to initiate or stimulate processes that improve the relative market position of cities in regard to particular activities, such as attracting commercial investment, or improving the effectiveness of service activities whether in the public or private sectors (Ashworth and Voogd, 1988, p. 66)

In this context, Porter claims that

Governments can assume a more effective role by supporting the private sector in new economic initiatives. It must shift its focus from direct involvement and intervention to creating a favourable environment for business (Porter, 1995, p. 57).

This means that the city administration is becoming an agency which manages the urban edifice as a commercial market product. The concept of the 'entrepreneurial city' advocated by Harding *et al.* refers to a place

where key interest groups in the public, private and voluntary sectors develop a commitment to realising a broadly consensual vision and mobilise both local and non-local resources to pursue it (Harding *et al.*, 1994, p. 9).

Thus, an entrepreneurial city is sensitive to the wishes of the business sector, has a strong sense for innovativeness and flexibility, is project-oriented, strategic in nature, seeks co-operation with the private sector (including project developers), aims to create an added value for the city and monitors socioeconomic performance of the city. Clearly, given the multifunctional and heterogeneous nature of the urban economy, a single and unambiguous performance indicator is difficult to identify. For example, for urban residents, the quality of the environment, access to public and socio-cultural facilities and a favourable socioeconomic

**Table 1.** A classification of four main urban target markets

Visitors	Residents and workers	Business and industry	Export markets
Business visitors	Professionals	Heavy industry	Other localities within the domestic markets
Non-business visitors	Skilled workers	'Clean' industry	International markets
	Wealthy individuals	Entrepreneurs	
	Investors		
	Entrepreneurs		
	Unskilled workers		

Source: Kotler *et al.* (1993).

climate may be key factors, while for business life such factors as availability of land, accessibility, the local tax system, and a flexible and high-quality labour market may be crucial (see also D'Arcy and Keogh, 1998; and Jones, 1996). In this context, Kotler *et al.* (1993) have made a distinction between four main target markets: visitors, residents and workers; business and industry; and export markets (see Table 1 for a further sub-division). It is evident that urban policy has to address a multiplicity of target markets.

Clearly, the focus of urban policy may be either on acquisition (aiming to attract new firms and functions) or on restructuring or revitalisation (aiming to reinforce the economic position of existing activities). In the first case, an external orientation is needed, whereas in the second case the policy attention is mainly directed towards firms already located in the city. In both cases, however, the aim is to maximise the incubator potential of inner-city areas through the mechanism of agglomeration economies (comprising scale, localisation, urbanisation and linkage or network advantages) in an increasingly globalising world.

### 3. Urban Policy in a Public-Private Domain

The emerging new role of urban governments prompts a discussion on the competence of the public sector. The topical question of whether—and if so, to what extent—urban governments should intervene in the market has been dealt with extensively in

the transaction costs approach. In classical economic theory, these transaction costs are assumed away—for example, because information is free and accessible without costs to all economic actors. In the absence of transaction costs, even externalities will be included in market or government decisions, because in this case (costless) negotiations will continue until there is a Pareto-optimal allocation of goods (see Rienstra, 1998). However, in practice, every transaction leads to costs (negotiating, preparing of contracts, control, information acquisition, etc.). Hence, there may be a case for public intervention—for example, to reduce monopolisation of information. However, government intervention also leads to new transaction costs. It is thus clear that it is difficult to define an unambiguous balance between the tasks and competencies of the public versus the private sector.

In the literature, various arguments can be found which would justify public intervention (for an overview, see Fokkema and Nijkamp, 1994). Usually, three major classes of argument can be identified: the 'infant' activity argument; the market imperfection argument (in particular, in cases of imperfect competition, imperfect information or malfunctioning markets); and, the equity (or ethics or justice) argument. Against this background, transaction costs may play a major role at the interface of the private and public sectors.

In the context of the urban land market, there is often not a clear unambiguously operating market, as urban land use is the result of a multiplicity of complex structures

and institutions. It is sometimes argued that—instead of substantive rationality—urban development strategies are much more driven by procedural forms of rationality (in particular, learning capacities of organisations and of the system at large). In this institutional perspective, much emphasis is placed on organisational models which also take into account transaction costs from opportunism in human behaviour (see Williamson, 1995). As a consequence, the urban regulatory system comprises economic, technological and social dimensions, which have to be reconciled in a collective decision-making process in which mutual agreements and contracts play a critical role. In urban rehabilitation strategies, for instance, the behaviour of contractors, based on bounded rationality and opportunistic behaviour, plays an essential role (see Moschandreas, 1997). In the case of externalities (or social costs), the property right principle advocated by Coase (1937) is then an important ingredient of urban policy-making. Burgenmeier (1999) has recently argued that the Coasian definition of transaction costs (information, negotiation and uncertainty) can be extended from those emerging in the market to costs outside the market.

Clearly, as outlined above, the role of the public sector is increasingly moving towards a diffuse force-field in which public and private interests have to be reconciled. In recent years, this has necessitated public decision-makers seeking a new *modus operandi* with the private sector. In consequence, public-private partnerships (PPPs) have become a rather popular institutional arrangement in urban development policy, as they may create win-win situations as a result of mutual benefits or socioeconomic symbiosis. A PPP is an institutionalised form of co-operation of public and private actors who, on the basis of their own indigenous objectives, work together towards a joint target, in which both parties accept investment risks on the basis of a predefined distribution of revenues and costs. In practice, a PPP is not a fixed structural model for collaboration between public and private partners, but just a tailor-made

organisation for the realisation of a given project. Flexibility, speed, cost efficiency and, in general, reduction of transaction costs are the main benefits of a PPP.

It is unsurprising—given the above observations—that there is no single PPP model. Instead, examples which demonstrate their variety include: the building-claim model, the joint-venture model and the concession model. Such models can be distinguished on the basis of the division of competence between the public and the private sectors (for example, land exploitation, real estate exploitation, a joint exploitation and management company) or the degree of risk-sharing or financing (see van der Burch, 2000). In reality, we often face a great variety of mixed-economy land development agencies and related institutional models.

There is not an unambiguous choice for any of these models, as their effectiveness and feasibility are contingent on various local and legal factors, such as the willingness to co-operate or institutional modes of decision-making. In this context, Mintzberg (1997) has formulated two hypotheses on the effectiveness of organisational structures: the congruence structure (a situation when situational—or contingency—factors and design parameters are closely matched); and the configuration hypothesis (a case of internal consistency among all design parameters). The situational factors are mainly determined by features such as stability, complexity, diversity, information and communication, and degree of co-operativeness. In practice, both constellations appear to play a role with different intensities.

The number of fields in urban planning where PPP models are applied is rapidly increasing. In particular, PPP solutions have become popular in the areas of infrastructure provision (for example, parking facilities), residential construction, urban development and revitalisation projects and integral urban (or inner-city) development. Recently, PPP arrangements in the field of public service provision have also gained in popularity. Clearly, the implementation of a PPP model is often not without problems. Some major

barriers to a successful realisation of PPP configuration are: the long planning-horizon, the complexity of various projects, the hold-up problem caused by a change in the position of partners, cultural differences between private and public partners, the role of public subsidies and the competition rules for public projects as formulated by institutional actors such as the European Commission (see van der Burch, 2000).

A comparative analysis of success factors of various institutional models requires an in-depth investigation of various PPP constellations, based on extensive field work. Most information acquired from field interviews and literature search is non-numerical (i.e. qualitative or fuzzy) in nature. Consequently, standard statistical methods are not appropriate in this context, even if we exclude the problems of small samples. Therefore, in the present study, we have to resort to qualitative classification methods.

In the light of the complexity and the heterogeneous nature of PPP projects, a thorough investigation into the critical success (or failure) factors of such projects is warranted, as it may generate important and transferable lessons for urban development planning. This requires an extensive study of different specific experiences (see Yin, 1994). Against the background of the varying and diverse nature of PPP projects, a methodology based on comparative case-study research—i.e. rough set analysis—seems to be appropriate, as this method is capable of summarising various findings in a systematic and succinct form. This will be further described in the next section.

#### **4. A Comparative Meta-Analysis of Urban Development Projects**

The aim of this study is to develop a new methodology for a systematic analysis of critical success conditions for urban PPP strategies, based on an investigation and comparative evaluation of various empirical cases in The Netherlands. This methodology is based on modern principles of research synthesis, as developed in particular in meta-

analysis (for a general overview, see *inter alia* van den Bergh *et al.*, 1998; Nijkamp and Pepping, 1998; and Florax *et al.*, 2002). Meta-analysis aims to derive common elements from a series of previously undertaken case studies, often with a view to the identification of transferable lessons in the form of conditional statements, which would specify under which conditions a certain (probabilistic or deterministic) statement on an as-yet-unknown phenomenon is valid.

In the framework of our investigation on PPP constellations in urban projects, nine studies of Dutch urban redevelopment have been undertaken and subsequently analysed. These studies were selected from a broad database on urban (re)development projects collected by Arthur Andersen Real Estate Services in The Netherlands. This consultancy firm specialises in the management and development of Dutch urban development projects and has a rather broad and representative overview of many projects. The initial selection criteria used were: the project has to have been completed; a sufficient database on the project is available; there has to have been a PPP element in the project; the project has to have had a substantial financial and institutional scope. The general procedure for carrying out the time-consuming field work on these case studies was straightforward: selection of potentially interesting cases, exploration of willingness to co-operate among major stakeholders in the project concerned, assessment of available information relevant for a systematic case-study approach, execution of structured interviews with main parties involved, collection of relevant data from study reports including 'grey' literature and experts, and compilation of a systematic database on features and success factors. Each of the finally selected and investigated projects had to fulfil at least the following assessment criteria: it has a PPP feature; it features urban restructuring with a clear economic function, it has been (more or less) completed; and, it is suitable for an *ex post* evaluation. Clearly, whether or not a project is successful was not a selection criterion. After an extensive literary overview of the

various PPP projects, it appeared necessary to present the available information in a compact and systematic form in order to generate a consistent database for comparative purposes. The systematics of this approach were based on a qualitative codification of all nine PPP cases under consideration.

The following Dutch urban PPP case-study projects were selected (see the Appendix for details; also van der Burch, 2000):

- (1) Amersfoort: Eemskwartier (AME).
- (2) Amstelveen: Stadshart (AMS).
- (3) 's-Hertogenbosch: Paleiskwartier (DEB).
- (4) Eindhoven: De Witte Dame (EIN).
- (5) Heerlen: Centrumplan (HEE).
- (6) Maastricht: Sphinx Céramique (MAA).
- (7) Nijmegen: Brabantse Poort (NIJ).
- (8) Rotterdam: Beurspassage (ROT).
- (9) Waalre/Aalst: Centrumplan (WAA).

It is clear that most of these projects are located in medium-sized to large cities in The Netherlands. It should be noted that our comparative research is not concerned with a comparison of the cities, but with a systematic comparative analysis of urban development projects which are largely similar in terms of both scope and size.

The comparative purpose of our study also calls for a more detailed description of the various attributes of the individual cases. A comparison of PPP constellations in urban development projects leads to the need for systematic insight into institutional arrangements, financing and risk elements, revenues and costs, and project organisation. (The Appendix offers some more details on these aspects.)

For each case, an extensive information system was built up comprising many detailed insights and the detailed systematic information was put into a data matrix in which both within-case data and cross-data patterns could be mapped out (for details, see van der Burch, 2000). It should be noted that the information in the database is qualitative in nature. In fact, most available information has a categorical measurement scale (nominal, binary). This ultimately led to the construction of a codified data matrix (see

Table 2), which is a concise representation of all underlying field information. This multi-attribute table serves as the basis for a systematic comparison of the PPP projects.

Next, it is also important to know whether these nine projects may be regarded as successful or not. Success is a composite concept and may refer to various elements of a decision. We will interpret success here as a positive contribution from: an executive and organisational perspective; an operational and marketing perspective; and, a contractual and building perspective. To maximise reliability of the success score, a broad approach is needed. Therefore, based on extensive interviews with stakeholders, administrative representatives and local experts, a common assessment of the relative success scores of each urban project (and its constituent factors) has been made. The resulting information has taken into consideration the timing, the institutional environment, the scale, the user benefits and the contextual information of the projects. These results are systematically mapped out in a very concise way in Table 3, according to executive, organisational, operational, contractual, building and marketing criteria. Table 3 shows two levels of aggregation: a comprehensive aggregation and a disaggregate representation over three items each of which contains two of the above-mentioned criteria. The information in this table reflects some sort of an 'average' opinion from various experts on the different performance indicators. Clearly, a PPP constellation is not by definition successful and, therefore, the question has to be answered: are there critical success factors that tend to make a project successful? Rather than offering a verbal or intuitive explanation, we have chosen to deploy a new methodology, based on artificial intelligence, in order to provide a more rigorous answer.

The success scores in Table 3 essentially make up a set of endogenous variables to be explained from the background variables in Table 2. According to Eisenhardt (1989), applied case-study research seeks to identify linkages among qualitative and/or quantitat-



**Table 2.** Codified data matrix for nine urban revitalisation projects

	AME	AMS	DEB	EIN	HEE	MAA	NIJ	ROT	WAA
<i>A. Institutional arrangement</i>									
1. Type of initiative	1	1	2	2	1	1	1	2	1
2. Type of actors' co-operation	2	2	2	3	1	3	2	2	1
3. Spatial scope	2	2	2	3	2	3	2	2	1
<i>B. Financing and risk</i>									
4. Financiers and risk-bearers	3	3	3	2	2	2	2	2	1
5. Awareness of different risk profiles of project parts	1	1	1	1	2	2	1	1	2
<i>C. Contractual arrangements</i>									
6. Transparency of profit(ability) requirements	2	1	1	1	2	1	1	1	2
7. Nature of contract	1	2	2	2	1	2	2	2	1
<i>D. Revenues and costs</i>									
8. Financial transparency	1	1	1	1	3	3	1	2	3
9. Soil pollution costs	1	3	2	2	2	2	2	2	2
10. Expected rise in land price	1	1	1	2	2	2	1	2	2
<i>E. Project organisation</i>									
11. Selection procedure of partners	2	3	3	1	3	2	1	3	1
12. Stepwise approach to project components	1	1	1	2	1	1	1	2	1

A1 1: (mainly) public with limited number of players; 2: mainly private or public-private with large number of players.

A2 1: traditional; 2: joint venture; 3: concession.

A3 1: local; 2: regional; 3: (inter)national.

B4 1: mainly public; 2: mainly private; 3: joint public-private activity.

B5 1: yes; 2: no.

C6 1: yes; 2: no.

C7 1: global; 2: detailed.

D8 1: good; 2: fair; 3: poor.

D9 1: high; 2: modest; 3: poor.

D10 1: yes; 2: no.

E11 1: open selection; 2: target group approach; 3: combination.

E12 1: yes; 2: no.

ive variables or indicators in a framework model with a view to theory construction or hypothesis testing. For comparative case-study research, a cross-case analysis may be helpful. According to the author, a carefully selected sample of 5–10 cases may often be fairly representative. However, the problem is that a conventional statistical analysis (such as discrete choice modelling) cannot be applied because of the low level of measurement (categorical) of the explanatory variables and the small sample of observations. Therefore, we have to resort to other analytical techniques (in particular non-parametric

methods) to extract useful information on the drivers of success from Tables 2 and 3. A rather powerful method for qualitative data classification, which will be discussed in the next section, is rough set analysis.

## 5. An Artificial Intelligence Approach: Rough Set Analysis

In modern social science research, we observe an increasing need for quantitative research synthesis. This means that findings from previously undertaken studies (either quantitative stimulus response studies or

**Table 3.** Assessment of success scores for each project

Success score	AME	AMS	DEB	EIN	HEE	MAA	NIJ	ROT	WAA
S. Aggregate score	1	2	3	2	1	2	4	3	1
P <sub>1</sub> . Executive and organisational	1	4	4	2	2	3	4	3	2
P <sub>2</sub> . Operational and marketing	2	1	3	3	2	4	4	3	1
P <sub>3</sub> . Contractual and building	2	3	3	3	1	1	3	4	1

Note: 1 = unsatisfactory; 2 = acceptable; 3 = successful; 4 = very successful.

qualitatively described case studies) are summarised in a quantitative form in order to draw common research or policy lessons or to derive analytical statements that are transferable to other case studies.

In this context, meta-analysis is gaining importance. Meta-analysis already has a long history in the natural and life sciences, where (semi-)controlled research experiments are not uncommon; under fairly common *ceteris paribus* clauses, a systematic effort can be made to draw quantitative common results from previous research experiments. Meta-analysis aims to offer a statistical underpinning for the comparison and synthesis of studies within the same broad research field. Various techniques have been developed in this framework, such as meta-regression analysis or analysis of effect sizes (for a review, see *inter alia* van den Bergh *et al.*, 1998, Glass *et al.*, 1994; Hedges and Olkin, 1985; and Matarazzo and Nijkamp, 1997).

In applied case-study research—even when it is based on a systematically designed research format—we are often faced with results of a nominal character (for example, yes or no) or of categorical nature (for example, a qualitative rank order). In such cases, the application of standard meta-regression techniques is usually more problematic, in particular if not only the response variables but also the stimulus variables have a low measurement scale (or are only nominal in nature). Furthermore, the sample size of comparative case-study research is usually small, mainly for time or financial reasons. In-depth case-study research based on a sample size of more than 10 is uncommon and,

in many cases, even not necessary (see Eisenhardt, 1989).

A recently developed and potentially promising method for comparative research in cases of nominal or qualitative information and small sample size is rough set analysis (see, for example, Pawlak, 1991; Slowinski, 1995; van den Bergh *et al.*, 1998). Rough set analysis belongs to the family of artificial intelligence based on logical induction and deduction rules, and aims to perform a classification analysis on 'soft' data distinguished according to various distinct groupings. If a distinction is made between response and stimulus variables (or 'decision variables'), then rough set analysis is able to identify causal linkages between classified stimuli and responses. It is then able to derive conditional causal links of an 'if ... , then ...' nature. These linkage statements mean essentially that an unambiguous result can be found between the occurrence of certain stimuli in given data classes and the occurrence of the response variable in a given class. This means that deterministic statements can be derived based on a qualitatively codified data matrix. Thus, rough set analysis is a multidimensional classification tool that may offer a causal explanation for the emergence of phenomena which are described in nominal categories (or codes). Clearly, the codification of qualitative data from a case study is critical, but the rough set software allows for a sensitivity analysis of the codification (see Nijkamp, 2000). In any case, the construction of an information table is essential in any rough set analysis, as the only way to discriminate among objects is to classify their characterising attributes.

In our study, we use rough set analysis mainly as a tool for knowledge discovery in databases (KDD) (see Glymour *et al.*, 1997)—not only for a retrospective analysis of qualitative data on existing case studies, but also as a possible classification of new cases. In particular, we use a relatively simple and interpretable ‘pattern-focused’ model rather than a comprehensive explanatory model for institutional decisions. Consequently, we apply a data-mining algorithm which is able to produce a set of conditional statements on dependencies among variables in a rules form.

The methodology of rough set analysis and its development have been described extensively in the literature and will not be replicated here (details can be found, *inter alia*, in Polkowski and Skowron, 1998). The software has also various test statistics, so that the results can easily be judged as to their robustness and reliability.

The algorithm used here belongs to the framework of the ‘RoughFamily’ software system, which is able to perform a rough-set-based analysis of categorical or nominal data, in particular by assessing the approximation of decision classes, checking dependencies between attributes and identifying reduced subsets of attributes (see Slowinski and Stefanowski, 1998). In this way, we are able to extract characteristic patterns from the data, to induce decision rules from a set of learning examples, to evaluate the discovered rules by means of proper validation techniques and to construct a knowledge representation in the form of decision rules.

The computer software programme used here for the rough set analysis is known as ROSE. This software system is able to deal with the basic elements of rough set theory and the related rule discovery techniques.<sup>1</sup> It has an easy user interface; commands are executed by walking stepwise through the menus and sub-menus. In our case, we are especially interested in the rules generator through which decisions algorithms can be derived. These contain, *inter alia*, conditional statements (i.e. if ... , then ...), so that we can identify under which conditions

attributes of a phenomenon considered lead—as a logical deterministic consequence—to a certain performance score (or class) of that phenomenon. In the next section, we will offer results of the rough set analysis applied to our urban revitalisation case studies.

## 6. Presentation and Interpretation of Results

In this section, we will present the results of the rough set analysis at two levels: at the level of one aggregate performance score ( $S$ ) for each of the nine urban revitalisation projects under consideration; and, at the level of three partial constituents ( $P_1, P_2, P_3$ ) of the overall performance score (as presented in the success score matrix in Table 3) (for a detailed description, see van der Burch, 2000). Clearly, the interpretation is valid to the extent that the case studies considered offer a fair representation of urban development projects. In all cases analysed here, it turns out that the accuracy and the quality of the rough set approximation is equal to 1, which means that the reliability of the classification for the dependent variable and the overall quality of the nominal classification is at its maximum. The nine classes are indeed totally distinguishable.

### 6.1 Aggregate Results

Application of the rough set methodology to Table 2 in order to ‘explain’ the aggregate performance score included in Table 3 leads to a set of ‘decision rules’ (see Table 4). These rules can be interpreted in a ‘compelling’ way, based on binary deterministic logic. Given our database, they are unambiguously valid. They will concisely be interpreted here.

*Rule 1.* If the profitability requirements of stakeholders involved are not expressed clearly and at the correct time, then the performance of the urban revitalisation project is unsatisfactory. This hypothesis is sup-

**Table 4.** Rough set decision rules for aggregate performance score of urban revitalisation projects

Rule number	If	Then	Urban projects concerned
1	$C6 = 2$	$S = 1$	AME, HEE, WAA
2	$A2 = 3$	$S = 2$	EIN, MAA
3	$D9 = 3$	$S = 2$	AMS
4	$A1 = 2$ and $E11 = 3$	$S = 3$	DEB, ROT
5	$E11 = 1$ and $D10 = 1$	$S = 4$	NIJ

ported by three out of the nine cases (AME, HEE, WAA). For the interpretation of the remaining cases, we have to consult Tables 3 and 4, from which we can derive that the six remaining cities have been more transparent in their profitability demands. The scores of these cities are fairly good: three cities (AMS, EIN, MAA) have an acceptable performance; two (DEB, ROT) have a successful performance; and one (NIJ) even has an excellent performance.

*Rule 2.* If the institutional PPP arrangement is based on a concession, then the overall performance of the urban development project is in general acceptable. Moreover, the joint-venture arrangements in some cities result in a successful, or even a very successful, score (DEB, NIJ, ROT); however, one case (AME) is unsatisfactory, so that a joint-venture arrangement cannot be regarded as an infallible institutional model.

*Rule 3.* If there are no soil pollution costs, then the success of the project has an acceptable performance from the public side. Closer inspection leads to the conclusion that this statement is not shared by many projects, but for the remaining projects no unambiguous result can be found. This means that the role of soil pollution in urban revitalisation projects is somewhat fuzzy.

*Rule 4.* If the development initiative is a private responsibility or a joint private-public responsibility with many private players, and also if the selection process of partners has taken place via a combination of direct contacts and open selection, then the

project is certainly successful. For other combinations of features, the results are ambiguous.

*Rule 5.* If the selection procedure for partners in a PPP constellation is open and if there is a reasonable expectation of land price rises in the project stage, then the development project will be very successful. The combination of these two factors seems to be a strong one, as the complementary statements ( $E11 \neq 1$  and  $D10 = 1$ ;  $E11 = 1$  and  $D10 \neq 1$ ) lead to unfavourable performance results (mainly a success score of 1 or 2).

In conclusion, the rules generation procedure has led to a collection of interesting findings which—given the assumed validity and representativeness of the data set—reflect important lessons for urban development planning at the interface of public and private initiatives. The rough set analysis does not allow for the derivation of other rules which have a 100 per cent validity—although there may be cases which in a majority of the situations lead to some interesting conclusions. However, these are—given the small sample—statistically difficult to judge. We will now turn to an analysis of the constituent factors of the success scores at a more disaggregate level.

## 6.2 Partial Results

As mentioned above, the overall success score  $S$  is essentially a latent indicator which can be decomposed into partial performance scores  $P_1$ ,  $P_2$  and  $P_3$ . We will now apply the rough set analysis to each of these partial scores.

**Table 5.** Rough set decision rules for partial performance score (execution and organisation)

Rule number	If	Then	Urban projects concerned
1	D9 = 1	$P_1 = 1$	AME
2	A2 = 1	$P_1 = 2$	HEE, WAA
3	A2 = 3 and E 12 = 2	$P_1 = 2$	EIN
4	D8 = 2	$P_1 = 3$	ROT
5	A2 = 3 and E11 = 2	$P_1 = 3$	MAA
6	E11 = 1 and D10 = 1	$P_1 = 4$	AMS, DEB, NIJ

*Executive and organisational performance ( $P_1$ ).* Application of the rough set algorithm leads to the decision rules of an 'if, then' nature (shown in Table 5). Based on the results of this table and an interpretative analysis (via an inspection of complementary information in Tables 2 and 3), we may formulate—in a way analogous to subsection 6.1, but without further comments—the following lessons in the form of decision rules.

*Rule 1.* In the case of severe soil pollution, urban revitalisation projects appear to have a poor performance in terms of execution and organisation.

*Rule 2.* A case of a traditional PPP arrangement leads to a successful implementation and organisation of a project.

*Rule 3.* In the case of a concession and absence of temporally phased sub-projects, an urban revitalisation project may lead to a fair performance in terms of execution and organisation.

*Rule 4.* A case of reasonable financial transparency leads to a successful project outcome.

*Rule 5.* An urban project characterised by a concession agreement and a direct selection of partners has a successful execution and organisation.

*Rule 6.* In the case of expected land price rises and an open selection procedure, the

execution and organisation of the urban project concerned is very successful.

*Operating and marketing performance ( $P_2$ ).* The decision rules for these success factors are contained in Table 6. The logical rules are given below.

*Rule 1.* Low soil pollution costs do not necessarily lead to a good operational and marketing performance of a project.

*Rule 2.* In the case of a local project orientation, the performance in terms of operation and marketing tends to be poor.

*Rule 3.* A case of unclear prior transparency of profitability requirements and of a regional project scope may lead to fair operational and marketing project outcomes.

*Rule 4.* In the case of a private-oriented project (or a private-public model with many actors), we may expect the successful operation and marketing performance of the project.

*Rule 5.* An urban revitalisation project with mainly private financiers, with mainly private actors (or a joint arrangement with many players) and with a high degree of financial transparency will lead to a very high success score for operational and marketing indicators.

*Contractual and building performance ( $P_3$ ).* The decision rules for the contractual and building performance scores are given in Table 7.

**Table 6.** Rough set decision rules for partial performance score (operation and marketing)

Rule number	If	Then	Urban projects concerned
1	D9 = 3	$P_2 = 1$	AMS
2	A3 = 1	$P_2 = 1$	WAA
3	C6 = 2 and A3 = 2	$P_2 = 2$	AME, HEE
4	A1 = 2	$P_2 = 3$	DEB, EIN, ROT
5	B4 = 2 and A1 = 2 and C6 = 1	$P_2 = 4$	MAA, NIJ

*Rule 1.* If there is no clear awareness of the cost composition and risk distribution of different project parts, then the success score in terms of contractual and building performance is very poor.

*Rule 2.* In the case of soil pollution costs, the contractual and building performance is marginally successful.

*Rule 3.* A case with a transparent financial picture and a clear insight into profitability requirements leads to a successful project performance in terms of contractual and construction aspects.

*Rule 4.* If the financial transparency is alright, then the contractual and building performance is very high.

A more thorough and comprehensive judgement of the results from sub-sections 6.1 and 6.2 leads to the conclusion that the aggregate and partial results are largely consistent. Financial transparency and cost transparency form two critical success factors, while land price revenues, the selection procedure of partners and the institutional constellation of a PPP arrangement may also be seen as drivers of success.

## 7. Retrospect and Prospect

Increasingly, urban policy in modern societies has a competitive character: it seeks to achieve the highest socioeconomic progress. In a situation of devolution of administrative power, cities are bound to be more entrepreneurial, more market-oriented and

more international with a view to participation in global networks. City marketing is a proper instrument for a modern 'entrepreneurial city', provided that urban revitalisation policy is able to develop and create seedbed conditions for favouring and attracting business life. In this context, urban rehabilitation and urban revitalisation projects (for example, harbour-front development, city-centre transformation) are spearheads of effective urban development policy. Such a policy also requires critical reflection and repositioning of the urban economy and the role of the government. Institutional reform (such as privatisation or PPP arrangements) may then become a necessity, as it may lead to urban win-win situations with great added value. The task of the urban administration may then focus more on strategic development, on long-term interests and expectations, and on a balance with respect to environmental sustainability.

Furthermore, various specific issues may also have to be addressed. Based on a thorough comparison of nine Dutch case studies, we have come to the following conclusions.

First, a PPP arrangement has a high chance of becoming successful, if it is designed on the basis of joint-venture model. This also harmonises with the transition of urban governments towards an entrepreneurial role.

Next, a clear, timely and transparent mapping of all costs, revenues and profitability aspects of a PPP project is a *sine qua non*. Uncertainty in this respect is bound to lead to project failure.

The spatial scope of a project may also play an important role, in particular with

**Table 7.** Rough set decision rules for partial performance score (contractual and building)

Rule number	If	Then	Urban projects concerned
1	B5 = 2	$P_3 = 1$	HEE, MAA, WAA
2	D9 = 1	$P_3 = 2$	AME
3	D8 = 1 and C6 = 1	$P_3 = 3$	AMS, DEB, EIN, NIJ
4	D8 = 2	$P_3 = 4$	ROT

regard to the success of various project components. A larger geographical orientation of a development project tends to increase its performance (for example, through a broader marketing strategy).

Soil pollution may be a problem, but less for the overall performance of a project. Such costs are to be assessed in advance and the cleaning-up strategies have to be agreed upon in advance. However, for specific parts of a project, the costs of polluted soil may be problematic (especially during the organisational and executive stage).

And, finally, a clear insight into the planning of project parts, the risk profiles involved and the ways in which various partners are involved in different project elements is critical for the good performance of an urban development project. In general, a PPP arrangement requires a tailor-made collaboration between the public and private sectors.

This study has tried to identify the critical drivers of successful urban PPP projects with a view to urban revitalisation. The findings were based on an extensive analysis of results of case studies in The Netherlands. These findings do not contradict many experiences elsewhere and are largely supported by results from previous studies on PPP clusters in urban development planning. It is clear that the lessons drawn here may generate new hypotheses to be statistically tested in a broader review of experiences.

## Note

1. The ROSE software is available at: <http://www-idss.cs.put.poznan.pl/rose/>.

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## Appendix. A Concise Overview of the Nine Urban Development Projects

Our case study comprises nine urban development projects which met the criteria specified in section 4 (completion, sufficient data, critical mass and PP orientation). The extensive field work for these cases was undertaken in close collaboration with Arthur Andersen Real Estate Services. We will offer here a concise overview of these cases.

### 1. Amersfoort: Eemskwartier

This redevelopment project was concerned with the city core of Amersfoort. It was a brownfield site, strategically located. It aimed to establish a blend of public facilities, residential building, office functions and transport infrastructure. The project comprised many public and private partners (bank, pension funds, real estate developers, etc.). The project developed at a slow pace and was not satisfactorily equipped. Its total size is approximately 125 hectares.

### 2. Amstelveen: Stadshart

This project served to reinforce the economic functioning of the centre of Amstelveen, by improving residential, employment, shopping, recreational and cultural functions. The implementation was delegated to a specific project developer. The ambitions were (very) high, but the satisfaction of the user still leaves much to be desired. The approximate size is 15 hectares.

### 3. 's-Hertogenbosch: Paleiskwartier

This was a typical brownfield project where a potentially accessible area in the heart of the city was turned into a new combination of living and working. Public subsidies were rather scarce for this project, but the active co-operation between the private sector and the public sector led to a



rather promising performance. The size is about 20 hectares.

#### 4. Eindhoven: *De Witte Dame*

This was a large-scale industrial redevelopment project on a favourable location in the city. This project was meant to be an advanced technological innovation centre and it also had various complementary functions (cultural, educational, recreational and leisure). This turnkey project has—despite its limited scope—turned into a moderately successful project. The area covers about 4 hectares.

#### 5. Heerlen: *Centrumplan*

This centrally located project was a typical urban renewal project combining residential, employment and service functions. The development has shown some stagnation, mainly caused by a spatial fragmentation of this project. Thus far, the project has not yet gained a clear momentum. The size covers the entire inner-city area.

#### 6. Maastricht *Sphinx Céramique*

This was an industrial brownfield project in an interesting location in the city. The development was largely determined by private investors, while at a later stage only a modest public contribution was offered. It is a multifunctional project which is gradually developing. Its size is approximately 30 hectares.

#### 7. Nijmegen: *Brabantse Poort*

This was a project outside the city centre, but strategically located near nodal points of transport infrastructure. It was a broadly constituted turnkey project with recreational and cultural, office, residential, business, leisure and sports, and industrial functions. It has had strong institutional and financial basis and met all expectations. The eventual area covers some 4 hectares.

#### 8. Rotterdam: *Beurspassage*

This project has been realised right at the heart of Rotterdam. It meant a drastic restructuring of the central shopping area. The project had strong private-sector involvement. It combined culture, leisure, housing, shopping, office and public services and has turned out to be a rather appealing and successful project. The size is approximately 5 hectares.

#### 9. Waalre/Aalst: *Centrumplan*

This project was based on a drastic restructuring of the inner city and aimed to offer a set of competitive services with respect to other cities in the region (such as Valkenswaard, Eindhoven). It has taken quite some time to get this project off the ground and it has not yet reached a stage of maturity. The relevant area covers about 2 hectares.