UNDERSTANDING AGGLOMERATION
A CRITICAL APPRAISAL OF AGGLOMERATION THEORIES FROM THE PERSPECTIVE OF ROTTERDAM’S CENTRAL DISTRICT

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A critical appraisal of agglomeration theories from the
perspective of Rotterdam’s Central District

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Msc thesis – Lennaert A. van Vuurde

“You make a set of clearly untrue simplifications to get the system down to something you can handle; those simplifications are dedicated partly by guesses about what is important, and partly by the modelling techniques available. The end result, if the model is a good one, is an improved insight into why the vastly more complex real system behaves the way it does.”


KEYWORDS
Agglomeration, density, location theories, mixed-use, Leefbaarometer, real estate, Rotterdam Central District, Spacemate, Space Syntax, urban area development, urban economics.
ACKNOWLEDGEMENTS

In front of you lies my thesis *Understanding Agglomeration* which represents the completion of the dual master *Real Estate & Housing and Urbanism* that I have followed at the Faculty of Architecture of the Technical University of Delft in the past years. Over a year ago I got into the theory and reasoning behind agglomeration and the possibility of using these insight as a tool to support the demand-side on specific locations, with the goals of stimulation urban area development. Now the thesis is finalized I would like this opportunity to thank a few persons who – each in their own way – have added a valuable contribution to the realization of this thesis.

First of all, I would like to thank my mentors Akkelies van Nes, Wout van der Toorn Vrijthoff, John Westrik and Herman Vande Putte for their professional guidance that has given rise to the use of new points of views during the writing of this thesis. At first, it was my intention to formulate a generic development strategy for several Central Business Districts that have been planned in the past couple of years, such as the Zuidas in Amsterdam, Utrecht Central Station and Rotterdams’ Central District. Given that the research would become practical too complex and the discipline of urbanism would be an insufficient part of the thesis, I decided – in consultation with Herman, Wout and Akkelies – to shift the scope of the thesis to the fundamental problem that seemed to hamper the urban area development. Based on many good discussions and an essay from Herman’s course Corporations and Cities, the reasoning originated that in these areas there was insufficient demand for real estate from the user-end of the market, which led to the theoretical study of agglomeration.

Based on a few theories that originated from an extensive literature review, I was able to identify the various factors that could stimulate agglomeration of different users. Yet, in order to prevent the thesis from exclusively becoming a theoretical appraisal, John managed to bring more urban themes to the fore. I also want to thank Akkelies for her enthusiasm, for the time she invested in the development of this thesis and for explaining me the basics of working with UCL Depthmap. Finally I thank Wout for his help regarding the thesis and for monitoring the process and the structure, as the dual graduation programme has led to some hectic situations.

Secondly, above all I explicitly thank my beloved Leanne for the support she has provided me when my hard drive crashed just two days before the hand-in date of this thesis. This thesis would have never been realised in-time and in its current form without her support, given the large amount of data that got lost at the last minute. Given the stress and hard work I confronted her with I really hope that we will now be able to relax together and enjoy the summer.

I also would like to thank my (former) roommates, friends, my fellow students and particularly the DoVaBo for frequently providing me relaxation in the form of conversations, drinks, coffee and lunch-breaks.

Last but not least I would like to extent my gratitude to my parents for their continuous support during my years of study in Delft. Regarding my family I am
proud and delighted for the fact that my grandfather will be present on my graduation, even though I have given him, like so many others, too little attention as a result of my graduation. Hence finally a word of gratitude to all other family and friends that have been told “I don’t have time” in the past year.

The Hague, April 2012
Lennaert van Vuurde
ABSTRACT

The goal of this research is to provide a critical appraisal of agglomeration theories in order to understand why it occurs. The research examines to what extent it is possible for urban areas to adapt to the potential of agglomeration. This is carried out through comparing an appraisal of agglomeration theories to the features of an urban area for which urban development plans exist (the Rotterdam Central District). The idea behind is that any potential on the formation of agglomeration should be used as this will lead to an increasing demand for real estate which may as well boost urban area development projects. For this reason the main research question is formulated as follows:

To what extent does the Rotterdam Central District provide bases for firms and households to agglomerate and thereby prompt the urban area development?

In order to answer the research question 5 approaches that offer an understanding of agglomeration were chosen, namely:

- **Urban economic theories:**
  With the use of both (neo-) classic as (post-) modern location theories, an explanation of agglomeration is given from an economic point of view. The concepts of *urbanisation* and *localisation economies* provide an understanding of the importance of a specialised or diversified economy. Subsequent, eight economies and 5 diseconomies of scale are explained as these provide the most important and most practical understanding of economic reasons to agglomerate. Broadly speaking, it boils down to the fact that if an agglomeration grows, economies as such may first occur until the moment that the benefits of agglomeration no longer outweigh the disadvantages and diseconomies get the upper hand.

- **Location factors for firms:**
  This approach elaborates on the location preferences of firms in order to understand why they settle at certain locations. From this study follows that 7 aspects determine the settlement behaviour of firms, also including retailers: the accessibility of a location, proximity to other firms, the appearance of a building, the quality of life, the presence of a (high-quality) labour market, a (social) network-structure, and (sectorial) diversity.

- **Location factors for households:**
  A subdivision into four domains has been made in order to get an overview of the key location preferences of households: the physical environment (mainly concerning accessibility and possibilities to settle), the quality of life (housing qualities, qualities of the direct living environment, urban attractions and qualities in the urban region and hinterland), human capital (the composition of the population and the value of highly educated or creative people), and the economic profile (explaining the relationship between agglomeration, employment growth, education levels and their effects on the economy).

- **Market approach and urban area development:**
Based on a general explanation of urban area development processes in the Netherlands, the real estate market is explained with reference to the financial plan and the actors involved. Also the impact that the crises had on the real estate market, including funding issues and the fall in demand for properties, are clarified in this chapter.

- Quantitative framework:
  As the importance of a liveable neighbourhood, high densities and the right function mix were put forward in previous chapters, in this chapter a framework is established which clarifies the relationship between these indices and then studies their relationship with the use of statistics. This shows that the function mix is correlated with both the liveability as well as with the density of neighbourhoods. Density and liveability show no apparent relationship, yet further statistical research has proven a relationship between the density on the one hand and a number of liveability-domains: safety, public facilities, and social cohesion.

Besides, the quantitative framework makes use of the Space Syntax method in order to determine whether modifications to the street pattern are desirable with a view to the development of the Rotterdam Central District (RCD).

The link with Rotterdam Central District is made more explicitly once all characteristics have been explained that were associated with the factors that emerged from the 5 approaches. In addition, all identified factors are, from each point of view (approach), translated to spatial implications. Based on the results that followed from the five approaches, five schematic maps are drawn taking only a single approach into account.

Initially it was assumed that the (re-) development of urban areas could be stimulated by encouraging the process of agglomeration. Furthermore it was presumed that agglomeration would take place when the supply-end of the market would match to user preferences. Hence a conclusion was drawn in line with this thinking through seeking for analogies between the 5 final pictures. This comparison between the differences and similarities leads to four general recommendations regarding Rotterdam Central District based on the discussed theories:

- Deal more economically with the remaining land and use it more intense;
- Provide more publicly accessible (pocket-) parks in the public space of the RCD;
- More housing and shops are needed, whereas no final image points the need for more offices;
- A sufficient amount of parking places is valued by both residents as by firms, although not following from the other theories;

Yet it should be concluded that it is unlikely that these adaptations to the existing plan will be able to stimulate the agglomeration of firms and households to the district. Despite some promising target groups and positive or wishful thinking, the influence of the economy on the real estate market appears to be very large as it affects both the supply as well as the demand-side. Hence it should be concluded that agglomeration theories do not provide sufficient basis to stimulate the demand for real estate in an area.
Nevertheless, a better understanding of agglomeration has been provided in this study based on a broad overview of many theories and in-depth research on a number of aspects that were considered to be of interest. Moreover, a critical appraisal of these theories has been provided from the perspective of Rotterdam Central District which has led to a number of spatial recommendations to the existing master plan.

Despite the fact that formulation of a new development strategy is considered beyond the scope of this thesis, a number of recommendations on the process and organisation are made as well:

- Increase the support through focussing on more openness and broadening the diversity and number of actors involved.
- Provide more flexibility in the zoning plan to enable more types of developments;
- Focus on the plots next to the Central Station as this new terminal for public transport will certainly be ready in a few months;
- Divide the program financially by splitting unprofitable parts from profitable parts, by phasing or through modifications to the project;
- Reduce the size and duration of funding needed by the developer, by lengthening the time the municipality owns the ground.
- Turn back the leasehold-constructions and bring the project back to a conveniently arrangeable size through redistribution of the plots to a smaller development grain;
Understanding Agglomeration
a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District
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READING GUIDE

This master thesis has been divided in four parts that moreover have been subdivided in several chapters:

Part I: Thesis plan (research proposal)
Part II: Theoretical background (literature study)
Part III: Analysis framework (quantitative approach)
Part IV: Conclusions and recommendations (interpretation of the results)

The first part offers an introduction to the design of the research (e.g. the research questions, methodology, relevance) and on the other hand an introduction is provided to the case by means of the (policy-) background of the Rotterdam Central District.

The second part is very much the theoretical backbone of this research and has been divided in three parts: urban economics, location preferences of firms, and location preferences of households. The chosen subdivision within this extensive literature study rests mainly on the distinction between economic theories and (hedonic) studies on location preferences of firms and households. The former economic theories (such as the international trade, urban or spatial economy) by means of models attempt, according to Ohlin (1933), to find an answer to the question why certain parties produce specific goods at a specific location. The latter literature reflects on the specific and general needs of businesses (including retailers) and households, all resulting from a multitude of scientific studies. This part concludes with a synthesis, once again summing up the key aspects of the theories.

In the third part the findings that stem from the literature study are supplemented with analysis frameworks that emphasise on the process and the quantitative characteristics of urban area developments in the Netherlands. The quantitative research focusses on the interrelations between the density, the function mix and the liveability, using both statistics as well as theory.

Part IV offers an interpretation of the outputs by means of a spatial comparison between the five approaches that followed from the theory. This part concludes with more general conclusions, a discussion, recommendations, an evaluation and a personal reflection.
Zakenlijk CS onder vuur

Raad vreest voor financieel fiasco bij Central District

ROTTERDAM – Het Centraal District moet de nieuwe ‘banenmotor’ van Rotterdam worden, maar de prestigieuze zakenlijn naast het Centraal Station dreigt uit te monden in een financieel fiasco. Dat zegt de gemeenteraad, die wil dat wethouder Karakus zijn huiswerk opnieuw doet.

De nieuwe Kop van Zuid, of nog kortweg ‘KZ’, is de grootste ontwikkeling van de stad en wordt gezien als de toekomst van Rotterdam. Maar na talloze vertragingen en overheidsschulden is er vrees voor een financieel fiasco. De gemeenteraad eist nu dat Karakus zijn werk teruggestuurd krijgt.

Wethouder Karakus vertelt dat de plannen voor de nieuwe lijn nog niet helemaal gereed zijn. “We hebben nog een plekje te vinden voor de nieuwe lijn, maar dat is een kwestie van tijd. De banenmotor is een gigantische opdracht en dat wil niet zeggen dat we er niet aan werken,” aldus Karakus.

De gemeenteraad rekent echter beter op bijzondere maatregelen. “De KZ moet een succes zijn, maar als dat niet lukt, dan moeten we andere oplossingen zoeken,” zegt de burgemeester. Met andere woorden: de banenmotor zal niet worden uitgeschakeld voor zover mogelijk.

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RESEARCH INTRODUCTION AND METHODOLOGY

1.1 SUBJECT AND BACKGROUND

Location is commonly said to be the most important factor in determining the value of an urban or real estate development. It is principally defined by a location’s proximity to goods (best for suppliers and customers), services (near transportation nodes and networks), and amenities (e.g. environmental preferences). External factors as such have moulded the foundations of numerous location theories, explaining how agglomeration economies arise from external economies of scale, also known as externalities.

Due to these externalities, people and firms often concentrate in particular areas. For example, people tend to move to cities because of the large amount of jobs, social activities and specialist services. However, there is always the risk of diseconomies of scale, when concentrations become congested or disadvantages start to dominate.

Both Ottaviano and Thisse (2003) and Storper and Manville (2006) point out that NEG-models allow one to better understand why agglomeration occurs, but that it offers little information about where it arises. They subdivide their remark in two by pointing out the importance of studying a multiregional system, with the aim to understand why some regions are more successful than others. The second major point they put on the research agenda is to zoom in on a city, questioning how to steer agglomeration to a preferred location in order to prompt successful development of that particular area.

From the perspective of developing and planning central urban areas, Durden and Marble (1961) also indicate the value of expanding knowledge on structural relationships between a central district and the rest of its (sub-) urban region. Zooming in to an internal point of view, they pursue sharp ideas of the internal spatial structure and the exact nature of the total ‘mix’ of activities that might be expected within the core district of any given urban region, about which currently only little understanding exists.

Hence it seems valuable to obtain a better understanding of the forces attracting firms and households to central areas and their demands towards the physical, economical and social infrastructure. The relationship between both spatial and economic characteristics determines the type of real estate that ‘works’. Connecting agglomeration theories (which are external) and user demands (which are internal) to urban theories on physical requirements, may steer agglomeration to a preferred location in order to prompt a successful urban area development.

A large number of urban area developments in the Netherlands focus on inner-city and transformation areas, such as Amsterdam South-axis, The Hague New Central, and the Utrecht Central Station Area. Comparable to the so-called central business districts abroad, many of those districts are intended as centres of activities,
services, and amenities with good accessibility and a high concentration of firms and offices (Tang et al., 1999). However, private and public investments in the development of several of these areas are precarious, which is according to Habraken (2010) on the one hand due to the high purchasing costs (due to business’ outplacements), high costs to clean up the site, and stringent (public) preconditions (noise, air quality, parking). On the other hand, the user demand for space has dropped as a result of the credit crunch, uncertainties on the housing market, and others.

1.2 OBJECTIVES AND RESEARCH QUESTIONS

As put forward in the previous subsection, the scope this thesis is directed towards three keynotes, namely inner-city developments, high densities, and the development process. As suggested by Durden and Marble (1961), a better understanding of the preconditions may steer for a successful outcome of the urban development.

Hence the research question should meet the objective to obtain a generic research outcome with tangible keystones within the Rotterdam Central District. This has been worked out through offering a theoretical product as a basis to understand the agglomeration of firms and households. For this purpose, urban theories and analyses have been used in order to understand how real estate development may take place with regard to meeting user requirements for Dutch inner cities. This implicates to provide insight in both the functioning of the urban fabric as well as a better understanding of liveable urban qualities under the constant influence of economies (such as the real estate market), usage (by firms and households), governmental management and policies.

The main research question is formulated on the basis of this rather wide objective. In addition, the main question has been composed of five components, namely the important actors, which are according to the plans a mix of firms and households. Secondly and thirdly, the place and target of the research, which is to research the factors that prompt agglomeration in Rotterdam Central District. Finally, the fourth and fifth component deal with the question how to use the result and why this result should ‘work’, which is to prompt the urban area development through introducing an understanding of agglomeration theories.

Consequently, the research question is formulated as follows:

To what extent does the Rotterdam Central District provide bases for firms and households to agglomerate and thereby prompt the urban area development?

In order to answer the main research question and the issues involved, the following three sub-questions – some restraining multiple questions – will be taken into account:

1.2.1 Subquestion 1: the agglomeration in Rotterdam’s Central District

The first subquestion deals with the general conditions that should be created to match the demands of firms and households. Glaeser et al. (2001) point out that people and jobs tend to cluster and demand density, when firms profit from
agglomeration economies. First of all (see ad 1.), the functioning and effects of agglomeration will be examined from a theoretical perspective. Secondly (see ad 2.) it is necessary to gather knowledge on the working and living preferences of firms and households, in order to create sufficient support basis for agglomeration. User preferences are the reasons for firms and households to agglomerate – as suggested by Ottaviano and Thisse (2003) – and may enhance the demand. Finally the implications of the abovementioned knowledge are considered for Rotterdam Central District (ad 3.). For this purpose, the historical and policy background of the plans will be provided as well. These three issues are answered through the following subquestion:

What are the well-established spatial and physical demands for firms and households to agglomerate in one particular area, such as Rotterdam Central District?

Ad 1. How are centripetal and centrifugal forces explained from the agglomeration theories?
Ad 2. What user demands should be met to retain firms and households, attract new ones, and stimulate the stay of visitors and workers, and how do they interrelate?
Ad 3. How should these agglomeration theories be understood with respect to the development of Rotterdam Central District?

1.2.2 Subquestion 2: quantitative principles for urban area developments
Alongside the agglomeration forces, the existing spatial, economic and social bases for the proposed development of Rotterdam Central District are analysed. Firstly, the question arises how the process and product of an urban area development are established (ad 1.). Secondly, when relating the previous to Rotterdam Central District, the question arises whether adjustments to the plan or process may stimulate agglomeration (ad 2.). The overall subquestion is consequently defined as:

Which adjustments may improve urban plans and development processes, when relating it to the literature on agglomeration of firms and households?

Ad 1. How do urban area developments, as proposed for Rotterdam Central District, come about from a spatial and process-oriented perspective?
Ad 2. What adjustments to the development process or product can be done to stimulate agglomeration?

1.2.3 Subquestion 3: implementation of the results
The combination of agglomeration forces, user demands and knowledge on the history and policy background (subquestion 1), as well as knowledge regarding the establishment of the plans and processes for urban area developments (subquestion 2), should secure a strong basis to prompt urban area developments. Hence the final subquestion concerns how the knowledge gained can be combined to an overall picture (ad 1.), and whether this can be addressed to prompt urban area developments (ad 2.). These issues have resulted in the following subquestion:
Is it possible to prompt urban area developments with the knowledge gained or should a solution to do so be sought elsewhere?

Ad 1. How can the knowledge regarding agglomeration and the establishment of urban area developments be combined to a generic understanding?

Ad 2. Does the understanding that can be drawn from this thesis provide sufficient bases to prompt urban area developments?
1.3 RELEVANCE OF RESEARCH
The general objective is to add to the theoretic body of literature of urban area development from the perspective of real estate management and urbanism, but also to present genuine opportunity to maximise the density of the Rotterdam Central District. Subsequent an explanation of the scientific, social and practical relevance is given in order to clarify the relevance and importance of this thesis.

1.3.1 Scientific relevance
From a scientific point of view, the research is relevant for it contributes to the existing body of knowledge. The elaborate literature study presents knowledge on the causes of agglomeration, but also offers an overview of deglomerating forces which has not been drawn up before. The understanding of the nature of agglomeration and deglomeration in relation to user preferences and market conditions is scrutinised in order to expand knowledge on the development of inner-city environments. The combination of this matter offers a generic understanding of possibilities to steer on agglomeration through maximising user demand and optimising the development process.

1.3.2 Social relevance
The social relevance lies in the proposal to develop the core area within Rotterdam’s inner-city according to the preferences of firms and households. This is founded on a basis of external agglomeration economies and residential attractions to attract future users, to introduce liveliness and to bring about sufficient consumer-basis for retail and (hospitality-) services. In addition, some specific recommendations are made regarding the Rotterdam Central District, of which the development is social relevant given de central location in the city.

1.3.3 Practical relevance
It is practically relevant to point out real estate opportunities for parties involved in the process, as well as favourable insights for policy-makers, concerned with the development of Rotterdam Central District. The overall picture is meant to make a contribution to the development of Rotterdam Central District, that is in danger of unravelling further.
1.4 CASE SELECTION AND ACCOUNT

As described earlier, the aim of this thesis is to compare the acquired knowledge regarding location preferences of firms and households with an existing plan for an integrated urban area development on an inner city location. For which multiple parties seem to have the ambitions to provide both in the wishes of firms and households in an area with a high density.

The location had to involve a location for which development plans already existed, but where intervention seems appropriate given both the financing and the realization hardly come off the ground. The urban area development ought to be in the process phase which would still provide opportunities to steer on the content, planning and implementation.

The case which met the requirements as mentioned earlier, and hence is part of this research, is the so-called Central District which is located in station area in the centre of the Dutch port city of Rotterdam.

Finally, the choice for the Rotterdam Central District was motivated by the consideration that I have followed the developments of the different building- and area developments in Rotterdam for years and I would find it a shame not to use that knowledge and involvement.
1.5 RESEARCH MODEL

To come to an understanding of agglomeration theories in relation to urban area developments, preliminary research has been performed that consist of three parts. The first part concerns the research design and background information regarding the Rotterdam Central District. This serves as a basis for further research and the interpretation of the research findings regarding RCD are discussed in each synthesis.

Subsequently, Part II looks into the scientific theories on agglomeration and the empirical studies regarding location preferences. Given this part provides an important basis for future research, the theories that have emerge here are continuously referred back to.

In the third part a definition and determination of relevant element within the urban area development follows, on which basis a start model is presented. Furthermore, a spatial analysis framework will be provided which enables judgement of the quantitative context. This analysis framework is made specific for urban area development of the RCD (chapter 8), as a way of testing the framework. The subsequent synthesis will be combined with the previous synthesis which will result in the interpretation of the research results.

The final merging of the syntheses results, in Part IV, in the conclusions and recommendations, followed by the reflection an evaluation. The figure below offers the research model combined with the relationship (follow-up) of the thesis’ Parts.

Figure 1: the thesis’ research model

Source: personal interpretation

1.5.1 Research instruments

The semi-structured literature study consists of a documentation of available literature and collection of data. In addition, with regard to the RCD the history and policy background have been carefully reviewed.

The combined knowledge is subsequently used in a quantitative study of the spatial implications of agglomeration. For this several research tools are used, among which a number of indices (FSI, GSI, MXI), the Leefbaarometer and Space Syntax (UCL Depthmap).
1.6 INVOLVED DISCIPLINES

The subject of this thesis deals with input from the research fields of urbanism (focusing on spatial theorem) and real estate management (focusing on the development and management). Throughout the literature study, the reference-study, and the interviews, no distinction will be made between the two research fields.

The departments and master-tracks involved with this graduation are Spatial Planning & Strategy (part of Urbanism), Urban Compositions (part of Urbanism), Urban Area Development (part of Real Estate & Housing), and Corporate Real Estate Management (part of Real Estate & Housing). Knowledge and instruments related to these disciplines will be used in order to answer the research questions.

The following mentors have been involved in writing this graduation thesis:

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  Chair of Urban Area Development at the department of Real Estate and Housing

- Dr. A. van Nes
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chapter 2

INTRODUCTION TO ROTTERDAM CENTRAL DISTRICT

2.1 HISTORICAL URBAN DEVELOPMENT OF THE RCD

Bertolini and Split (1998) make clear that no universal definition exists for the station area, although existing descriptions of station areas can be divided into four categories based on the walkable radius (usually a 10 minute walk of approximately 500 meters), its functional-historical elements (such as infrastructure), its topology (arbitrarily established), or based on the development perimeter.

Rotterdam has a station area that is clearly defined by a development perimeter as such which is named the Rotterdam Central District (RCD). The district is located within the C.S. Kwartier (Central Station Quarters), as shown in the future allotment (figure 2) that was designed by Maxwan in 2005. An overview of the data regarding the existing and future buildings is provided in Appendix 1. Maxwan’s masterplan provides 5 development sites, of which two sites (Conradstraat and Delftseplein) are still unexploited. The existing real estate is replaced or extended at the other locations (Schiekadeblok, Weenapoint and the Schaatsbaanlocatie in the distant future). Currently, the actually exploited surface area is therefore low, the buildings are somewhat fragmented and offer little qualities (Schiestraat, Delftsestraat (the future Schiekadeblok), and the Schaatsbaanlocatie).

This thesis will, as in the previous section has been explained, based on a research into agglomeration theories, come up with recommendations for the RCD. Although these theories will only be explained in Part II, this chapter will explain the history of the RCD as an introduction.

Figure 2: allotment of the Rotterdam Central District by Maxwan.
2.1.1 Weena’s history until the end of the 20th century
From about 1136 to 1426 there was a stone keep named the Hof van Wena (literally residence of Wena) at the location of the former Hofplein Station. The fortified residence, with its magnificent gardens and surrounding farmlands, was originally a haven for local nobility, but was almost completely destroyed during the Hoekse en Kabeljauwse Twisten (Hooks and Cod wars) in the 14th and 15th century.

Figure 3: historical maps of Rotterdam

The residence of Wena at the river Rotte’s bend in 1340
Map of the triangular fortified city in 1649
Map of Rotterdam and several extensions in 1784
Map of the city centre of Rotterdam in 1897

Since the beginning of the eighteenth century, the population of Rotterdam increased significantly. Between 1700 and 1900, the city grew from less than 50,000 to more than 300,000 inhabitants. This growth occurred mostly during the Industrialisation (the second half of the 19th century), when Rotterdam started to become a world port. The growth of the population was evidently accompanied by
an increase of industries and trade, which soon led to the need for improved links with the city’s surroundings. In November 1848 train station Delftse Poort – as terminus of the Oude Lijn (the old line Amsterdam-The Hague-Rotterdam) – was opened to improve the accessibility of the city. It was designed by F.W. Conrad in Gothic Revival style and built in the head of the inner city triangle, opposite of the Delftse Poort. In 1857 a zoo was built at the location of the current square (Stationsplein and Kruisplein) and a road structure gradually evolved along its border canal (hence the Diergaardesingel). The area was however primarily characterised by meadows, a few farms, a ropewalk (lijnbaan), and a bleaching that were part of the manor of Blommersdijk. For a long time its open and rural character was retained as the area was very sensitive to flooding. Only after the completion of the Water Project in 1866, one was able to regulate the water heights whereby the area was adapted for cultivation (Gemeente Rotterdam, 2005).

Figure 4: The L-shaped station Delftse Poort along the Weena with the zoo in the foreground in 1922

In 1868 it was decided to create a second rail-line through the city build on a viaduct, as a result of which a new station Delftse Poort had to be build 400 metres westwards in 1877. The new station Delftse Poort (currently Rotterdam Centraal
Station) was, as shown on the city map of 1897, situated outside the city’s ramparts of the early 20th century.

The adjacent zoo was shifted slightly westward for the development of this station and its oval-shaped square (the Stationsplein). The area west of the station, between the zoo and the Spoorsingel, was entirely in use as a weaving station. The Delftsestraat was first to appear on a city map dating from 1884 and was used as main access to the new station’s square from the West-Schiekade. The station was reached through the Stationsweg for those that came from the direction of the Hofplein.

The area surrounding the Hofplein used to be the dandyish heart of Rotterdam with a railway station (Station Hofplein) and lots of busy cafes, restaurants, department stores and many smaller shops. The area became more densely built due to its popularity during this period (Gemeente Rotterdam, 2005).

Figure 5: an aerial photograph of the bombed and burnt city of Rotterdam

Figure 6: first page of a pamphlet dropped by the RAF over the Ruhr-area

The bombing of Rotterdam’s city centre by the German Wehrmacht in May 1940 and the fires it caused, destructed almost the entire city centre and many of its surrounding areas. Virtually the entire station area had been destroyed, including the zoo and the adjacent streets (the Schiestraat, the Poortstraat and the Delftsestraat). Despite early designs from 1941 by architect Sybold Ravesteyn, the hit station remained in use for 17 more years as Rotterdam gave priority to the restoration of the port as well as reinstating city services, housing and shops (Gemeente Rotterdam, 2005).
In 1941 already, Willem Witteveen designed the first reconstruction plan for the ruined city, taking a road scheme as a starting point. The core of his plan was a road circuit – formed by the Hofplein, the Coolsingel, the Blaak and the Goudsesingel – around the former city centre for which several major waterways would be muted with debris of war. In addition, station Delftse Poort was moved westward and was given its current name Centraal Station (Duivenbode, 2009). Also, his plan was characterised by a shift from industries to the Spaanse Polder to enable the return of 40% of the old dwellings (Gemeente Rotterdam, 2005).
In 1946, a revision of Witteveen’s plan by Cornelis van Traa – called the *Basisplan* – presumed a modern city centre with predominant urban functions and a subordinate place to live. The pre-war street pattern was streamlined for traffic means through the introduction of a system of squares and boulevards, of which *Weena* was considered the most important as a direct access from the *Hofplein* (Gemeente Rotterdam, 2005; Van Duivenbode, 2009). The major infrastructural connections were used as carriers for the *Basisplan*, and would function as a connection between the separated living, working and shopping areas (Van Duivenbode, 2009).

Only since the 50s, the new centre had been constructed according to the main features of the *Basisplan*, with exception of building several more residences in the downtown area than initially planned. The implementation of the plan was accompanied by a construction ban for a number of areas – some of which were located along the *Weena* – intended cope with yet unforeseen special purposes in the future. Being a reserve location, the *Weena* was at first left partly undeveloped and partly used for light and temporary programmes, and later temporary arranged as a deer park with some pavilions for catering (Duivenbode, 2009).

The new station designed by Van Ravesteyn was again situated west of the old station and was inaugurated in 1957. Only in the early 1960s, the area near the *Delftsestraat* was designated as a business area according to a larger, more austere, and businesslike design, even though the *Groothandelsgebouw* and post office (currently Central Post) used to be normative developments for the *Weena* in the early 1950s (Duivenbode, 2009).

Despite the revisions, the *Basisplan* was conceived as a business district wherein residential functions almost entirely lacked, which was in accordance with the Modernists’ principles (het *Nieuwe Bouwen*). In addition, the 1960s and 1970s were a period in Dutch urban planning currently referred to as the ‘makeability’ (*maakbaarheid*); the arranged cohabitation of the urban community. Compared to other cities in the Netherlands, the centre of Rotterdam obtained a low density and low built-up area as a result of these principles, causing absence of a pleasant atmosphere and abandoned streets in the evening hours. The city life was also fragmented by a lack of consistency between the buildings and a lack of logical routes between different parts (Gemeente Rotterdam, 2010). Perhaps as a result of this situation, at the end of the first reconstruction period a policy was announced to continually put more emphasis on residential and entertainment functions in the centre, which is also referred to as the *kleinschaligheidsgedachte* (the notion of small-scale building) that prevailed from 1974 onwards (Duivenbode, 2009). This approach to city planning was based on social democracy through a coalition between local residents’ committees and local authorities. The intensive cooperation between businesses and the local government ceased to exist when the government came to regard the city as a residence for its citizens as a result of which an unfavourable business climate developed (Wigmans, 2001).

In 1977, the municipality of Rotterdam held a competition for the *Weena*-area, which was generally perceived as a problematic. Before the final decisions on the spatial structure would be taken, they wanted to get insight into the possibilities of the area. Although approximately 70 ideas were submitted, none of the submissions were considered suitable to be elaborated (Duivenbode, 2009). In 1978
the first discussions started to cover or tunnel the Weena to establish a better connection between the station and the shopping area (the Karel Doormanstraat and the Lijnbaan). Eventually a plan for a metropolitan boulevard was chosen from all variants, although this was later adapted numerous times to its present form (Duivenbode, 2009).

2.1.2 The district’s developments to date
Since the war, many plans and ambitions for the Hofplein and Weena have been presented in that way, yet the area remained undeveloped for reasons stated above until the early 1980s (Duivenbode, 2009). However, demand for urban developments near the Central Station arose in the mid-eighties. Thus, a study to investigate the possibilities of the Weena was launched again with the aim to formulate the most appropriate development model. Eventually a combination of economic market tendencies, risk minimisation, and the desire to develop the area in phases, led to the boulevard model as it currently functions. On account of the development of the Weena – with a 151 meter office building named the Delftse Poort as the nation’s highest at the time – high-rise became a manifested phenomenon. For the first time a high-rise policy was formulated and the Station Quarter was emphatically part of it (Gemeente Rotterdam, 2005).

Figure 9: the Central District with Delftse Poort and the Weenatoren under construction in 1990.
compared to the beginning of this century the addition of high-rise apartments has improved living conditions of the downtown area. The extra homes also offered sufficient support for more shops, restaurants, and more terraces (Gemeente Rotterdam, 2010).

All that time – despite the concept of the city as a sum of projects which had caused some new developments at specific sites within the city – the central station building and large parts of its surroundings remained undisturbed as ‘metropolitan potential’. The Station Quarters was still seen as a backup location for the next tranche of offices and homes. This changed in 1997 when the Central Station and its surrounding area was appointed as one of the *Nieuwe Sleutelprojecten* (NSP: New Key-Projects) by the central government. The NSP’s involved the renewal of HSL-stations (High Speed Line) in the Netherlands and the integral development of some of their surrounding urban areas.

Since 2009, Rotterdam Central Station is one of only 20 HST (High Speed Train) stops in Europe (Wigmans, 2001) and would thus become too small to accommodate an expected 50%-growth of passenger volumes by 2025. In 1995, Rotterdam’s urban planning agency and the Dutch Railways (NS) therefore initiated to develop ideas for a new station and the restructuring of its surroundings (Wigmans, 2001; Trip, 2005). In 1997, this led to a public-private partnership (PPP) between the City of Rotterdam, the NS Vastgoed (the real estate branch of the national railway company), the property developer ING Vastgoed, and the property development investor Rodamco Netherlands (through the acquisition of Amvest Office Nova BV in 2000), which together formed the Alliantie. Remarkably, the national government refused to participate in the partnership, disappointing the participating parties.

After an early master plan by Alsop Architects, for which public-private cooperation effectively ceased to exist shortly after its presentation in April 2001¹, a new programme of requirements was formulated in 2003 (Trip, 2005). Attracting (inter) national firms as well as the focus on diverse consumer amenities (culture, leisure and urban entertainment) were some of the unchanging components within this new programme of requirements (Wigmans and Kooijman, 2003). The name Rotterdam Central District was explicitly chosen to emphasise that the area was not a copy of the average American or Asian Central Business District. The emphasis on district was chosen to stress that the area was to be a department within the city as it distinguishes itself as a functionally specialised area, but is nevertheless an integral part of the city and should thus explicitly be connected with the surrounding spaces and (finer-grained) urban fabric.

Eventually, in 2007, the station by Van Ravesteyn was closed to make way for a new station designed by Team CS (a group of architectural firms, consisting of Benthem Crouwel Architects, Meyer and Van Schooten, and West 8).

The municipality currently stands an ambitious attitude which was, among other things, expressed by its notification of a 2nd Era of Reconstruction (Gemeente

¹ Reasons for this included: (1) Rodamco quitting the Alliantie due to tax legislation, (2) ING that failed to acquire the old Post Office to strengthen its real estate position, (3) the central government which not accepted the financial analyses, (4) a retrenchment of the plan that was also rejected by the government, and (5) the changed political climate that presumed ambitions being too high.
Rotterdam and dS+V, 2009). Despite the ambition which was also reflected in the presentation for redevelopment of the RCD and several attempts to carry the plans through, the process appears to stay put.

In the new plans (initiated in 2005) for the renewal of the Central District, the symbolic functioning as a city gate is still considered one of Rotterdam’s most important urban projects for the period 2010-2020. Major differences from the new plans compared to Alsop’s plan were on the one hand its size and costs (no urban entertainment, hotel and theatre are included in the current plan), and on the other hand Alsop’s plan was based on a broader vision for the city as well as several broader urban economic concepts (Trip, 2005). Nevertheless, the new station and related infrastructure involves a purely public investment, whereas for the development of the surrounding area – although being much smaller than the area considered in Alsop’s master plan – private investments are still necessary (Trip, 2005).
2.2 POLICY DOCUMENTS
As of Alsop Architects’ 2001 plan for the RCD, some important policy documents have been drawn. First though, the old master plan by Alsop will be discussed, whereupon 13 newer policy documents will be discussed to clarify the design, background, principles and content of the current plans.

2.2.1 July 2001: Design Masterplan Rotterdam Central Station
Commissie Ruimtelijke Ordening en Grondzaken / Commission Spatial Planning and Land Use

After the City Council agreed on the Programme Principles for Rotterdam Central Station in May 2000, an integral master plan by William Alsop followed in juli 2001. The master plan aimed to transform the weak surrounding areas of the railway station to a strong central urban area. The programme assumed the development of 641.000 m² of real estate (318.000 m² offices, 195.000 m² of housing, 121.000 m² city theatre, and 7.000 m² for a hotel) through building new buildings and redevelopment of the existing properties. It was however intended to regularly check whether the designed development would lead to an urban environment as suggested by the master plan.

Figure 10: Alsop’s masterplan for the area surrounding Rotterdam Central Station.

In 1997, a planning agreement between ING Vastgoed, NS Vastgoed, Rodamco Nederland BV, and the municipality of Rotterdam, consisting of a spatial study and a financial analysis was concluded. The year 2018 was set as planning horizon in the draft master plan, although some parts might not be built by that time as the urban area would be developed in a flexible manner. However, as mentioned in the previous section, the cooperation between the four parties ceased to exist whilst they were still setting up a joint Land Development Corporation (LDC). The profits from the property development were to be diverted to carry the large infrastructural costs. Yet it appeared to be too early for the private parties to make a reliable estimation of the project’s financial profits and risks. Moreover the parties would have to sign a legally binding commitment for a project comprising many uncertainties on the content, planning and financial feasibility, which appeared too much to ask of both private parties. Moreover, due to local elections there was no longer political support for Alsop’s plans, that were depicted as “a witness to arrogant madness” (Wigmans and Kooijman, 2003).
2.2.2 September 2005: Voorlopig Bestemmingsplan Stationskwartier

*Gemeente Rotterdam / Municipality of Rotterdam (2007)*

The document proposes a spatial programme of 400,000 m² of urban entertainment, housing, and offices. The boundary of the plan as set in this document does not consider the Weenapoint as a part of the plan, whereas the southside of the Weena does belong to the area. The Delftseplein and Conradstraat are mentioned as key locations in the development, while the development of the Schiekadeblok is barely mentioned.

The document on the one hand aligns the stated ambitions with the policy framework (national provincial and local policy) and on the other hand already anticipates on guidelines that stem from the Environmental Impact Report (MER: Milieueffect-rapportage).

Finally the document states that the quarters should integrate in the surrounding urban area for an optimal functioning. Better connections to the city, densification and mix of functions are therefore considered crucial.

2.2.3 July 2007: Weena I Glocal City District

*Gemeente Rotterdam / Municipality of Rotterdam (2007)*

Based on a number of essays the document provides a first insight into the identity, direction and positioning that was foreseen for the Station Quarters by the ‘concept developers’ of Concire. It starts from the idea that Rotterdam and Europe will be better connected in the future with the arrival of the High Speed Line (HSL) and the RandstadRail-connection to The Hague. The merger term *glocal* indicates the presence of firms and institutions acting in ‘global’ open networks from their ‘local’ bases. A *glocal city* connects parts of its local network to globally operating networks, making it part of a global archipelago of local networks. In addition, the document provides an explanation to the concept *mixone*, which indicates a lively and intensively used zone in which firms and institutions are visible, and meet with each other as well as visitors.

Finally, it is indicated that a public-private partnership between the municipality and market parties involved – called the MEM: Mixone Exploitatie Maatschappij (Mixone Operating Company) – is pursued. Based on this cooperation, the urban design is completely revised and the zoning plan-procedure is stopped. Ultimately, Maxwan becomes the urban planning agency to develop the masterplan for the municipality based on the concept by Concire.

2.2.4 November 2007: Stadsvisie Rotterdam 2007 – Ruimtelijke Ontwikkelingsstrategie 2030

*Gemeente Rotterdam/ Municipality of Rotterdam (2007)*

This urban vision declares the ambition to develop Rotterdam into a city of international stature with an attractive downtown. The RCD (at that time still called Stationskwartier) is mentioned as an image-defining location and is for that reason considered as one of 13 *VIP-areas.*
2.2.5 **February 2008: Centraal District Rotterdam**  
*Gemeente Rotterdam/ Municipality of Rotterdam (2008)*

After demolition of the Rotterdam Central Station had started in January 2008, this document set out the ambitions for the RCD, although different interpretations were left open for market parties. A preliminary discussion between Maxwan, dS+V and the residents’ group of the *Provenierswijk* (15 januari 2009) led to fierce discussions about the building heights. Despite a change of the name to *Centraal District Rotterdam* (presented at the MIPIM ’08 as Rotterdam Central District), the concept to develop a glocal city district remains. In addition, the document provides some statements concerning the accessibility and the business’ climate.

2.2.6 **May 2008: Bezonningsstudie Provenierswijk**  
*Gemeente Rotterdam and Arup (2008)*

Commissioned by the municipality of Rotterdam, Arup’s engineers conducted a solar lighting study (*bezonningsstudie*) in response to the concerned residents. According to Arup, the *Provenierswijk* will indeed experience more shadow as a result of the new buildings, yet 21 selected 21 sites in the neighbourhood experience a difference of less than 10% compared to the existing situation, whereas the difference is only 2,5% on average. Requirements for the minimum amounts of sunlight in the *Provenierswijk* were included in the PlanMer of November 2009.

2.2.7 **October 2008: Stedenbouwkundig plan 2007: Centraal District Rotterdam**  
*Gemeente Rotterdam and Maxwan (2007)*

Maxwan’s urban plan is a revision and extension of the Preliminary Zoning Plan (*Gemeente Rotterdam, 2005*) and considers 400.000 m² to 460.000 m² of housing, offices and urban entertainment. The plan was adopted by the board of the mayor and aldermen in Februari 2008 and approved by the City Council in June. Although the first part of this document once again describes the concepts *mixone* and *glocal city district*, the second part examines the spatial translation of the spatial translation of these concepts. Basically four keypoints are spatially translated:

- **The RCD in balance:** The RCD should be perfectly in balance with the surrounding neighbourhoods – some of which will also be developed in the coming years – by making it an integral part of the downtown city centre.

- **Liveliness on the street:** The RCD should offer a highly diverse, multifunctional and publicly accessible program (offices should no longer dominate) for an attractive stay and walk in order that the *Weena* no longer represents the edge of the city centre.

- **Urban network:** The accessibility of the RCD from and to the surrounding neighbourhoods is regarded a critical condition for the area to be successful.
Superb public space: The area’s public space should provide high quality furnishing and natural transitions in order to invite staying, strolling, and using the area.

As in the Zoning Plan Station Quarters (Gemeente Rotterdam, 2005), the construction of a new east-west connection is planned between the Pompenburg and the Oude Westen – complementary to the Weena – by means of two future connections.

2.2.8 October 2009: BeeldKwaliteitsPlan Rotterdam Central District
Gemeente Rotterdam and Maxwan (2009a)

The District Appearance Plan (BKP: BeeldKwaliteitsPlan) combines previous plans for the RCD (the Weena I Global City District and Stedenbouwkundig plan 2007) together with two guidelines for the design of Rotterdam’s public space (the Visie Openbare Ruimte Binnenstad Rotterdam and Rotterdam Centrumstijl). The BKP discusses the desired quality (structure, appearance, choice of materials, sustainability and functionality) in respect of the buildings and public space. The document provides detailed descriptions of almost every building part and piece of the public space by using guidelines, references and impressions.

2.2.9 October 2009: Welstandsparagraaf Rotterdam Central District
Gemeente Rotterdam and Maxwan (2009a)

In line with the Housing Act 2003, the Commissie van Welstand en Monumenten (Commission on Monuments and Amenities) in this nota clearly points out the requirements concerning the external appearance of buildings that will be used for their review of building plans. The Welstandsparagraaf indicates the RCD as a development area (ontwikkelingsgebied) which enables more specific and tailored criteria, such as a mandatory of an arrangement plan (inrichtingsplan), a ban on the parcelling or fragmentation of the plinth, comprehensive requirements for façade signs and openness of the building programme (such as the plinth and building tops).

2.2.10 November 2009: PlanMER
Gemeente Rotterdam (2009b)

This document’s main conclusion is that real estate in the RCD that contains functions which can have significant implications for the environment need to go through an Environmental Assessment Procedure (PlanMER-procedure). The PlanMer was, together with the structure vision, adopted by the City Council.
2.2.11 December 2010: Programmaplan Binnenstad 2010-2014 – Binnenstad als Citylounge
Gemeente Rotterdam (2010)

In the Programmaplan Binnenstad 2010-2014 the municipality of Rotterdam distinguishes 4 problems:
- a low building density compared to other cities;
- a separation of functions and lack of downtown housing;
- fragmentation and a lack of coherence between the buildings;
- a lack of logical routes between various locations.

The Programmaplan also set 3 quantitative targets for the development of the inner city in the period 2010-2014:
- 5% more people (around 1,600 additional inhabitants);
- 5% more employees (about 3,000 additional jobs);
- 10% more visitors;

The document sites Gerard Marlet (2009) as an inspiration because of his theory that employment will increase in cities where people prefer to live. The targets of the Council’s programme are worked out from that vision along five lines:
- Vibrant downtown;
- Hospitable town;
- Downtown to live;
- Connected neighbourhoods;
- Active downtown businesses.

The vibrant and hospitable downtown are designated as software, which will be the result of small private and public initiatives and on the other hand should also be achieved by the last three lines that are designated as the hardware. The latter three lines focus on the densification, building typologies and connections.

2.2.12 March 2011: Structuurvisie Rotterdam Central District
Gemeente Rotterdam (2009a; 2011)

Besides several chapters that offer a summary of some of the preceding documents, a new chapter in this structural vision describes the development perspective, or the feasibility and (public) support. In the Ontwerp Structuurvisie Rotterdam Central District (November 2009) – which is a concept-version – the municipality explains that they assume to steer the phasing through land allocations. Also, the draft explicitly presumes “economic progress” within a free market that will result in realisation of the plans within 10 to 15 years.

On the 17th of March 2011, the final structural plan was – along with the PlanMer – adopted, with some modifications included in the development perspective in response to a resolution by D66 (also signed by CDA, GroenLinks, PvdA and the VVD) and a resolution by the CDA (also signed by D66, PvdA, and the VVD). The new phasing acknowledges that the large real estate developments are difficult to be realised in one single stream of construction. Although the new document pays more attention to phasing and a flexible zoning, enabling more function mixes, the land exploitation is still based on normal economic business cycles and the expectation remains that the real estate market will fully recover from the current crisis during the exploitation period.
Starting point of the land exploitation is that the costs will be offset by the revenues in the period 2009 to “after” 2020. For this, the revenue side is based on the realisation of five development sites: two large private developments (Schiekadeblok and Weenapoint) and three sites owned by the municipality (Schaatsbaanlocatie, Delftseplein and the Conradstraat). The focus of the exploitation’s revenues lies on the allocation of the municipal lands of the Conradstraat and the Delftseplein.

The costs for the construction of the public space, the infrastructural projects, the costs for communication, acquisition costs, overhead and interest expenses are fully covered in the exploitation (neutral balance based on a Net Present Value (NPV’s price level at 1st of January 2009), additionally a risk reserve has been taken into account. Based on the high quality and ambition, the municipality expects an increase of market interest and a rise of real estate values for offices as higher rent levels are expected to be realistic, which provides the basis to attribute some of the investments in the RCD to private real estate developers.

Finally, according to the Wro (Act on Spatial Planning), new zoning plans for the RCD will be made before the 1st of July 2013, whereas any other building regulation will be granted on the basis of the structural plan until that time.

April 2011: Kantorenmarkt Rotterdam Central District
Tordoir and Jones Lang LaSalle

As the Rotterdam office market is tarnished since 2008, the vacancy rate increased, with the RCD having a relatively high vacancy rate of 20% (measurement 3rd quarter of 2010). Nevertheless, a growing demand is expected for multimodal accessible locations with a lot of mixed uses that will attract newcomers to the offices planned in the district, which is also due to the little new supply elsewhere in the years ahead. Accessibility (and sufficient parking places), a competitive location, function mixes, a lively plint hand a matching high quality public space are called essential to fully exploit the opportunity of the RCD.

The prognosis concludes that the average demand for new high quality office buildings in the RCD for the period 2012-2020 will be at least 12.500m² of lettable floor area (LFA) up to 25.000m² LFA per year. Until 2022, a total intake of 145.000m² LFA up to 240.000m² LFA of new office space is expected in the RCD.

August 2011: Binnenstadmonitor 2011: De Staat van de Rotterdamse Binnenstad
COS Gemeente Rotterdam (2011)

This monitor makes the indicators clear to measure the lines and targets as mentioned in the Programmaplan Binnenstad 2010-2014 (Gemeente Rotterdam, 2010. Briefly, the score for the city centre is still considered lower than desired on the points beneath:

- Growth of the population and real estate valuations (WOZ-waardes);
- Accessibility and connections;
- Function mix in the building plinths;
- Score on liveability (Leefbaarheidscore);
- Appreciation of the public space.
PART II theoretical background:
literature study
3. LOCATION FACTORS

3.1 CLASSIC LOCATION THEORIES
For centuries, urban economists have proposed theories explaining why certain types of economic activities are located at specific geographic locations. Some important economic models ground on classic location theories in explaining reasons for land use (industrial, commercial and residential). This paragraph will explain the foundations of location theories on the basis of some important contributions made by economists and geographers.

3.1.1 Land use
A classic location theory was developed by Johann Heinrich von Thünen in his treatise Der Isolierte Staat, dating back from 1826. The title – The Isolated State – refers to the evenly distributed ‘medieval’ towns of his time, which were isolated locations surrounded by agricultural hinterlands (the ‘featureless plain’). Von Thünen managed to model the joint determination of optimal intensive versus extensive agricultural land use and land rent for a town and its hinterland. His BID-rent curves model a ‘least cost’ thought based on transport costs to a market with given prices, and the availability of productive resources (the land use) is a determiner for possibility to produce. His model shows the rent-gradient for farmland which, through spatial competition, slopes down from the most optimal location with the highest BID-rent (for being close to a central market), to the least optimal location at the outermost limit of cultivation. Each farmer is faced with a trade-off between the yields and costs of land use and transportation. Von Thünen’s monocentric city model shows the spontaneous emergence of a pattern of concentric rings due to difference in land uses, which is socially efficient due to minimised costs of producing each particular good (Fujita, 2000).

Figure 11: BID-rent curves of the monocentric city model

Source: adapted from Von Thünen (1826)
In the middle of the 20th century, the growth of the urban population and its associated urban problems, manifested the need for a comprehensive theory of modern urban economies (Fujita, 2000). William Alonso (1964) also considered a monocentric model surrounding a localised market like Von Thünen did, but substituted residents and workers for farmers and the central business district (CBD) for the town. His model, known as the monocentric city model, generalises the BID-rent curves to an urban context, illustrating the optimal distances of commercial and residential land uses from the CBD. The height of the BID-rent per sector is determined by the left over principle (Vreker et al. 2004), modelled after Von Thünen’s marginal productivity formula and his locational rent formula1:

\[
\text{Economic rent} = \text{output revenue} - (\text{non-land input costs} + \text{transport costs})
\]

In a monocentric city model office firms are located in the city centre (CBD), manufacturing industries are further from the CBD and residents are located in the furthest zone. According to the theory of the land use in a monocentric city model, one may expect that the office BID-rent function is steeper than the manufacturing BID-rent function.

The monocentric model of urban spatial development is attributed to Alonso (1964), Mills (1967), and Muth (1969). Since Alonso’s revision of the classic Von Thünen model, the latter two economists put their focus on an equilibrium between location patterns of households and urban amenities. In the Alonso-Muth-Mills model all employment is concentrated at the CBD and location choice is modelled solely on the basis of access to the employment centre. Population and employment densities or human activities decrease with distance from the CBD. In a monocentric city model, activities are arranged according to transport costs: those with the highest costs occupy the most central land. Thus, workers travel to the centre and transportation costs depend only on radial distance to the city centre.

Figure 12: BID-rent curves surrounding the Central Business District (CBD)

\[
\begin{align*}
R &= Y(p-c) - YFm \\
L &= Y(p-C) - YDF
\end{align*}
\]

<table>
<thead>
<tr>
<th>R</th>
<th>Land rent;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Yield per unit of land;</td>
</tr>
<tr>
<td>p</td>
<td>Market price (per unit of commodity);</td>
</tr>
<tr>
<td>c</td>
<td>Production expenses (per unit of commodity);</td>
</tr>
<tr>
<td>F</td>
<td>Freight rate;</td>
</tr>
<tr>
<td>m</td>
<td>Distance to the market.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L</th>
<th>Locational rent;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Yield;</td>
</tr>
<tr>
<td>P</td>
<td>Market price;</td>
</tr>
<tr>
<td>C</td>
<td>Production costs of the crop;</td>
</tr>
<tr>
<td>D</td>
<td>Distance from the market;</td>
</tr>
<tr>
<td>F</td>
<td>Transport costs.</td>
</tr>
</tbody>
</table>

1. locational rent formula
Besides organisational considerations, both models suffered imperfections like the simple assumption of the existence of a CBD or town centre, the nonexistence of scale economies, and the limits of model dynamics to take market recursion and uncertainties (technological change, demand changes, price variations, joint production) into account.

### 3.1.2 Central places theory and urban hierarchies

Earlier, the German geographer Walter Christaller (1933) also considered optimal market areas in a featureless and infinite plain, where a land market was absent. However, he introduced the uniform spatial distribution of the households, which would have similar demand for products and services, similar purchasing power, and similar shopping behaviour. The homogeneous demand became dispersed over the isotopic, abstract space, and was always stocked at the nearest location to minimise the economic distance (in time and costs of travelling).

However, for a broader variety or higher order of goods and services, people were considered to travel longer distances to larger settlements. Hence Christaller managed to allocate transport costs to individual goods, and demonstrated how the pattern of central market areas was the result of conscious locational decisions in line with businesses’ consumer policies.

Christaller introduced the ‘threshold’ and the ‘range’ for aggregated industries of the industrial economies, which were later revised by the economist August Lösch (1954) for post-industrial urban economies. According to their Central Place Theory (CPT), firms will fill in unserved areas as they enter a market, until market areas become small enough to generate zero economic profit. Spatial competition as such is applicable for each type of market (each firm has its own market) and is determined by the range and the threshold.

- **Threshold:** The economic distance which takes in enough customers to dispose a minimum quantity of goods for a firm to stay in business. Goods purchased infrequently have a larger threshold.
- **Range:** The maximum economic distance at which the quantity of disposed goods to customers is zero. More expensive goods have a larger range because transport costs are relatively small compared to their price. High order goods also have larger market areas because they are expensive and purchased infrequently. The area between the inner (d₁) and outer scope (dᵣ) provides an enterpriser’s profit.

Walter Christaller (1933) came up with a landscape of hexagonal market areas where the highest order centre (the central place) disposed of the most and highest order functions with the largest range, thus dominating all lower-order centres. Nonetheless, not all lower order functions are necessarily present in higher-order central places. Within his landscape a hierarchy of seven city types was considered, ranging from the smallest Marktort (with a market area radius of 4.0 km; town-population of 1000 inhabitants; and a market population of 3500 people) to the biggest Landstadt (market area radius of 108 km, a town population of 500.000 inhabitants; and a market-population of 3.5 million people).

Christaller (1933) only dealt with the locations’ market functioning relating to the spatial pattern of human settlements. He clearly stated that he focused only on a town’s centrality which was described through economic distance, disregarding all
other features and issues. His normative CPT was a diagrammatic version of reality used to find patterns following from the model’s assumptions.

Already in 1958, Berry and Garrison disclaimed Christaller’s assumption of an isotropic plain by pointing out the impossibility of uniform markets with an evenly distributed population, and with the same preferences and purchasing power, to exist in reality. They propose an urban system containing one-, two-, three-, or four (sub-) centres, which were defined as the urban core (red dot), the suburban centre (the black dot), and two types of community centres (the medium and small circles).

Figure 13: an urban system of (sub-) centres

Source: adapted from Berry and Garrison (1958).
The informal and descriptive character of the CPT-model was also criticised by Paul Krugman (1995) for its lack of formal foundations, particularly regarding the market structure and behaviour of firms (Fujita and Thisse, 2002). Christaller’s urban hierarchy of seven city types was later replaced by Hall, who modified them on account of contemporary features, such as globalisation, the shift to the informational service economy, and the development of supernatural groupings such as the EU (Hall, 1999). Hall supplemented two higher levels to Christaller’s arrangement in order to account for Global Cities (Sassen, 1991), and Sub-Global Cities. Also, Christaller’s lowest five levels have not been taken into account anymore for they ceased to perform any significant role as central place ever since. Hall’s new categorisation of cities is as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Population of 5 million and up to 20 million in the hinterland</td>
</tr>
<tr>
<td>Sub-global</td>
<td>Population of 1 to 5 million and up to 10 million in the hinterland</td>
</tr>
<tr>
<td>Regional</td>
<td>Population of 250.000 to 1 million (Christaller’s Landstadt)</td>
</tr>
<tr>
<td>Provincial</td>
<td>Population of 100.000-250.000 (Christaller’s Provinzstadt)</td>
</tr>
</tbody>
</table>

3.1.3 Spatial structures

Besides the categorisation based on size of population or economy, the World Bank (2009) offered a new perspective on modern urban spatial structures. Classic location theories used to consider two separate entities, namely an urban space which was in dichotomy with the rural space. The World Bank proposed a continuum space, composed of a variety of transitional structures, such as rural villages, urban towns, and an agglomerated centre, instead of just two entities. The Extended Metropolitan Region (EMR) is the pivotal point within the rural and suburban space, and comprises a continuous network of secondary (satellite) cities, and an agglomerated urban centre.

Figure 14: *continuum and dichotomous* spatial structure of a city

Source: adapted from World Bank (2009)
3.2 NEO-CLASSIC LOCATION THEORIES

Classic location theories consider cities to be *freely floating islands* whereby internal processes are exclusively explained from the perspective of the city itself. Notwithstanding neo-classic location theories building on the contributions of the German economic geographers (Von Thünen, Weber, Christaller, and Lösch), new theories distinguished themselves, considering mutual spatial competition through spatial duopolies with multiple centres.

3.2.1 Spatial duopoly and the principle of minimum differentiation

Harold Hotelling (1929) to introduce a *spatial duopoly* wherein demand, which is price- and distance-inelastic, is spatially distributed (along the horizontal axis). There is only one competitor and for both producers A and B the production costs are independent of their location. Different from Alonso’s BID-rent curves for a mono-centric city, Hotellings spatial duopoly exists in a one-dimensional space, with two central points at which transport costs are minimised for the given use, whereby sellers compete *back to back* in the centre of the market.

Figure 15: Hotelling’s *spatial duopoly*

Hotellings principle of market competition is shown in figure 15, indicating how the range depends on the price and transport costs of a uniform product. The profits of the firms are equal when both firms sell their products for the same price (P1). However, firm A will have a larger market share when its accessibility improves (when, for example, its centrality increases) or when it simply lowers its price to the level of P2. Apart from the effect of a similar price reduction, firm B will also win its lost market share back by moving towards firm A. The possibility of gaining additional market share pulls both firms towards each other, hence spatial competition as such leads to clustering of competitors in the market centre; an outcome known as the *principle of minimum differentiation*.

3.2.2 Location of industrial production

Weber (1909), Moses (1958), and later Smith (1966), also considered a localised market with given prices, but localised the supply to a single location of industrial production. Alfred Weber was the first to assume three interlinked levels of costs, namely transportation costs, the cost of labour, and the savings from being located at the centre (agglomeration economies). For that reason he proposes a *least cost*
theory to which industrial producers are presumed to look for the optimal location where costs are minimised for both inputs and outputs. Contrary to Weber’s (1909) lowest cost location, David Smith (1966) suggests the industrialist to seek the area where he will gain the highest profits. The space cost curve is Smith’s most important determinant and illustration of the optimum location for a firm to set up.

Figure 16: Smith’s locational line

One will obtain different space cost curves when the base prices \((b)\) of \(M_1\) and \(M_2\) are variable, the required quantities \((a)\) of \(M_1\) and \(M_2\) may change, and transportation costs \((r)\) are inserted into the model.

Figure 17: space cost curves

Another addition was made by Moses (1958) who introduced the principle of substitutability into the location theories, allowing for (dis-) economies of scale in case of heterogeneous production of goods. Marshall (1890) indicated earlier that businesses modify their arrangements to obtain better results with a given expenditure (as explained by Smith, 1966), or equal results with less expenditures (as explained by Weber, 1909). However, most business is not homogeneous and deals with the inseparability of three problems: the location of optimal output, the location for the optimum combination of inputs, and the optimum location itself. The latter optimum varies with the levels of output and demand, allowing for spatial (or locational) substitution.

Subsequent to Weber’s cost levels and Moses substitution theory, Walter Isard (1969) built sophisticated models of regional industrial growth with multiple interrelated factors. Isard’s theory, as many of the abovementioned theories, have been criticised for assuming that regional markets have a natural tendency to equilibrate. In response to the equilibrium theories, a critical theory was developed by Karl Gunnar Myrdal who focused on the emergence of disequilibria.
Charles Tiebout (1956) put his focus more on the local economy in developing his hypothesis on *household sorting*. According to Tiebout, each household has a different tax and expenditure pattern, hence metropolitan households shop around for a location that provides them with their preferred mix of local public goods and services. This engenders an incentive for local politicians to provide the preferences for public goods that are demanded by residents, as the value of public investments gets capitalised into residents’ homes.

### 3.2.3 Cumulative causation

In 1957, Myrdal formulated the theory of *(circular) cumulative causation*, introducing the principle of an ever expanding economic centre, at the expense of peripheral regions. Cumulative causation is for the greater part caused by the agglomeration effect due to a favourable investment environment (through particular taxation, legislation, or advantageous production factors). Further economic growth of the centre is stimulated on account of its strengthened competitive advantage, as a result of economic growth which it previously lived through. Economic activities will concentrate at the centre of the region because of this, causing a decrease of employment and prosperity in the periphery.

Concentration of economic activities in the centre leads to both positive effects (the *spread effects*) and negative effects (the *backwash effects*) for the periphery. The cumulative advantage of the economic centre is accompanied by cumulative disadvantages of the under-developed periphery, which is defined as the *backwash effects* of the periphery. Nevertheless, as the centre’s economic development strides along, economic activities will spatially disperse, which is defined as the *spread effects*. 
3.3 MODERN LOCATION THEORIES

In the Industrial Revolution (in the Netherlands roughly from 1850-1900), the presence, supply, and transport of raw materials used to be decisive conditions for location of businesses, as well as a nearby consuming market and the presence of cheap labour. The location having the lowest transport and production costs, was the optimal place of business for an industrial company and in consequently determined growth differences among cities (Marlet, 2009).

Classical and neo-classical theories on location and land use examined growth as an exogenous factor, which could equalise or polarise the urban landscape, but were unable to satisfactorily explain locational growth. The modern location theories presume networks wherein (1) no single business absolutely stands alone, and moreover, (2) wherein networks may produce a pattern for regional economic growth. The relative distance, such as the availability of information, knowledge, and clients, is even becoming more important for firms’ locational decisions compared to the absolute distance (Van Oort et al. 2002).

François Perroux (1950, 1970) was the first to explain growth through linking growth poles (see also section 3.3.2) to the proximity of a number of sectors to an economically advantageous space. According to his theory, strong economic poles were able to generate agglomeration of leading sectors, causing locational attraction for comparable or even different sectors. For that reason, growth poles are more or less identical with (specialised) clusters, which will be discussed in the next section. Following Perroux, Henderson’s urban system model (1974) exemplified the growth of cities from their sectoral specialisation and interaction with other cities by means of trade in their specific goods.

In 1977, Avinash Dixit and Joe Stiglitz developed the ground-braking assumption of monopolistic competition. The possibility of firms to produce multiple varieties was excluded by Dixit-Stiglitz, assuming economies of scale would not arise in that case. Secondly, the Dixit-Stiglitz model explains that consumers not simply satisfy their basic needs, but prefer product diversity instead. Each firm was suggested to profit from the consumers’ love for variety and would in consequence produce a distinct variety to benefit from monopolistic competition, rather than producing goods similar to other firms and loose profits (Neary, 2004).

Hence, separate industries would enjoy economies of scale, instead of diminishing returns, through international trade between the bilaterally resembling countries. Larger economies will increase real wages since they are able to offer more scale economies. The economic integration of (labour) markets and basis of higher real wages, may result in a cumulative process of workers’ migration from smaller to larger countries and cities, enhancing their expansion.

Perroux (1988) implicitly recognized, and Berry (1972) explicitly argued, that innovations of firms provide the impetus for the growth of a pole, that could attract other firms (Zook, 1997). The resulting links between different industries provided more flexibility in the spatial organisation – their physical location – of firms. Following modern location theories generally assume firms to be footloose as a result of their reduced dependence on natural, location-bound factors of production or some nearby harbour or coal mine. Usually it is decisive for footloose companies to profit from agglomeration advantages in the world’s economic centres (Marlet, 2009).
3.3.1 The scope of agglomeration economies

Two types of agglomeration economies exist, namely internal economies of scale (the capacity and size of production which is not related to location but to business economics), and external economies of scale, which stem from location theories, explaining the incentives for firms to cluster through attraction of other firms present at a certain location (Ohlin, 1933).

Firms that increase their scale size or broaden their production scope, may experience beneficial effects on productivity, cost, and export performance. In the first situation, firms’ growth may enable a more detailed division of labour, promoting specialisation of the labour force that may cause productivity growth. In the latter situation, internal economies of scale exist when increases in the capacity of productive units lead to a more than proportional increase in output, or decrease in unit cost (Johansson and Forslund, 2006). Both suppliers and producers may benefit from higher production volumes (when subject to increasing returns to scale) in case of large consumer markets.

External agglomeration economies are referred to as the industrial scope of agglomeration economies, comprising localisation externalities (external advantages for a firm arising from the size and concentration of the local industry) and urbanisation externalities (external advantages to the local industry, arising from the size of the city or local economy), regardless of competition (Rosenthal and Strange, 2004; Ottaviano, 2008). Basically, when agglomeration economies spread across industries, they are called urbanisation economies, and they are called localisation economies when they are confined inside them.

According to Alfred Marshall (1890), firms produce their goods more efficient in cities due to these externalities. Their preference for urban locations—that led to a spatial concentration of a rapidly growing supply of businesses, variety of products (and suppliers), workers, and hence the growth of cities—has also led to the introduction of the term economies of scale.

1. Localisation economies;

Economies obtained from local specialisation through expansion of a single firm are called economies of scale. However, when this local specialisation is the result of joint location of different firms, it should be seen as an example of localisation economies (Malmberg et al. 2000). Such economies are agglomeration externalities like technological and information spillovers, skills matching on the labour market and the share of indivisible goods and services. Localisation economies relate to firms engaged in similar or interlinked activities, leading to the emergence of spatial agglomeration of related firms (industrial districts, localised industry clusters, e.g.). Economies as such emphasise knowledge spillovers (see section 3.3.2) and may—according to the theories of especially Alfred Marshall (1920), Kenneth Arrow (1962), and Paul Romer (1986)—enhance firm competitiveness by triggering particularly innovations and processes of learning. Through localisation economies, a greater chance of contact with early adopters of a new technology exists, as well as

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2 Besides an industrial scope, Gianmarco Ottaviano (2008) also distinguishes the geographic scope and the temporal scope. Similar to classic location theories, stressing the spatial aspect of an optimal location choice, the geographic scope refers to the extent to which external economies depend on the proximity of firms. The temporal scope takes the effect of time into account, such as knowledge creation through cumulated learning.
more rapid circulation of information about specific technologies (Malmberg et al. 2000).
Hoover (1948) stressed that they are confined inside specific industries, but overlooked the concept of co-location. Co-location implies clustering of firms that mutually benefit from being located in the proximity of each other, although they do not belong to the same industry. The mutual benefit is a place-specific increasing return to scale (Johansson and Forslund, 2006).
However, it is generally assumed that only firms can enjoy localisation economies by locating at or near the central export node or in specialised clusters. Their clustering results in increased profitability, due to which the sector is able to pay higher rents for a location and hence the BID-rent shifts upwards (from Office to Office). The example also illustrates how other functions are outbid by the office-sector when more firms prefer to enter the same market (Vreker et al. 2004). Likewise, the BID-rent reduces in case the use of office space decreases or when the accessibility of other locations improves (extra public transport stations, suburban highway crossings e.g.).

Figure 18: BID-rent curves under the effects of localisation economies

Source: adapted from Vreker et al. (2004)
2. *Urbanisation economies;*

Both people as well as firms require real estate, health care and educational services, legal and marketing firms, catering, transportation and security. These various services are not directly related to the sector but will cluster in or near these *specialised clusters (localised economies)* in response to the large market opportunities (Johansson and Forslund, 2006). Hence *urbanisation economies* develop, which are more complex and spread out across industries external to the local firm, arising from the size of the local economy. The economies accrue from the agglomeration of firms that, irrespective of sectoral origin (Jacobs, 1960; Johansson and Forslund, 2006), benefits from sharing basic assets, resources, and institutions, which are to be regarded as public goods (notably investments in infrastructure and the development of general labour markets). However, the amount of benefit may differ per industry (Henderson, 2003) and the stage of the product life cycle (Duranton and Puga, 2001). Nonetheless *urbanisation economies* will cut across industries and hence apply to all firms and industries in a single location and relate to savings from the large-scale operations of the agglomeration as a whole (Malmberg et al. 2000).

*Urbanisation economies* emphasise the advantages that can be gained from a large diversified urban structure, such as diverse and constantly available labour skills, developed infrastructures and different kinds of public and private services. Empirical evidence on urbanisation economies can be found in for example Glaeser (1998), and Duranton and Puga (2001).

Figure 19: BID-rent curves under the effects of *urbanisation economies*

![Figure 19: BID-rent curves under the effects of urbanisation economies](source: adapted from Vreker et al. (2004))
As with the *localisation economies*, the effect of *urbanisation economies* too can be displayed in a BID-rent chart (see figure 19). Firms will locate near each other as they benefit from the presence of other businesses, shops, and households. If Firm $A_n$ was to decide to move in the direction of Firm $B_n$ (down to $A_u$), it would (ceteris paribus) pay a lower BID-rent, yet costs of transportation would be higher. Firm $B_n$ on the contrary, will experience lower transport costs to the market centre, but has to pay a high BID-rent in an *urbanised* economy (Firm $B_u$). However, both firms will benefit from increased productivity of their inputs due to *urbanisation economies*, due to which the BID-rent curve shifts upwards (the straight curves), and the size of this shift increases with proximity (bent curves), until both curves intersect (Vreker et al. 2004).

### 3.3.2 External economies of scale

Abovementioned *localisation* and *urbanisation economies* are parallel agglomeration phenomena with a different scope (Ottaviano, 2008). Apart from the two *scopes*, cities and agglomerated regions attract people and businesses due to *scale economies* (such as market-size and diversity), gaining more economic potential according to the agglomeration theory (Brakman et al. 2001). This section provides a list of eight external economies of scale as sources of agglomeration economies (Ottaviano, 2008), and micro foundations for locations within cities. Alfred Marshall (1890; 1920) was first to outline three externalities, which are now referred to as *Marshallian Externalities*:

1. **Input sharing**
   The notion of *input sharing* enables downstream firms to produce inputs at a lower price due to scale economies when located in an agglomeration compared to an isolated region. As a consequence, this leads to more choice selection of (secondary) suppliers due to widespread linkages, and hence to cheaper or better purchases.

François Perroux (1950), in his *growth pole theory*, even points out the possibility of economic growth instigated by a single *firme notice*, which may bring prosperity to a region through the profits gained by local suppliers. In the 1960s and 1970s, government policies were even based on the assumption that a region that contained a growth pole, would be able to realise and maintain effects of growth as a result of four significant, and succeeding polarisation and multiplier mechanisms (Perroux, 1950; Atzema et al. 2002):

1.1 **Technical polarisation**
   Firms are supposed to locate near the *firme notice* or growth pole to maintain relations and trade products.

1.2 **Income polarisation**
   More income is generated as a result of the increased employment in both the *firme notice* as well as in the firms attracted through the technical polarisation, which enables new services to profit from too.

1.3 **Psychological polarisation**
   A momentum within a region arises as a result of the presence of a *firme notice* and the agglomeration of other businesses. The positive image that is
carried out, is consolidated and intensified by the *firme notice*, and may attract new, different firms to the region due time.

1.4 Geographic polarisation
As a result of the changed regional economy, due to the preface polarisation effects and influences, further growth of the region is encouraged for the future, which Myrdal (1957) already indicated with his theory of *cumulative causation*.

However, (post-) modern location theories explain that Perroux’s *growth pole theory* (1950) does not root for the plain reason that the required production environment and other (related) factors of production are often lacking, among which other *externalities*.

2. Labour market pooling;
Adam Smith (1776) already indicated *human capital* – the level of knowledge and skills of workers – as one of the four capital goods for firms. *Labour market pooling* refers to the advantages of thick markets in urban areas, offering a broader selection of workers with specialised skills. This may cause firms to concentrate with differentiated labour requirements when they have greater chances on capable and qualified workers. Agglomerations as such offer more job-opportunities, and will therefore attract households as well.

Nevertheless, *labour market pooling* may also cause dispersion of the business activities in case a firm decides on obtaining a larger or different ‘pool’ of potential workers.

3. Knowledge spillovers;
Knowledge spillovers comprise the third Marshallian externality through what Marshall (1920) called *‘something in the air’*. Knowledge spillovers are mainly localised (Rosenthal and Strange, 2001; Beenstock and Felsenstein, 2009) near the city, being an important source for increasing the human capital and hence for agglomeration of firms at inner city locations (Rosenthal and Strange, 2004). As a result of knowledge exchange between individuals – mainly through face-to-face contacts – more productive employees are generated in benefit of firms. Nevertheless individuals benefit as well as it provides the opportunity to increase one’s human capital, resulting in a larger productivity and a higher wage.

Lucas (1988), and Storper and Venables (2004) developed foundations of face-to-face contacts among *knowledge workers*. They indicated the exchange of *tacit* and *codified* knowledge among the *unobserved human capital*. Firms are able to profit from workers in dispose of unobserved human capital by ways of more knowledge and skills, innovation, as well as an above-average growth and labour productivity.

Glaeser (1992) distinguished three types of knowledge spillovers:

3a. *Marshall-Arrow-Romer (MAR) externalities (localisation externalities)*
Kenneth Arrow (1962) and Paul Romer (1986) further extended the Marshallian externality of knowledge spillovers. This kind of externality describes the spillovers applicable between specialised firms and an

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3 Certain labourers are immobile (for instance internationally). See also section 3.4.2 concerning the *centrifugal force of immobile factors*. 


industry along the supply chain. The routines and knowledge shared with other industries allows for productivity enhancing innovations. Business parks and high-tech clusters (such as Silicon Valley) are examples of localised businesses that may benefit from MAR-externalities as such. In case of a local monopoly (hence localisation externalities), MAR-externalities may be internalised by the innovator provided that outflow of ideas to other firms is restrained since local competition does not exist (Glaeser et al. 1992).

3b. Porter’s externalities (competition externalities)
Just like the MAR-externalities, Michael Porter (1990) encountered spillovers to take place in specialised, concentrated, localised industries as well. However, he introduced, in contrast with MAR’s local monopoly, the concept of local competition within the industry as stimulant of growth of the industry as a whole. Porter considers local competition to foster the pursuit and rapid adaption of innovation.

3c. Jacobs externalities (urbanisation externalities)
Jacobs externalities (1969) are knowledge spillovers applicable in case of sectoral diversity, especially from outside the core industry. Contrary to Porter and MAR, these type of spillovers are driven by variety and diversity of nearby industries, rather than specialisation. Her theory considers urban diversity to be more conducive to the generation of new ideas providing the variety of experience that spurs innovation.

Currently the debate among urban economists deals with the question whether economies of scale conduct best is cities specialised in a particular sector (localisation economies) or cities with a diverse sectoral structure (urbanisation economies) (Marlet, 2009). Since localisation economies (see section 3.3.1) mainly occur in specialised clusters, it is assumed that such economies are mainly explained as MAR-externalities (and to a lesser extent by Porter’s) means of intra-industry knowledge spillovers. The more complex nature of urbanisation economies that are spread out across industries irrespective of sectoral origin, led to an abstract, theoretical debate as to the origin upon which Jacobs externalities make a contribution to firms.

Figure 20: comparison of knowledge spillovers

<table>
<thead>
<tr>
<th></th>
<th>MAR</th>
<th>Porter</th>
<th>Jacobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial concentration</td>
<td>+</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Sectoral diversity</td>
<td>–</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td>Local competition</td>
<td>–</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: adapted after Koppels (2010)

Nevertheless, it appears that within the Dutch context, cities with a diversified sectoral structure generally obtain a better economic performance compared to more specialised cities (van Oort, 2002; de Groot et al. 2007). By means of a meta-analysis and a statement of 31 empiric findings (De Groot et al. 2007) has shown that not specialisation (as in MAR and Porter), but diversity (as in Jacobs) in the
sectoral structure, is an effective economic factor of success for the growth of (employment in) cities.

Parallel to this debate concerning specialisation or diversification, Brakman et al. (2009) conclude that *economies of scale* are principally not associated with the level of specialisation in production, but with the number of firms and households in the city and its surroundings. They stress that “there is no advantage for cities in being specialised, only size as such matters” (Brakman et al. 2009). After Florida (2002), who argued that the creative class comprises a valuable type of human capital, Glaeser and Saiz (2003) demonstrate that *knowledge spillovers* are not only related to the concentration of firms, but also to the concentration of like-minded *human capital*, which explains the existence and growth of *skilled cities*.

4. *Infrastructure sharing*;
Two location characteristics may be the underlying mechanisms that lie at the basis of arising agglomerations (Malmberg et al. 2000). Ottaviano and Thisse (2003) worked out these characteristics as a fourth external economy of scale, namely the sharing of infrastructure.

The first characteristic deals with the improved performance (cost reductions or increase revenues) of transportation and transactions between suppliers and customers, as a result of enhanced interactions when located side to side.

The second characteristic is referred may be subdivided in *hard* and *soft* infrastructure. The former comprises train, metro and highway networks as well as (air-)ports and telecommunication facilities. Declining the distance between two cities through infrastructure construction may cause firms to decide to merge offices or shops as a result of declining (generalised) costs of transportation.

Secondly, *soft* infrastructure comprises education, libraries, hospitals, theatres and (semi or quasi-) collective goods as such. The share of the latter externalities may be an internal economy of scale as well when a firm shares its available amenities within the organisation.

5. *Home Market Effect (HME)*;
Christaller’s efficient CPT wherein an entire urban system consisting of a central city, suburban towns, and rural villages, was supplied from one single market area, forms the underlying principle of the *Home Market Effect* (HME). The HME was rediscovered and worked out to its current form by Paul Krugman in his *New Trade Theory* (1979), and was later also featured in his contributions to the development of the New Economic Geography (see section 3.4.1) in 1991.

The HME is the result of interacting scale economies which magnify the amount of customers, and which leads to higher wages and a broader choice of products and services (Rosenthal and Strange, 2001). Also, when a region is larger in terms of population or purchasing power, this region will attract a more than proportional share of firms. The larger the local outlet, the larger the HME: ‘there is no advantage for cities in being specialised, only size as such matters’ (Brakman et al. 2009).

The HME arises in agglomerated regions due to the large population, which tend to prefer a differentiated variety of products and services, designated as the *love of variety* (Dixit and Stiglitz, 1977). The larger demand in cities and *love of variety* enables firms to offer a larger and broader selection of products and services. This will provide efficiency benefits in production and through better sales, enabling firms to ask a higher price for their products, which effect is defined as *pecuniary*
Understanding Agglomeration

a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District

externalities. Secondly, technological externalities (or real externalities) appear to exist when firms gain efficiency advantages (lower costs of production) through exchange of information and knowledge with other firms (Marlet, 2009).

6. Consumption advantages;
   In his consumer city theory, Edward Glaeser indicates the economic importance of consumption advantages that determine the agglomeration forces of cities. Glaeser et al. (2001) emphasise the consumption advantages, not the production advantages, offered by a city; that is the attractive amenities of a city. They distinguish four fundamental ways that large cities enhance consumption. First, there may be goods and services available in large cities that are not available elsewhere, such as operas, large events, a diverse supply of culture, specific hospitality businesses and shops, and other urban consumption opportunities. Second, large cities may offer various aesthetic charms or specific urban characteristics such as canals or monumental architecture. Third, large cities may allow the provision of specialised collective goods that are not available in smaller cities, such as universities and specialised schools. Fourth, the relative dense settlement of a large city allows speed of interaction and better possibilities to maintain wider social contacts among a more diverse set of friends which would not be possible in a smaller city (Glaeser et al. 2001). Contrary to knowledge spillovers, much of those advantages are primarily received by households, instead of firms, and one may imagine suburban consumption advantages (such as sports facilities or malls) also being mainly in the interests of households living in the city (Marlet, 2009).

7. Natural advantages;
   Urban amenities are attractors, such as cultural supply, haute cuisine, specialised products and services (the love of variety), building density, a dynamic quality of life, but to some extent also the beauties of the landscape. Likewise, Rosenthal and Strange (2004) point out the natural attractiveness of a location for firms and households, such as physical conditions (nature), the character of the climate, the presence of raw materials, and the access by land or water (Marshall, 1920). Krugman (1995) later assigned those factors as first nature, in case they are the historical geographic and spatial reasons for the city’s existence and presence of its (historical) urban amenities.

8. Rent seeking (hardly applicable in NL);
   Rosenthal and Strange also distinguish rent seeking as an advantage gained through proximity of powerful administrative centres, which are generally located in cities, producing employment and the possibility to exert an influence on policies through active lobbying. Rent seeking may especially explain concentration of firms and households near administrative centres in dictatorial nations and powerful capital cities. McKay and Perge (2009) argue that urban populations are not only better served by infrastructures and public services that facilitate their agglomerations, but may also be able to get better access to, and have more influence on, the required permits, licences, and government policies. However, due to the scale of the Netherlands and its easy access to governmental administrations, rent seeking is less relevant within the Netherlands (Marlet, 2009), and impact of this externality will therefore be left out of account within this thesis.
3.3.3 External diseconomies of scale

In the *Theory on the Location of Industries* (1909) Alfred Weber pointed out three factors of importance for locating an industry, one of which was the phenomenon of agglomeration and deglomeration. Ohlin (1933) pinpointed *transportation costs, land rents and high labour prices* as deglomerating forces, limiting the extent of agglomeration. Leon Moses (1958) also proposed the idea of diseconomies of scale, yet in accordance with his 'substitutability' principle, taking into account the dollar expenditure, transport rates, and base prices of the inputs. A couple of years later, Walter Isard (1969, pp. 106) published a large list of partial substitution problems as well, many of which he pinpointed to may have spatial aspects affecting the micro-scale of agglomerations.

The underlying thought of these theories is that there will be a larger outlet in an agglomerated region, which leads to a larger profit margin and sometimes even higher wages. As a result, locations as such become attractive for working, and hence for living, which leads to an increase in production, employment, and population (the HME). With the increasing number of companies, services, and residents – that used to benefit from agglomeration advantages – excessive urban concentration may occur which becomes too congested, unwieldy, and inefficient to administer (Rosenthal and Strange, 2004), causing an offset of initial advantages in their strive for unceasing economies. Once this process continues and an urban centre reaches optimum size, advantages balance away from economies of scale (agglomeration economies), giving way to diseconomies of scale. Concentration and agglomeration of economic activities may even reverse to sprawl (deglomeration) in case diseconomies of scale start to prevail.

The process is also considered in NEG-models, which consider a bell-shaped curve, explaining how spatial concentration first increases, and then decreases as a result of non-optimality (Henderson, 1974). Similarly to the eight external economies of scale, external diseconomies of scale\(^4\) make up a list of five externalities negatively affecting agglomeration economies.

1. *Urban disamenities;*
   Besides the *consumption advantages*, urbanised areas also bring about liveability discomforts, such as privacy-issues, tranquillity, and criminality, negatively affecting the level of safety, comfort and liveability. Furthermore it is generally accepted that certain modes of transport emit harmful gasses causing climate change. Factors as such may mainly form a force of deglomeration for households.

2. *Environmental disamenities;*
   Apart from the fact that access to green and open spaces is often lacking in urban environments, urbanised zones may cause environmental decay, such as water shortages and pollution. This may also take place in the peripheral zone through reduction of visual and environmental value as a result of deforestation or expanding business parks. Secondly, environmental damage may occur in non-urban areas through a loss of biodiversity green algae, resource depletion, erosion, e.g. (Productivity Commission, 2004). At a later stage, both types may cause the rise

\(^4\) *Internal diseconomies of scale* are, in line with *internal economies of scale*, problems associated with unmanageability and miscommunication within a business.
of resource prices, for instance through scarcity, and may hence be an internalised diseconomy of scale as well.

3. Disadvantages of immobility;
The immobility of certain products, such as farmland, offices and houses, as well as services, such as agriculture and industry, may result in high prices due to limited supply of non-tradable goods as such. Migration of activities as such often implies resistance towards relocation and expensive expropriation procedures. On the other hand, certain immobile factors of production will remain in peripheral areas, which may get firms from the centre to move there to serve these areas.
Secondly, the immobility of buildings and infrastructures (such as monumental railway stations like New York’s Penn Station), may lead to capital destruction by way of demolition of historic buildings to replace them by, for instance, costly high-rise constructions.
Thirdly, the concentration of populations also induces disadvantages caused by uncorrected market failures and costs increases, such as land use regulations, municipal taxes and urban land rents (McKay and Perge, 2009). This can be explained by density that is positively correlated with population size, but negatively with per capita income. As incomes per capita increase over time, the demand for a better quality of life also increases since affluent societies demand more space while population growth works in the opposite direction. Hence, growth of the population may involve a loss of welfare in the form of less space per person through an increase in density (Kerr, 1970), or a higher price of housing through the increase in demand (Helpman, 1998). Both higher costs and space reduction set deglomeration of firms and households (employment decentralisation) going.
The disadvantages of higher density living are also set-up by the inside-out approach of developing urban areas. Central areas are developed first (minimising commuting costs), and as land in the central city becomes filled in, developments move to more open suburban locations. The small, centrally located residences filter down to lower income groups that cannot afford high transport costs, as high income groups are attracted to the larger, peripheral housing (Mieszkowski and Mills, 1993). The filtering-down process of high income groups to peripheral location acts as a force of deglomeration which may even have a vicious effect when the urban space becomes segregated by income, generally causing further deterioration of the poorer locations.

4. Congestion forces;
Because of congestion forces (or congestion externalities), firms and households may decide to leave the urban core and settle in nearby suburbs and satellite towns (Marlet, 2009). Congestion forces may be distinguished in four different forces, namely accumulated infrastructures, the shadow effect of transportation, compensation requirements, and the capital dilution effect.

4a. Accumulated infrastructures
Traffic jams, higher transport costs, and costly infrastructure projects are the result of interactions within an urban agglomeration, which is experienced as a diseconomy of scale for both firms as well as households (Marlet, 2009). Hence, there will be need for high-quality infrastructure, such as highways, that essentially subsidises (or at least encourage) long-distance commuting by allowing faster, more affordable, and easier
transportation. However, transport time and cost reductions generally reduce the value of centrality of location within the city and will always reduce the value of land rent in the city-centre. Moreover, even when high infrastructural investments are made that decrease the commuting time and reduce transport costs, deglomeration may only slightly occur.

4b. The shadow effect of transportation
At the middle of the 19th century, households used to locate near their work. Higher income groups used to locate at the centre, while lower income groups lived at walking distance from the factories and central facilities. However, a larger amount of people started to commute to work as a result of fallen costs and time of transportation, which at their turn were both the result of innovations in transportation. Secondly, a larger amount of people used these fast modes to commute from the suburbs as a result of increases in real incomes, causing reconsiderations of travel time relative to earnings.

This classic example demonstrates the shadow effect, in which improved local transportation not necessarily works as an agglomeration economy. Locations’ infrastructural improvements may be disproportionately used for shipments to and from some other place, casting a shadow on the locations’ attractiveness (Ottaviano, 2008).

4c. Compensation requirements
Households that are not prompted by the commuting times and costs to move to the suburbs, suffer from higher costs of urban living. In contrast, the trade-off of commuting costs and land prices also allows for households to decide to live further from the metropolitan centre as land prices fall with the distance from the centre, despite living further from the metropolitan centre involving larger commuting costs (Wheaton, 1977).

Hanson (2001) points out the need for determined compensation requirements for those located in larger markets: the costs of being in a larger market are higher wages, resulting from high housing costs associated with local congestion.

In order to maintain agglomeration benefits such as knowledge spillovers, labour market pooling, and the HME, firms are implied to compensate for the prices of both their goods (higher rents and land costs) and their workers. Either firms compensate for the high costs of urban living, or the city becomes unattractive for residents and firms, causing their out-migration to the suburbs. Hence the compensation requirements balance on the switching value of either firms or residents paying too much.

4d. The capital dilution effect
The capital dilution effect is a cost-increase suffered by the municipality as a result of population growth; costs which may have otherwise been invested in other purposes. As Brady explains (1989), the effect consists of a

5 Sau-Him Lau demonstrates that the capital dilution effect dominates the savings effect or free riding effect (an opposing side effect to capital dilution which may occur in case of aggregate population growth) for a wide range of population growth rates (Lau, 2009, pp. 560).
decreasing capital/labour-ratio in case of aggregate population growth (whether through immigration or natural growth).

Moreover, the effect is enhanced by free riders, a market failure associated with the provision of public goods. Free riders tend to enjoy the benefits of a public good without payment, laying the burden of public provisions on others (Stroup, 2000).

Due to the increase in population and existence of free riders, investments are diverted away from ‘capital deepening’ (e.g. new technology and research) to ‘capital widening’ (e.g. houses and schools needed to service the growing population). The capital dilution effect decreases the quality of public schools and government services as a result of aggregate population growth, and may in that sense be a diseconomy of scale.

The capital dilution effect is usually the result of larger cities that have become inefficient to administer, whereas governments in some cases appear to be imperfect institutions in successfully formulating, executing and controlling policy objectives.

This can lead to the formation of oligarchy wherein government decisions are not taken in the public interest, but are determined by a disproportionate influence of a privileged class which deals exclusively in their own interest. In modern times, the oligarchy includes not only this privileged class, but also consists of ignorant voters, lobbyists, organised special-interest groups and NIMBY's. The role of elected representatives erodes in case last mentioned citizens obtain considerable influence on the public administration during their time of legislation. The latter is generally referred to as NIMBY'ism, regularly involving citizens claiming some right of legislation on all sorts of issues that primarily harm their own interests to a certain extent. However, their actions generally overlook the larger interests of the community as a whole, which often results in slow and laborious processes with potentially poorer outcomes.

5. Human Capital Flight (HCF);

In general, the human capital flight indicates an outflow of knowledge workers to regions with a more stable government, better career opportunities, higher wages or better earnings relative to travel time. This explains why a region will grow faster and obtains a stronger economic position when it constantly offers better conditions to reach innovations or combinations of productive resources (Schumpeter, 1934). Hence specialised locations oppress a more competitive force in their attraction of specific skills, compared to generally diversified regions. This force is known the backwash effects (see section 3.2.3) that reinforce the dominance of successful cities, for instance, by inducing selective migration of younger and possibly well qualified workers. However, growth in centres may induce growth in some peripheral regions (spread effects) if these regions are needed to supply the centres, for instance because they have good resource bases (Myrdal, 1957). This out-migration of knowledge workers may be reinforced when other regions actively pursue policies to increase their amounts of human capital.

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6 NIMBY is an acronym which stands for ‘Not In My BackYard’.
3.4 POST-MODERN LOCATION THEORIES

Economic geography studies the location, spatial organisation, and distribution of economic activities across the world. A new epoch commenced with Paul Krugman’s New Economic Geography (NEG). NEG’s pecuniary scale economies which have clearly defined microfoundations, whereas Marshallian externalities can be conceived as a theoretical ‘black box’, (Fujita and Thisse, 2002).

3.4.1 Core-periphery model

In 1991, the economist Paul Krugman noticed a growing number of brands as a result of the increased appreciation of diversity in people’s consumption patterns. Krugman therefore introduced the core-periphery model (CP-model), which explained how cities were able to benefit from economies of scale through creating monopolies in terms of multiple different (non-competing) brands. Hence, consumers worldwide would benefit from a greater product diversity through international trade, while each city-core was still able to take effective advantage of scale economies in production. In this way Krugman managed to integrate urban economics, international trade, and regional science in a single theoretical framework (Currie, 2006).

Henderson’s urban system model (1974) also considered specialised poles to generate agglomeration, but he did not speak of the cities’ hinterland. The CP-model on the other hand, implies dynamic growth as a result of trade between cores and their periphery. The growth is explained through concentration of firms in the core involving monopolistic competition, comparable to Dixit-Stiglitz, which Krugman extended to a multi-location setup. The location of clustering is for that matter based on randomness, imperfect competition and scale economies. Secondly, whereas Henderson did not take the costs of transportation into consideration, CP-models incur those costs by simply ‘melting away’ a fraction of the good (the iceberg effect) as a constant rate per distance covered (Krugman, 1998a). Similarly, through migration of international labour force, both households and new households concentrate in cities to reduce their transport costs and prevent the value of their labour to ‘melt away’.

Nonetheless, major drawback of the CP-model was that it overlooked factors generating a dispersing force, except from the immobility of peripheral producers such as farmers. As secondly also the notion of spillovers from the core, which were to a large extent comparable with Myrdal’s spread effects (1957), that could eventually lead to further development of the peripheral regions.

However, Krugman’s core experiences dynamic growth, while the periphery is continuously stagnating. Hence, the CP-model eventually always generates an equilibrium of full agglomeration, since a counterforce does not exist. In a following paper (Brezis et al. 1993), Krugman together with Brezis and Tsiddon, pointed out that regions with technical and economical disadvantages may nevertheless still catch up with more advantageous regions.

3.4.2 New Economic Geography

In one of his articles, Paul Krugman (1996) introduced a theory of three centripetal and two centrifugal forces that appeared in various models of urban growth. Thereby, Krugman was first to deliver a single approach wherein both the
consideration of an equilibrium between microfoundations (second nature factors), as well as the existence of a centripetal and centrifugal force, were emphasized in a coherent framework (Schmutzler, 1999). Moreover, Krugman on the one hand involved firms in his theory, that want to maximise their profits, and on the other hand consumers who want to maximise their utility, whereas classic theories often used to be descriptive in nature and difficult to apply.

In 1999, Glaeser basically presented a follow-up to Krugman’s agglomeration-theory by contesting Marshallian externalities to their contrary (outward-pulling) forces. That same year, Puga (1999) was the first to work out Glaeser’s notions to a standard New Economic Geography (NEG) framework, which was further developed by Fujita, Krugman and Venables (1999). Puga’s framework provides a full analytical solution of the stability of the equilibria in terms of parameters and transport costs, explicitly integrating vertical linkages (Robert-Nicoud, 2004). The original framework also includes agglomeration costs borne by all workers in the agglomerated region, hence indicating stable partial agglomeration equilibria, comparable to Helpman (1998), considering both migration and non-migration.

NEG, as well as (dis-) economies of scale, explains the strong tendency of particular industries or clusters of industries to concentrate in space. Krugman’s NEG-model (Fujita and Krugman, 2003) comprises the most recent construct explaining second nature factors as the advantages and disadvantages of agglomeration. In essence, Krugman’s theory describes the tensions between agglomeration forces on the one hand, and deglomeration forces on the other.

Krugman distinguishes, apart from an agglomeration force (the centripetal force), also a decentralising force (the centrifugal force), which is mainly related to the transportation costs. The relative strength of these centralising and decentralising forces differs for different functions and activities (Koppels, 2010).

Figure 21: forces affecting agglomeration

<table>
<thead>
<tr>
<th>Centripetal forces</th>
<th>Centrifugal forces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market size effects (economies of scale)</td>
<td>Immobile factors</td>
</tr>
<tr>
<td>Economies of agglomeration</td>
<td>Land rents / commuting</td>
</tr>
<tr>
<td>Positive locational externalities</td>
<td>Pure external diseconomies</td>
</tr>
</tbody>
</table>


1. Centripetal forces:

The centripetal side of the NEG-framework considers circular cumulative causation (à la Gunner Myrdal (1957): see section 3.2.3): ’manufactures production will tend to concentrate where there is a large market, but the market will be large where manufactures production is concentrated’ (Krugman, 1991).

The circular causation that generates the centripetal force happens through inter-industry linkages (or interdependencies). Inter-industry linkages consist of vertical and horizontal linkages. The former linkages direct backward (access to upstream

7 The contrary first nature factors, are the historical geographic and spatial reasons for a city’s existence, such as natural resource endowments, characteristics of the landscape and even presence of its (historical or logistic) urban amenities (Krugman, 1995). Minor historical events and small initial differences between locations can lead to a core-periphery structure (Schmutzler, 1999).
markets) and forward (access to downstream markets) between suppliers, production firms, and consumers. Horizontal linkages occur within the same industry, involving issues such as knowledge spillovers and (price) competition. Branch industries will generally concentrate in the largest market, if multiple markets (ceteris paribus) offer sufficient backward linkages (to upstream firms), leading to horizontal linkages. Forward linkages are constituted through distribution of output products as inputs to other industries further down the value chain. Firms can profit from maximum access to products provided that the market also offers sufficient upstream and downstream linkages (vertical linkages). Moreover, production firms also benefit forward linkages of large markets due to their large amounts of mobile workforce (thick labour markets), whereas consumers benefits more consumption and job opportunities.

Figure 22: market linkages and directions

As previously mentioned, the centripetal force is constructed of market size effects, economies of agglomeration, and positive locational externalities, which will be explained below.

1a. Market size effects (economies of scale)
Firms tend to concentrate both their production as well as business activities in one region to benefit from economies of scale. Economies as such are subject to the size of the market for consumers (in case of production) or the qualities of labour force (either more suitable for production activities or managerial activities). Hence firms gain productivity advantages to clustering physically near each other, and near or at the largest market to gain maximum profits and reduce transport costs (Fujita and Krugman, 2003).

1b. Economies of agglomeration
Economies of agglomeration do not require increased production quantities, unlike economies of scale, but merely clustering of business
activities (Geltner et al. 2010). As such they are a productivity advantage caused by a critical mass of facilities, and clustering of firms in direct proximity. The critical mass of facilities may consist of cultural and academic facilities, transportation hubs, and international institutions that are attracted by the firms’ clusters. Such clusters enable vertical linkages (upstream and downstream linkages) in the production process, and horizontal linkages (synergies) due to a common pool of skilled workers as well as a critical mass of experts.

1c. **Positive locational externalities**

Positive locational externalities occur when one firm benefits from another nearby firm, for example when knowledge spillovers arise. Contrary to economies of agglomeration, no critical mass of firms or workers is required for positive locational externalities to occur (Geltner et al. 2010).

2. **Centrifugal forces:**

Fixed and marginal costs associated with the production of any variety of goods depend positively on the number of firms in a location which eventually leads to congestion effects that affect the nature of the NEG-equilibrium model (Brakman et al. 1994). Effects as such make it less efficient or more costly to produce goods and services in large cities, or reduce the quality of life of its inhabitants (Geltner et al. 2010). The existence of the centrifugal force explains why peripheral regions are usually able to compete with their metropolitan centre (Schmutzler, 1999), due to agglomeration diseconomies as such, which most likely leads to the core-periphery pattern to occur.

2a. **Immobile factors**

Some factors, such as land and natural resources, are, contrary to the backward and forward linkages, of immobile nature. Firms from the centre may therefore decide to move to these immobilities and gain cost advantages in their production. Relocation of production activities could mean, considering the supply side of production, that firms therefore become less accessible to workers. From the perspective of the market demand, immobile factors can place restraints on firms to locate close to their customers.

2b. **Land rents/ commuting**

As the concentration of economic activity increases the demand for local land that results in high land rents, those firms and households that demand much ground (such as farmland) will settle outside the city (simply because land is immobile). Through this, they will generally experience higher costs of commuting or transportation to the market centre (the city), thereby providing a disincentive for further concentration (Krugman, 1998b).

2c. **Pure external diseconomies**

Pure external diseconomies are understood to include environmental problems (such as pollution and climate change) and congestion forces (see section 3.3.3). An increase of the number of competitors in an agglomeration may cause considerable diseconomies as such to occur,
affecting the nature of the equilibrium set. Especially congestion forces make production in dominant manufacturing regions excessively costly, as a result of which firms will find it profitable to move to the less congested periphery (Brakman et al. 1994).

Consumers have preferences as to where they want to live relative to the centre of a region. This notion, first stated by Asilis and Rivera-Batiz (1994), allows for the possibility that consumers have preferences to live far away from the centre to escape from disamenities (implying a centrifugal force). However, these costs have to be weighed against higher costs of living resulting from the costs of transporting manufacturing goods (Schmutzler, 1999). Moreover, amenities, consumption goods and welfare produced through urbanisation usually largely compensate for the disamenities of urbanization and higher densities may even improve the local quality of life (Albouy, 2008).

Hence, according to the NEG-framework agglomeration is likely to become more robust with higher transportation costs, an increasingly important manufacturing sector, and more significant economies of scale (Schmutzler, 1999) that outweigh diseconomies.
chapter 4  LOCATION FACTORS FOR FIRMS

4.1 ATTRACTIVE FORCES OF LOCATIONS TO FIRMS

The location theories discussed in the previous chapter are part of the research field of urban economics (or urban economic geography), which studies the location choices of firms and households. Urban economists often simplify the real world through expressing costs as a linear function of transportation, and with the assumption of an evenly distributed population, perfect competition, and consumers with the same preferences.

According to the neo-classic theory of the *Highest and Best Use* (HBU), which lies behind most economic theories on location, each site will be used in the most productive way for that location. The extent to which a location is productive to a particular user is determined by the difference between possible revenues at that site and the costs of the mobile production factors. Unfortunately the real world is not that easily outlined as a set of valuables and assumptions.

This thesis will therefore mainly use (post-) modern location theories in order to ensure implementation of the agglomeration theories in a spatial context. However, Brakman et al. (2001) argue that equilibrium thinking takes a fairly prominent place in the *New Economic Geography*, making this explanation for agglomeration less suitable for a spatial implementation (nonetheless an indication of a spatial implementation will be given in chapter 3). From a practical point of view, Krugman’s (1998b) *centripetal* and *centrifugal forces* are, to a greater extent than *economies and diseconomies of scale*, a set of geographic factors in a black box that is labelled ‘external effects’ that are possibly altering the economic geography. On the one hand the exact mechanism of this metaphorical box is unclear, making it impossible to optimise. On the other hand it is also unclear how the forces may be deployed to actually influence an economic situation.

Although the equilibrium thinking may be useful for understanding agglomeration theories, modern location theories appear to offer a more concrete basis for the implementation in an actual spatial context. The previous chapter mainly focussed on agglomeration and deglomeration through economies and diseconomies of scale (see section 3.3), which are all external reasons for firms and households to cluster in a particular area. The disadvantage of this approach is its inability to explain where agglomeration occurs (Ottaviano and Thisse, 2003). For those reasons chapter 4 and 5 will pay closer attention to land uses, location choices, and user preferences among other things.

William Alonso’s BID-rent function (1964) – as shown on page 30 – considered a distribution of three land uses: residential, offices and retail. The latter consists of amenities such as shops, hospitality businesses, leisure and some public services. Amenities serve as a firm basis for the *quality of life* and are therefore characterised by their large number of visitors compared to their workforce (Van den Hoek, 2009).
The category ‘offices’ comprises primarily commercial establishments such as (financial) business services and multinationals. Secondly, R&D facilities, top-quality production, manufacturing and logistics and distribution are also in this category. Nonetheless, some of the latter mentioned companies usually locate close to heavy infrastructure, such as highways, eccentric railway stations and airports or at so-called specialised clusters, usually located in the periphery. These type of businesses will however not be discussed extensively given the explicit focus of this thesis on inner-city locations. As such the focus will be on retail and amenities, business services and multinationals, and to a much lesser extent on R&D facilities, top-quality production, and logistics and distribution (BCI, 2010).

The third sector considered by Alonso (1964) consists of households that rely their location choice primarily upon the benefits and opportunities that a centre has to offer. This involves factors such as employment, schools, shops and recreational activities, that will be discussed in section 5.3 (quality of life).

The previous chapter started with discussing the (neo-) classic location theories which function as first nature factors explaining the emergence of cities. Subsequently, the classic location theories of Von Thünen (1826), Christaller (1933) and Alonso (1964) especially discuss the relation between the costs of labour and transportation.

Where classic theories cannot account for differences in growth between cities, modern location theories do help to understand why some cities are more attractive for firms and households than others. Therefore in the 1950’s, the classic view was complemented by agglomeration factors which have proven dominant for companies looking for a new business location since the beginning of this century. Companies as such select their future location based on a kind relation between the characteristics of the production environment (the economic factors) and the internal business objectives (Atzema et al. 2002).

When firms compete in location and through the price of a homogeneous good, Hotelling (1929) conjectured that they agglomerate at the market centre in order to obtain a larger market area or outlet (see section 3.2.1). Secondly, firms may cluster together because they have something in common with regard to (a) inputs suppliers that are present in a place, (b) resource endowments which are available in the place, or again (c) customers that can be reached from a place (Johansson and Forslund, 2006). The movement of economic activities (retail, services, industries,) from the periphery to the core of an urban area, or the relative growth of employment in the centre versus the periphery, is termed economic land use concentration.

Such reasons for clustering also play a central role in the theory of Ohlin (1933), which was discussed in section 3.3.1. However, d’Aspremont et al. (1979), demonstrated that firms tend to locate apart in order to avoid Bertrand price competition¹, which can push their profits down to zero.

¹ The Bertrand price competition describes how two non-cooperating firms that produce homogeneous products, compete by setting prices simultaneously. Consumers tend to choose for the lowest priced products, or randomly select among them if all firms charge the same price. Bertrand price competition makes firms seek spatial separation, which is diametrically contrary to the principle of minimum differentiation (see section 3.2.1).
Takatoshi Tabuchi (2009) makes abovementioned twofold explicit, explaining how some retail firms, such as gas stations and convenience stores, indeed tend to locate apart to relax price competition, which is so in case of monopolistic competition\(^2\). If goods are homogeneous, it is no doubt that firms avoid Bertrand price competition in spite of the attractiveness of the market centre. However, it has also proven true that they often form clusters in case of imperfect competition, such as oligopolistic, duopolistic and monopolistic firms and industries. If the goods sold by firms are heterogeneous, such competition would be relaxed. Hence it is possible that the repulsion due to price competition may be outweighed by the attractiveness of the centre in the case of heterogeneous goods (Tabuchi, 2009).

### 4.1.1 The importance of location

What firms consider to be important in their location choice is per sector heavily time-dependent. The essentials outlined by various studies are nevertheless demonstrated in this chapter. First of all, Pellenbarg (2002) makes this clear in the figure below by three distinct phases:

![Figure 23: factors that have determined location choices over time](image)

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>industrial revolution</strong></td>
<td><strong>after 1950</strong></td>
<td><strong>from 1990’s onwards</strong></td>
</tr>
<tr>
<td><strong>Primary factors</strong></td>
<td><strong>Secondary factors</strong></td>
<td><strong>Tertiary factors</strong></td>
</tr>
<tr>
<td>Transport costs (of commodities and raw materials)</td>
<td>Proximity of the market for outlet</td>
<td>Governmental control on locations</td>
</tr>
<tr>
<td>Labour costs</td>
<td>Proximity of suppliers and services</td>
<td>Knowledge centres and IT-infrastructure</td>
</tr>
<tr>
<td></td>
<td>Other agglomeration benefits</td>
<td>Level of institutional thickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Representative identity of the corporate location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qualities of the living environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality and ethos of workers (mentality)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental aspects (environmental zoning/contours and sustainability)</td>
</tr>
</tbody>
</table>

Source: adapted after Pellenbarg (2002)

\(^2\) Monopolistic competition is characterised as (1) many small sellers relative to the total market, (2) real or apparent differentiated products or services, and (3) free and easy entry and exit.
For businesses there is actually a lack of agglomeration economies as primary and secondary location factors (that have been decisive from the Industrial Revolution up to 1900) have gradually become equal in more and larger areas. A *level playing field* has emerged as only gradual differences between the attractiveness of different European metropolitan business environments exist, for businesses operating within a (inter-)national market (Pellenbarg, 2002), that has made them *footloose*. Moreover, globalisation has led to the disaggregation of global business activities (Sassen, 2001), allowing companies to seek cost and quality advantages worldwide, that even further diminished their sense of local bonding.

In phase III, it is therefore often the personal judgement that entrepreneurs make (their mental maps and managerial *gut feeling*3), and the deployment of economic into social networks (behavioural and institutional theories). The scale level to which such economies of agglomeration play are depicted in figure 24.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Location theory type</th>
<th>Focus</th>
<th>Scale level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Classic</td>
<td>Least cost</td>
<td>Regional concentration</td>
</tr>
<tr>
<td>Phase II</td>
<td>Neo-classic</td>
<td>Cumulative causation</td>
<td>Urban agglomeration</td>
</tr>
<tr>
<td>Phase III</td>
<td>Modern</td>
<td>Growth pole theory</td>
<td>Urban agglomeration</td>
</tr>
<tr>
<td></td>
<td>Post-modern</td>
<td>Behavioural and institutional theories</td>
<td>Spatial diffusion</td>
</tr>
</tbody>
</table>

Source: adapted after Pellenbarg (2002)

The extent to which a location relates to business’ objectives (activities, organisational structure, the division of labour e.g.) will determine a firm’s location choice. This decision will on the one hand be based on *internal* factors, such as business strategy, productive resources and personal aspirations, as the already mentioned *mental maps* and *gut feeling*, and on the other hand in accordance with *external* factors4 (EIM, 2002). Those factors external to the firm can be divided into *hard* and *soft location factors*; the first type is mainly related to market accessibility, proximity to outlets and a sufficient *pool* of nearby workers. In addition, the availability of plots is important concerning the presumed height of land values, which will eventually be discounted in the lease or rental price.

*Soft location factors* relate primarily to the visual appearance of the building and its surroundings, as well as the network that the site offers, such as the structure of

3 The behavioural sciences offered a new perspective on location theories by claiming that humans do not entirely act rationally and as a *homo economicus*, but instead frequently act as *satisficers* because of our limited rationality, as a result of which a firms do not necessarily settle at the optimal location. The location choice is often not determined by the most optimal combination of location factors, but by the knowledge and perceptions that affect an entrepreneur’s interests (Lambooy et al. 1997; Pellenbarg, 2002).

4 *Internal factors* are mostly specific business and managerial in nature, and are therefore do not constitute an ample component of this thesis (see section 3.3.1 for some more information on *internal economies of scale*).
suppliers, their workers’ place of residence, social networks and in some cases the companies’ historical legacy.

Based on the NVB Thermometer Kantoren\(^5\) (2011) the 10 most important criteria in respect to the office environment are divided on *hard* and *soft* conditions for location.

**Figure 25: overview of the most important *hard* and *soft* location factors**

<table>
<thead>
<tr>
<th>Hard conditions for location</th>
<th>Percentage according to NVB (2011)</th>
<th>Soft conditions for location</th>
<th>Percentage according to NVB (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility by car</td>
<td>8,2%</td>
<td>Environmental appearance (image, status, visual quality and spaciousness)</td>
<td>7,5%</td>
</tr>
<tr>
<td>Parking lots</td>
<td>8,1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessibility by public transport</td>
<td>7,6%</td>
<td>Exterior appearance of the office</td>
<td>7,3%</td>
</tr>
<tr>
<td>Options for considerable growth</td>
<td>6,6%</td>
<td>Proximity to workers</td>
<td>6,8%</td>
</tr>
<tr>
<td>Convenient shops within walking distance</td>
<td>5,8%</td>
<td>Proximity to customers and associates</td>
<td>6,4%</td>
</tr>
<tr>
<td>Visibility</td>
<td>5,6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total clarification:</strong></td>
<td><strong>41.9%</strong></td>
<td><strong>Total clarification:</strong></td>
<td><strong>28,0%</strong></td>
</tr>
</tbody>
</table>

Source: adapted after NVB (2011)

### 4.1.2 Scale dependence

A location choice is largely determined by a firm’s scale. Both at the start, relocation and extension of businesses, SME’s mainly use *hard* location factors, which is confirmed in Pellenbarg’s (2006) research as well.

Then there is also, as already mentioned, a *level playing field* for globalised firms with disaggregated business activities due to minor differences between different locations. Richa Singh (2010) performed case studies among four large Dutch and Belgian organisations, examining which microfoundations they use as a pretext to cluster at a certain location. Based on her interviews she concludes that particularly *infrastructure sharing*, *knowledge spillovers*, *input sharing*, and *rent seeking*\(^6\) are reasons for organisations to cluster at a certain location. On the contrary, firms mostly leave clusters as such because:

- suitable metrages of real estate are lacking (see section 3.3.3: the *disadvantage of immobility*) due to growth of business activities;

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\(^5\) Office Gauge by the Dutch Association of Building Contractors (NVB, 2011).

\(^6\) It is assumed that *rent seeking* has shown to be a decisive microfoundation mainly for the reason that half of Singh’s (2010) case studies were performed in Brussels, the governmental capital of the European Union.
other firms are able to pay more for property at a desired location (which is in line with the BID-rent theory: section 3.1.1); or
- the aim for a better mix of functions (urban synergies) elsewhere;

High rent levels also constitute a reason for firms to spread their offices across multiple locations in a city, a region or a country. Lastly firms move to other locations because they (1) can access new pools of labourers, they (2) prefer to locate closer to their clients and associates (the HME), or (3) when they already have offices at their disposal in these locations (for example due to mergers and acquisitions in the past).

4.1.3 Sector dependence

Finally, the location choice of a company is heavily dependent on the segment in which it is active. The abovementioned factors are to a large extent of importance to the housing of SME’s, services, multinationals and other businesses, but the various interest at the location choice of urban amenities (retail, leisure, entertainment and recreation) puts out quite different. The major difference between working (SME’s, multinationals e.g.) and amenities is that amenities have more visitors than workers (Van den Hoek, 2009). Given this difference, the next section will discuss some factors specific to the retail sector.
4.2 RETAIL AND AMENITIES
This section provides a separate treatment of so-called urban amenities (Glaeser et al. 2001), that, contrary to firms, serve as supply functions for households and visitors of a city. Generally, retailers focus on the four P’s (product, price, place and promotion), that are assumed to influence buyers’ response on their choice, quantity of purchases, and moment of purchase (Kotler, 1991).
This section will mainly discuss the characteristics of retail and consumers’ shopping behaviour. Subsequently the next chapter’s section 5.3.3 will clarify how retail and amenities influence urban attractiveness for households.

4.2.1 Characteristic location choices
Retailers’ location choices are, just like educational institutions and various other people-oriented businesses and services, largely explained by the population size. Hence it is understandable why residential areas with higher densities tend to have more retail outlets, while places with insufficient demand have none. In this sense, additional people nearby confer a benefit on each other by helping to make more products available. Nonetheless, a product market will only benefit in case of an agglomeration with people of like preferences. Hence it is not simply the amount of nearby demand that determines what is available, but rather the mix of consumers according to their preferences (Waldfogel, 2006).

Concentrated shopping areas often entice consumers through an accumulation of attractions (their promotion) to a combined visit (Van der Post, 2004) and compulsive buying. Three factors can be distinguished, based on the theory of Boekema et al. (1998), that determine the attractiveness of the inner-city in general, and its main retail area in particular:
1. A logic embedment in the urban fabric through which clear walking and cycling routes occur. Streets preferably have a clear starting point at their beginning and some kind of goal at the end;
2. The impression of crowded shopping streets (both by day and by night) contributes to vibrancy of the inner-city. Walking on the streets is supposed to be pleasurable, supported by spatial qualities, such as alternate building types, a characteristic atmosphere, well designed and managed public spaces (Gijsbers, 2006), and physical comfort such as climate protection, places to rest and sufficient parking; and
3. A combination of the concentration of a big variety of functions, companies, activities and public spaces (love of variety), such as a number of large warehouses and small shops both offering a specialised assortment, that is important in order to create a mix of product-options and quality-levels.

Concerning the place, a logical design of the urban fabric on the one hand leads to natural walking and cycling routes resulting in the much needed flow for retailers, and on the other hand determines the shape and size of the city block defined by this configuration of streets. In an urban setting (especially in Europe) so-called perimeter blocks often arise, which are mostly built up on all sides, surrounding a central place that is (semi-) private. At ground level, the public and private environment of the perimeter block actively come into contact. This interface area is often characterised by altering building typologies and is therefore often used for retail or commercial purposes, as proprietors see opportunities to create an
atmosphere of their own (as promotion). The inside of the perimeter block was traditionally used as courtyard, surrounded by multiple apartment layers. Albeit this urban form already allows very high urban densities, some northern American cities (New York, Chicago, Portland, Toronto e.g.) filled up the court yards or street fronts of the perimeter block with high-rises to achieve even higher densities. Apart from this typical urban building form, the periphery is on the one hand characterised by small-scale (neighbourhood) services and ‘new’ retail concepts of various up-scaled formulas on traffic locations on the other hand. Such peripheral shopping centres are in competition with standard retail formulas that one usually finds in the inner-city (Walen, 2005). Nevertheless, in their research on the effects of the peripheral shopping centre Rotterdam Alexandrium, Gorter et al. (2003) conclude that large scale, peripheral shopping centres are more attractive for consumers living in a longer distance from the centre, hence they appear not directly in competition with inner-city retail.

4.2.2 Consumer typologies
Consumers patronise a specific spectrum to each category of products (e.g. haute couture, ready-to-wear, or second-hand clothing). For instance, highly educated people value specific amenities more (such as museums, shopping possibilities, cuisine options, and trendy public spaces with higher environmental standards), and prefer to have them locally available, rather than their less-educated counterparts do (Glaeser et al. 2001). They are even willing to pay a higher rent for similar apartments, in case these services and cultural consumption potentials are locally available (see also section 5.3.3).

The type of purchasing behaviour is largely influenced by the accessibility and availability of retail businesses (Van Leeuwen, 2010), but on the other hand also by the consumers’ economic bases (Gijsbers, 2006). Following the earlier discussed spatial differences, different kinds of shopping can be categorised as run-shopping, fun-shopping and goal-shopping (Gorter et al. 2003; Van Leeuwen, 2010).

a. Run-shopping;
Consumers take run-shopping as a rational routine to purposefully purchase everyday products (Pine and Gilmore, 1999). Given the everyday nature of this way of shopping, many consumers attach importance to good accessibility and convenient opening times (Van Leeuwen, 2010). Run-shops settle preferably in locations where high currents of (hurried and easy) consumers go, or at location where a large population is concentrated. This often involves locations at transport routes (for example retail at train-stations) and inner-city areas where large concentrations of households and employees are living (retail near home- and workplaces). It is also true for these types of shops that they prefer clustering to benefit from a larger spending potential (Boekema et al. 1998).

b. Goal-shopping;
Although goal-shopping, as well as run-shopping, refers to targeted shop visits, it distinguishes itself with consumers that orient in advance, and for it mostly concerns costly articles (such as cars and furniture). Suppliers that focus on the purpose-oriented consumers settle preferably in large scale, peripheral shopping centres (Pine and Gilmore, 1999) where consumers generally go to by car (Van Leeuwen, 2010). As with run-shopping, the
consumers prefer clustered stores with multiple suppliers of the requested product, but do not combine their visit with other store visits.

c. Fun-shopping;
The core business of shopping is for many people no longer limited to regular retail, but has become a form of recreation wherein multifunctional shop supply and pleasing surroundings (including the design of the public space) determine an area’s appeal. All of this has to do with the experience, atmosphere, identity/branding, differentiation (*love of variety*), as well as the retail mix and combinations with entertainment and leisure, to encourage combined visits and compulsive buying. Fun-shopping is a way of modern, recreational shopping, and the only way of shopping in which synergy-effects between retail and other businesses, such as entertainment, hospitality, leisure and culture, come into play. Non-retail functions as such therefore increasingly act as ‘trigger’ for the shopping centres and areas that contain them (Gijsbers, 2006). Also there is often a concentration of large and popular brands at such retail locations. This led to so-called *brand zones* which in some cities even appeared to be a destination in themselves (for example Rodeo Drive in Los Angeles, the Sony Centre in Berlin and Oxford Street in London).
4.3 RESUME OF AGGLOMERATION FORCES

Sinai (2010) points out that firms frequently locate near other firms because of returns on agglomeration, whether through less expensive transportation of goods and services between them, knowledge spillovers amongst them, or by having access to a thick pool of labour that accumulates around a large concentration of employers. Sinai’s remark illustrates the difficulty of empirically identifying and separating the microfoundations of agglomeration (the second nature factors), whether due to incomplete and limited data or information that is susceptible to change, and complex interactions between heterogeneously distributed workers and firms (Duranton and Puga, 2003).

The following sections will set out the importance that firms attach to the second nature factors (except for input sharing, knowledge spillovers and natural advantages), as they are left unexplained in many cases. For this purpose, stated preferences derived from two surveys have been related to the individual microfoundations7. The European Cities Monitor is an annual survey performed by Cushman & Wakefield (2010; 2011) among 500 European companies that were systematically selected from a shortlist of Europe’s largest companies. Secondly, Ernst & Young (2011) performed their 2011 European Attractiveness Survey among 812 respondents from various international business sectors.

4.3.1 Input sharing

The spatial proximity of firms and collaborations with competitors comes with savings on operational costs, savings on the search for appropriate information and innovation, savings on aligning activities in each other’s production schedule and the possible exchange of labour (Scott, 1988), some of which are also associated with the possibility of knowledge spillovers, that will be discussed in section 4.3.3. The efficiency and business relationships shape an embedded network (Granovetter, 1985) which relies on trust, loyalty and social security. Such relations within networks are often seen as so-called keep-factors for a firm’s location (Atzema et al. 2002).

Although neither the survey by Ernst & Young, neither that of Cushman & Wakefield indicated the importance of input sharing for firms, proof of its existence was found by Singh (2010) at corporate level through case studies, and by Rosenthal and Strange (2001) at state and zipcode levels. Yet, Marlet (2009) shows that agglomeration economies in the labour market (such as labour market pooling) and at the market-outlet (the HME) are more important than scale economies in procurement and supplies (input sharing). In addition, firms do not consider the presence of suppliers as important at local scale, but do so at regional and national scale (Pellenbarg, 2006).

Firms are linked by input-output linkages (see section 3.4.2) after all: what is output for a firm is input for the others and vice versa (Ottaviano, 2008), yet this is obviously not important at local scale level. Nonetheless, different firms tend to cluster at specific locations in order to:
- receive input from various services such as administrative, consultancy, legal, and marketing firms (Singh, 2010);

---

7 These results will eventually be linked to the 4 domains that are used for households that will be explained in the next chapter. The factors will be further operationalised in the synthesis to indicate their relative importance for both spatial interventions and policy.
- use *indivisibilities*\(^8\) as inputs for their production; and
- specialise in tasks to decrease fixed costs.

Abovementioned reasons for clustering at local scale level can be explained in spatial terms due to the fact that *input sharing* requires a large local market provided by the spatial concentration of residents and other downstream customers (Ottaviano, 2008). Hence it is assumed that the importance of *input sharing* is not solely based on the presence of either *horizontally linkages*, nor *backward linkages*, but rather on *forward linkages* to a sufficient amount of consumers.

### 4.3.2 Labour market pooling

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2(^{nd}) (53%) Availability of qualified staff</td>
<td>6(^{th}) (50%) Local labour skills level</td>
</tr>
<tr>
<td>6(^{th}) (32%) Costs of staff</td>
<td>7(^{th}) (50%) Labour costs</td>
</tr>
<tr>
<td>9(^{th}) (21%) Languages spoken</td>
<td>10(^{th}) (42%) Flexibility of labour</td>
</tr>
</tbody>
</table>

Labour market pooling can very basically be explained by firms that demand labour in order to supply products (Dixit and Stiglitz, 1977). In line with the outcomes of the abovementioned surveys, De Graaf *et al.* (2009) indicate the average distance to the surrounding population to be of significant importance. Moreover, Rosenthal and Strange (2001) show evidence of *labour market pooling* at both state, country, as well as zipcode levels.

After all, the location choices firms make do not depend so much on the local labour market, but rather on the access to sufficient amounts of qualified staff on the regional and even national labour market (Pellenbarg, 2006). The study by De Graaf *et al.* (2009) illustrates the importance of the effect of many potential and suitable workers living in an area on the real estate value of an office in that area. Jobs requiring a higher level of education have a lower spatial density than jobs requiring a low level of education (Simpson, 1992). As a result, workers with specific skills are more flexible spatially, although firms often prefer to locate at good accessible locations anyway.

In addition the spatial concentration of workers with different skills and firms with different needs (*urbanisation economies*) increases the likelihood of good matches. Spatial concentration as such also reduces the duration of unemployment spells and unfilled vacancies (Ottaviano, 2008). Moreover, any growth of the population may bring about more potential employees as well, again causing the city to attract more firms (*cumulative causation*).

### 4.3.3 Knowledge spillovers

Rosenthal and Strange (2001, 2004) show evidence of the existence of *knowledge spillovers* at zipcode and state levels, and Beenstock and Felsenstein (2009) show that *knowledge spillovers* are mainly localised near the city. Also, measurements of knowledge spillovers per location may be available through the number of patent...

---

\(^8\) Facilities or tools which are only feasible when shared by many firms (or households), such as fitness rooms, a day-nursery, production machinery, and trucks.
citations in that same location, the intensity of skilled labour (by education levels), or the number of R&D expenditures per capita. However, knowledge spillovers are hard to measure but are, according to Rosenthal and Strange (2004), most likely to take place at cluster level and gradually attenuate with the distance from the business centre (Singh, 2010). Knowledge is transferred between individuals thanks to sheer physical proximity. In case they possess different pieces of information, pooling them through informal communication channels can benefit everyone, hence the importance of proximity (Krugman, 1991).

Hence the interest for firms lies in the distance to other areas (centrality) and the presence and vicinity of different companies and industries where benefits can be extracted from (see also section 3.3.2 concerning the home market effect), such as the possibilities of encounters and unforeseen exchange of information (knowledge spillovers). Due to this, the potential for network formation increases, which is important for the economic position of a geographical area, but also especially for smaller firms that are often not able to organise anything internally.

The type of firms, for which knowledge spillovers are important as an urbanisation economy, therefore locates on the most expensive locations in the city (the PLVI: Peak Land Value Intersection), where density is generally high. Locations as such offer them the urban dynamics that support sufficient opportunities for face-to-face contacts (see section 5.3) with customers, suppliers, government agencies, but also with competitors or diverse businesses and corporate dynamics which only serve to inspire (Porter’s externalities).

For knowledge spillovers in localisation economies, the proximity of especially comparable, preferably specialised firms, is considered important (De Graaf et al. 2009). In this context, the quality of the R&D environment (universities, colleges, technological institutes and knowledge facilities) also showed to be an increasingly important location factor for firms (Pellenbarg, 2006).

### 4.3.4 Infrastructure sharing

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd (52%)</td>
<td>Quality of telecommunications</td>
</tr>
<tr>
<td>4th (42%)</td>
<td>Transport links with other cities and internationally</td>
</tr>
<tr>
<td>10th (20%)</td>
<td>Ease of travelling around within the city</td>
</tr>
<tr>
<td></td>
<td>1st (63%)</td>
</tr>
<tr>
<td></td>
<td>Transport and logistic infrastructures</td>
</tr>
<tr>
<td></td>
<td>2nd (62%)</td>
</tr>
<tr>
<td></td>
<td>Telecommunication infrastructures</td>
</tr>
</tbody>
</table>

Agglomeration of firms may occur since they locate preferably at highly accessible sites, hence there will be competition for land as a result of the accessibility of a location. The spatial economy can be visualised as a network of interconnected markets, wherein the attractiveness of a market as a production site for firms also depends on both its relative size (its support base), besides its relative centrality in the network of trading markets (its accessibility). These two dimensions are embedded in the concept of ‘market potential’ of a location, high market potential being associated with attractive and well accessible sites (Ottaviano, 2008).

The presence of adequate infrastructure increases a location’s attraction value to firms at both local, regional as well as national scale level, although the quality of the infrastructure is not a primary location factor for most firms (Pellenbarg, 2006).
Ottaviano and Thissse (2003) point out that firms locate close to both hard and soft infrastructure. Firms consider it important to locate in close proximity of roads and an airport (hard), to have qualitative telecommunications at their disposal (soft), and for transport and logistics services proximity to railways and ports appears important. Apart from infrastructure for short distance interactions, it may be assumed that accessibility through ‘global infrastructures’ also is an important location factor for firms (Ottaviano, 2008).

In the Dutch situation, the value of an office increases with approximately 16% when located within a 500m radius of a railway station, but diminishes rapidly as it is located further than 1km from the station. The latter may be understood as firms within the 500m radius are easier accessible by foot, which is preferable to transits on other modes of transport (De Graaf et al. 2009). Traffic congestion appears to be less important for the real estate value of offices as such, although it still has a limited adverse effect (De Graaf et al. 2009).

### 4.3.5 Home market effect (HME)

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; (60%) Easy access to markets, customers or clients</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; (57%) Potential productivity increase</td>
</tr>
<tr>
<td>8&lt;sup&gt;th&lt;/sup&gt; (48%)</td>
<td>The country’s or region’s domestic market</td>
</tr>
</tbody>
</table>

Apart from abovementioned surveys, Krugman (1979, 1991) proves the existence of a home market effect through indicating the magnifying effect of interacting scale economies.

The larger the city and its direct environment, the larger the potential market for products, as the number of potential customers increases with the amount of urban dwellers and firms. Firms gain the advantages of a large HME through high urban densities causing a large local outlet to exist (Brakman et al. (2009). Moreover, if some firms provide positive externalities, the premium, that others would be willing to pay to locate close to them, should go up, leading to higher land values (Sinai, 2010).

Secondly, cities are attractive to firms for exporting products to smaller markets which are in the direct environment (Marlet, 2009). For these two reason, new firms will enter the central market until their economic profit drops to zero. Besides this, the size of the population outlet imposes an important location factor, mainly for consumer-oriented firms, which hence often benefit from high densities and easily accessible locations.

As a result of the trickle down effect, these consumer-oriented firms will concern both financial and business services as well as ordinary retailers such as bakeries, butchers and groceries, which will lead to an overall increase of employment (Marlet, 2009). It is even shown that small firms impose a relatively large contribution to the employment growth, especially when a collaboration with one or more business partners is involved (Birch, 1979 and 1987; Schutjens and Wever, 2000). Storey (1994) notes that this is not true for older firms and for firms that do not have a growth-perspective.

Of all firms located in the Netherlands, 77% is relatively small and has no more than 10 employees. These small businesses account for one fifth of the total
employment. However, most labourers are employed at larger firms and organisations: more than half of it can be found in firms with more than 50 jobs (PBL, 2009). When firms grow, they tend to settle at less mixed locations (a higher FMI\(^9\)). Hence the assumption that smaller businesses are easier to mix than large ones appears right. Finally, the PBL (2009) emphasises how the reducing industrial sector offers a fairly wide range of new industries with growth potential, including smaller businesses that can be mixed with housing.

In conclusion, the HME occurs as a result of the concentration of employment, and thus demand, that attracts other firms. Hence it is constructed of (1) the size and density of firms, and (2) the population density.

### 4.3.6 Consumption advantages

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11(^{th}) (53%) Quality of life for employees</td>
<td>5(^{th}) (54%) Social climate and environmental stability</td>
</tr>
</tbody>
</table>

Smaller businesses are mainly located in residential areas that have a low FMI (see section 7.3 for an elaborate explanation of the FMI), while larger firms are mainly located in areas where the FMI is high (PBL, 2009).

Larger firms are increasingly regionally and nationally oriented in their location choice as the embedment in regional economic and social networks plays a decisive success factor for them (Pellenbarg, 2006; Stam, 2006), yet they often do not consider the quality of life important at local level (Pellenbarg, 2006).

Nonetheless it appears more and more explicitly that firms also increasingly become concerned with quality of life-factors such as schools, recreation and cultural amenities, although their location choice primarily depends on the appreciation of regional infrastructure and labour markets. However, quality of life shows, just as local infrastructure, not to impose a primary location factor for most firms.

Nevertheless, workers increasingly have a say in the choice of the workplace location and thus it is important for firms to locate themselves in areas which workers are also attracted to. In this sense it appeared that consumption advantages contribute to their workers’ quality of life, hence spatial concentrations of people and consumptive provisions can indirectly attract firms as well. Furthermore, concentrations as such are especially present in inner-cities where many opportunities on social interactions (urbanisation economies) exist that may result in valuable knowledge spillovers (Ottaviano, 2008).

### 4.3.7 Natural advantages

Manifold natural advantages closely relate to first nature factors (Krugman, 1995) that explain the reasons for a city’s existence. However, the first nature usually offers no explanation for relative differences in the degree of agglomeration between cities, as it presumes very small, historic differences that often no longer apply to the contemporary urban settlement. The extent to which natural advantages impose an attraction to firms is negligible, as their attractive value to households is somewhat limited. Neither did the literature study bring forth any

---

\(^9\) The Function Mix Index (FMI) will be discussed in chapter 7.
evidence that natural advantages would be crucial to attract firms. Nevertheless, high dense concentration of firms in urban centres may be beneficial to residents, as it preserves peripheral highway locations as natural or agricultural land.

4.3.8 Rent seeking

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th (20%) The climate governments create for business, through tax policies or financial incentives</td>
<td>3rd (62%) Transparency and stability of political, legal and regulatory environment</td>
</tr>
<tr>
<td>9th (46%)</td>
<td>5th (33%) Corporate taxation</td>
</tr>
</tbody>
</table>

The surveys show that the location choice of firms also depends on the institutional environment that is determined by regulations, the tax environment, permits, subsidies, regional network formations, market conditions, political balance of powers, and public-private cooperation (EIM, 2002; Pellenbarg, 2006). Especially headquarters tend to locate close to important administrative institutions (Singh, 2010).

Nevertheless, Marlet states that firms are hardly guided by the government in their location choice; local taxes and accommodation costs only impose a small effect on the profit and loss account on the long term and are often not even on their own balance sheets. The scale and agglomeration economies of well-figured locations are for most firms many times more important that their accommodation costs. In spite of the possibly high costs, firms therefore especially put effort in optimising revenue and profit margins through locating at locations where people and firms are concentrated in high densities, as product demand is usually greatest in these regions (Marlet, 2009).

4.3.9 Diseconomies

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield (2011)</th>
<th>Ernst &amp; Young (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th (33%) Value for money of office space</td>
<td>-</td>
</tr>
<tr>
<td>7th (25%) Availability of office space</td>
<td>-</td>
</tr>
<tr>
<td>12th (16%) Freedom from pollution</td>
<td>-</td>
</tr>
</tbody>
</table>

Most of the internal diseconomies of scale will affect the location choice of households. Only 16% of the respondents to the survey of Cushman & Wakefield (2011) considers the absence of environmental disamenities important. Both surveys show that particularly the price and amount of available space are indicated as important factors for firms.

The importance of sufficient supply of locations is considered important at all scale levels, from local to national (Pellenbarg, 2006). Although location-specific characteristics of the business environment are primarily emphasised in spatial and physical terms by economic geographers, accommodation is not considered of direct importance for the performance of firms by managers, business economists and financial experts (Pellenbarg, 2006). For them it is especially important that a firms dispose of more capital through favourable lease terms. Especially start-ups
are in need of capital as such to investment in their production capacity in order to grow; outlay must precede returns. According to Orr en Jones (2003) rent developments in the market for office locations are particularly influenced by: economic growth, employment trends in financial and business services, rents paid in previous years, and the completion of new office space.
chapter 5

LOCATION FACTORS FOR HOUSEHOLDS

5.1 NATURE OF THE FACTORS
The economies and diseconomies of scale, as discussed in the third chapter, particularly address reasons for firms to agglomerate from their production standpoint. Subsequently, chapter 4 elaborated on site-specific properties which appear important to different kinds of businesses. Several studies on agglomeration factors have already shown effects as such to yield benefits to consumers and households as well.

On the contrary, it is also necessary for people to live in the city so they can work in the firms present and to make use of the urban amenities (Vande Putte, 2010b). According to De Groot et al. (2010) it is the interaction of a city’s attractiveness as a consumer city, and the ability to put itself on the map as an (industrial) outlet, that brings forth a successful city. This suggests that a city on the one hand needs to have factors of productivity, such as natural resources (land and an advantageous climate), workers (employees) and capital (both permanent, such as buildings and infrastructure, as current, such as inventory and finished products), and on the other hand consumptive attractions that constitute the quality of the housing and their surroundings.

Apart from productive- and consumptive resources, cities ultimately not solely depend on their location and structures, but depend all the more on their people and the economic vitality generated by this human capital (Florida, 2002; Marlet, 2009; Glaeser, 2011). Hence, the question remains through what composition of attractions certain people are drawn to cities or clusters, that is able to keep them there? A clear answer to this question would provide an answer to this thesis’ first subquestion concerning households (see section 1.2.1).

This thesis therefore makes a distinction based on four domains according to a similar approach Buck Consultants International (BCI, 2010) used in a monitor concerning the business climate in de Dutch province of Limburg. The BCI-monitor functioned as a starting point, but has been further enriched on grounds of scientific publications concerning firms’ (features of which have been discussed in the previous chapter) and households’ motivations in their location choices.

Both in accordance with the BCI-monitor, as well as regarding former empirical studies that have been conducted on factors that were thought to affect the attractiveness of an area, the attractive force presumed in the subsequent domains is considered relevant for further explanation:

1. Physical environment
2. Quality of life
3. Human capital
4. Economic profile
The first domain relates to the attraction value of the physical environment, particularly on the basis of infrastructural facilities. It concerns agglomeration benefits on the value of a location’s output, which are for that reason also called production factors or agglomeration advantages.

Quality of life, the second domain, refers to the consumption factors which are largely determined by residential amenities. The latter may be subdivided in urban/constructed amenities and natural amenities. Such amenities are immobile (location specific amenities), collective, publicly accessible and distinct from housing qualities, which deal with dwelling specific amenities. Disamenities as a result of agglomeration are included in this domain as well.

The third domain is concerned with the presence of human capital, which particularly encompasses the presence of the creative class and high educated at the local labour market. This domain will be elaborated on in the fourth section (5.4) of this chapter, closely looking at their wants and demands regarding their residential location.

Lastly, the economic profile concerns the importance that households attach to a sound and healthy economic structure in their location choices. This has for a large part to do with the composition of the population, but also its growth and the density in which it is living.

The relative importance attached by different people to the abovementioned domains will be elaborated on in the synthesis of Part II, by weighing each domain per population sector. This chapter will, as an introduction, provide explanations on each domain, the individual factors of which they are constructed, and their relationship to the scientific literature.
5.2 PHYSICAL ENVIRONMENT
The first domain concerns the extent to which the physical environment of a metropolitan area offers sufficient opportunities for optimal use of available production factors. Besides nature as a factor of production, such as location, life and climate, in particular the availability of land is regarded important as it is essential for the construction of infrastructure, buildings, mechanical and industrial production and agricultural activities. For workers (in itself a production factor of major importance) the quality of infrastructure is especially considered important, which is endorsed by Von Thünen and others (see section 3.3.1 and Appendix 1 for an overview of other contributors to location theories) since 1826.

Information (the quality and availability of knowledge, data and communication) and entrepreneurial capacity are, besides the classic factors of production (nature, capital and labour), within the knowledge economy reckoned among factors of production sometimes. Modern production factors as such are on the one hand ranged under the physical environment (ICT-infrastructure) and on the other hand under human capital (the entrepreneurial capacity) that will be discussed in section 5.4.

1. Accessibility of jobs;
Accessibility by road is a basic prerequisite for a favourable business environment and covers both access by motorways as well as regional accessibility by various other transportation modes. Regarding public transport, both the regional, national and international access quality (intercity trains and faster rail transport modes) of the rail network are considered irrelevant. Finally, the degree of accessibility is determined by larger-scale infrastructure, such as airports and ports, as well as multimodality at different transfer points, and smaller public transportation modes such as subways, trams and buses (BCI, 2010).

A large proportion of the employees does not live close to work, as work is no longer located at one specific place for them. The majority of working locations are situated in the suburbs of the city where they work, but for many they are even located in other cities. The regional character of the labour market is partly reinforced by the substantial increase in travel speeds, but also due to employees that are more willing to travel for their work (De Groot et al. 2010). As a result of the increased importance of consumptive factors, households are no longer solely attracted by jobs in the city, but especially by the extent to which work is accessible from the city. It is therefore in terms of accessibility not so much about the number of jobs in the city, but the more about the accessibility of jobs outside the city (Marlet, 2009).

Therefore employees have a broader choice of residential locations which is for a large part depended on the qualities of the dwellings and the direct living environment as well as the proximity of urban facilities (see section 5.3). As a result of this, many people are more willing to travel further and longer to work than for facilities as such (De Groot et al. 2010). On the other hand, city dwellers prefer to combine different activities such as work, leisure and education in their living environment as time savings appears to be an important underlying reason most of for them (Boumeester et al. 2009).

Differences in land values are generally for 25% explained by the accessibility by car, for 6% explained by the accessibility by public transport, and the proximity of a railway station for 2% more offers an explanation for the height of the land value.
The (classic) factors of production that are present in the physical environment thus for 33% determine differences in land values in total (De Groot et al. 2010).

2. Possibilities to settle;
The quality and availability of working locations are considered classical factors of production (land is meant as ‘natural resources’) and therefore particularly plays an important role in attracting firms. In today’s market, both offices and other commercial buildings are relatively widely available and are therefore hardly considered a priority. Yet the demand for offices (and housing) will indirectly also become the demand for land as once available plots become more cultivated. Currently, few cities seem to suffer from a pressure on space, yet pressure on space can become a true disamenity (disadvantage of immobility) once the demand-market turns into a buyers’ market again (which mainly depends on the economy). From this perspective it does make sense to deal economically\(^1\) with the remaining available land, whatever the type of construction, at well accessible downtown urban locations.

The land price is for 33% explained by the physical environment (factors of production) and 43% by the qualities of life (consumption factors), which will be further discussed in the next section (De Groot et al. 2010). According to the NVB Thermometer Koopwoningen of autumn 2010 (NVB, 2010), the municipality often applies very high land quotes\(^2\), besides making use of many additional requirements for the land use. As a part of the construction costs, the average land quotes have increased from 15% in 1976, to 34% in 2010, which is quite unattractive for the realisation of new urban dwellings.

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\(^1\) Economic use of lands means that no unnecessary residual spaces exist between, in front of, or adjacent to buildings, as well as a reduction in the size of road profiles unless broadness is strictly necessary for the quality of the infrastructure.

\(^2\) An explanation of the land quote will be provided in section 6.3.1.
5.3 QUALITY OF LIFE

The accessibility and distance from houses to all amenities, infrastructure and employment, as discussed in the previous section, belong to the functional characteristics of the habitat (Visser and Van Dam, 2006) and are factors of production. No less than 76% of the variation in land values is explained through these factors of production (see mainly section 5.2) and consumption possibilities (the quality of life) present in the living environment (PBL, 2009; De Groot et al. 2010). In addition, Glaeser et al. (2001) showed how differences in consumption possibilities can account for growth differences as well.

The quality of life mainly concerns consumption factors that are further distinguished on the basis of 4 scale levels, namely housing qualities, qualities in the living environment, urban attractions and qualities in the hinterland.

In line with Tiebout's household sorting (see section 3.3.2), policymakers, developers and private investors are paying increasing attention to the provision of public goods that are oriented toward consumers, such as museums, waterfront parks, and other public spaces that are enjoyed by families and individuals (Carlino and Saiz, 2008). Nevertheless, Cortright (2005) notes that the meaning of quality of life is different to different people and that the sense of place does so too. The essence of this notion is that cities need to look for their own unique identity and offer their own distinctive combination of attributes that a significant set of knowledge workers will find attractive. Following the foregoing, the next chapter (chapter 6) will establish a relationship between those factors that attract businesses (which have been discussed in the previous chapter) as well as households, and the city of Rotterdam which serves as a case study for this thesis.

At the lowest scale level, dwellings differ, among other things, in typology and arrangement, floor space, volume, number of rooms, the presence of a heating system, a garden, a balcony or a garage, condition and maintenance, insulation label, and certainly not insignificant the purchase price. Due to the ambiguous demand, which depends on the interests of various groups in the population, a dwelling is perceived as a differentiated commodity (Kauko, 2002).

According to Marlet (2009), six of the 26 residential attractions, which could theoretically be important for the attraction value of the (K31-) cities, show a measurable relation on higher scale levels to the residential behaviour of Dutch households.

With the exception of the presence of a successful professional football club, the other five indicators also show a significant relation to the housing values:

- a low number of violent crimes (5.3.2: insecurity, violent crime and devastation);
- the culinary quality of restaurants (5.3.3: qualitative and diverse supply of hospitality businesses);
- the supply of performing arts (5.3.3: small ticket events);
- the presence of a historic centre (5.3.3: aesthetics of the inner-city);
- the presence of a successful professional football club (5.3.3: big ticket events), although this is not relevant at neighbourhood level;
- the accessibility of nature (5.3.4: nearby natural and coastal areas);

The accessibility of nature actually belongs to the highest scale level, namely the hinterland of the city (section 5.3.4), whereas all other indicators relate to the physical characteristics of the living environment (Visser and Van Dam, 2006) at the
scale of the city. Consumption patterns have become more important than production patterns at that scale level, as a result of which only 28.4% of the attractive value of Dutch cities is determined by the availability of jobs (the most important production factor) (Marlet, 2009). Hence, the extent to which a city succeeds to excel at its consumptive side appears critical to the success on the production side of its economy.

By means of an hedonic study, Visser and Van Dam (2006) also indicate the importance of socio-cultural and socio-economic characteristics of the living environment. These characteristics refer to the composition of the population (human capital), the unemployment rates, and a neighbourhood’s average income level, which, as indicated in the introduction (section 5.1), will be discussed in sections 5.4 and 5.5.

5.3.1 Housing qualities

The housing characteristics distinguished in this section are the size of the dwelling, the rent segment and the time of construction. For these parts, insight into the attractiveness of certain types of housing (apartments, single family dwellings e.g.), the ownership (purchase or rental), the economic price of the houses, their architectural appeal and the state of their structural maintenance will be provided. In general, one can say that wants and demands regarding a new house on the one hand relate to the current housing conditions (which one often wishes to improve) and the (estimated) financial resources on the other hand (Van den Broek and De Jong, 2007), on which will be elaborated in paragraph 5.4.

1. Dwelling sizes;

Space can be regarded as a universal value, since everyone has a significant need for private space. Space may seem even more important for a city dweller (space which is at odds with the possible disadvantage of immobility) due to the fact that it is a relatively scarce resource in the city, although they especially make high demands on the finishing up of their dwellings (Boumeester et al. 2009). Nevertheless, still 51% of households do point out the connotation of their property being too small as a reason to move (Van den Broek and De Jong, 2007).

Larger households need at least 4-5 rooms, and even half of the smaller households would also prefer a similar number of rooms. Nevertheless, the urban dweller generally prefers less room than non-urban dwellers (Boumeester et al. 2009). Urban dwellers consider a pavement-level apartment important and they would like an extra room to use as a computer (34%), office (25%) or hobby/guest room (25%), although such rooms may be joined with the living room in many cases. In addition, urban households prefer a spacious (dining-) kitchen and living to relax and socialise. Both the kitchen, living room and outdoor space are associated with experiencing ‘pleasure’ (Boumeester et al. 2009).

Besides more indoor space, outdoor space (gardens, balconies, terraces, or other outdoor spaces such as courtyards, (common) gardens and yards) as well produces a plus on housing prices, that is (per square meter) three times higher for urban homes compared to rural ones. Private outdoor space is valued much higher in cities as the building density is higher and open spaces and greenery are scarce (Visser and Van Dam, 2006). Of potential owner occupiers of apartments, 78% considers an urban apartment only attractive when it has a spacious balcony that offers sufficient privacy (Boumeester et al. 2009). Especially households without
children indicate that a balcony or roof garden can be a substitute for a garden, as long as it is large enough to sit outside, to receive guests and keep some planting. Maintaining a garden is by urban dwellers experienced as a burden; only 22% indicates wanting to really garden themselves (Boumeester et al. 2009). The average living space of both single-family and multi-family housing has increased considerably in recent decades (VROM and CBS, 2009). Over half of the supply of single-family houses in urban areas consists of apartments and about one quarter of row housing. The proportion of semi-detached and detached houses is very limited (Boumeester et al. 2009). Boumeester et al. (2009) also call the number of single-person households for who apartments can be built ‘reasonable’.

2. Proportion of private to social housing;

In the city, social characteristics of the living environment to a larger extent determine the price of dwellings, compared to rural areas (Visser and Van Dam, 2006). It is therefore important that residents can identify themselves with the social climate of their new living environment, which is among other things influenced by the ratio of private to rented apartments. Correspondingly, the proportion of social housing interrelates strongly negative at neighbourhood-level with housing values (Marlet, 2009).

Moreover, within 50m of other housing types the percentage of social housing interrelates strongly negative with the perception of the neighbourhood and the valuation of the liveability. Large amounts of social housing in inner cities all provide for large concentrations of disadvantaged groups, such as unemployed and unskilled people, especially due to the fact that these people are designated to such housing forms (Marlet and Van Woerkens, 2010). From the standpoint of housing differentiation, an ideal neighbourhood composition seems to exist if the majority of residents (>75%) consists of owner occupiers (Leidelmeijer et al. 2008).

A better match to the general Dutch housing demands will also result in less property mutations. From that perspective, the starters’ segment offers the best opportunities according to the NVB Thermometer Koopwoningen of autumn 2010 (NVB, 2010), whereas the luxury segment shows problems in accessing the market. Within the starters’ segment, most interest appears to exist for rental apartments (flats and porch houses) and participation in alternative housing arrangements such as dwellings for overhauling (kluswoningen), patio houses and community housing. From the moment that starters move through, 2/3 prefers to buy a newly built single family home, whereas among senior citizens the distribution of rental to private housing is 50/50 (Van den Broek and De Jong, 2009). The more general trend towards housing preferences is summarised as follows:

- Residents are to a greater extent than before in search of high quality living space;
- In terms of typology, residents more and more appreciate a classically looking typology (traditional, rustic, canalside e.g.), instead of the previously popular style of the 1930s. In this context, foreign architects are otherwise well-appreciated;
- Energy efficient homes gain in popularity, but residents primarily reason from the perspective of their own pockets;
- More and more people are attracted to alternative forms of housing (patio houses, down/up-stairs apartments, community housing, self-construction,

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3 See also the introduction to section 5.4, explaining why *birds of a feather flock together.*
solids e.g.) and prefer variety in building typologies (in favour of the identity of their own dwelling).

Regarding the most preferred typology of housing per sort of ownership in urban environments, the preference appears to be as follows (Boumeester et al. 2009):

<table>
<thead>
<tr>
<th>Housing typology</th>
<th>Private</th>
<th>Rented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached</td>
<td>29%</td>
<td>22%</td>
</tr>
<tr>
<td>Semi-detached</td>
<td>19%</td>
<td>13%</td>
</tr>
<tr>
<td>Apartment</td>
<td>17%</td>
<td>39%</td>
</tr>
<tr>
<td>Multi-family housing</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>End houses</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Row housing</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>Drive-in housing</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

3. Construction period;
Research conducted by Leidelmeijer et al. (2008) distinguishes the following construction periods and examined the relationship between the level of liveability in the neighbourhood and the construction period. It should be noted that areas of various construction periods generally perform better than districts in which some construction period is dominant.

<table>
<thead>
<tr>
<th>Construction typology</th>
<th>period</th>
<th>Valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-war</td>
<td>before 1940</td>
<td>positive</td>
</tr>
<tr>
<td>Early post-war</td>
<td>1940-1970</td>
<td>Negative</td>
</tr>
<tr>
<td>Late post-war</td>
<td>1970-1990</td>
<td>Indifferent</td>
</tr>
<tr>
<td>Recent construction</td>
<td>after 1990</td>
<td>positive</td>
</tr>
</tbody>
</table>

Especially pre-war dwellings in urban environments definitely provide added value compared to dwellings built in the period 1971–1990 (Visser and Van Dam, 2006). The next section (5.3.3: aesthetics of the inner-city) will further explain how historicity functions as an urban economic proxy to determine a city’s attractiveness based on facts (numbers). Yet historicity does not count for intangible aspects such as retro-buildings and a city’s skyline, which have shown to be important as well.

Apartments built just before World War II and in the subsequent period (early post-war) are characterised by a lower price, probably because of an inferior building quality (Visser and Van Dam, 2006).

Late post-war dwellings are mainly functional but, in contrast to new dwellings built as of 1990, do not affect the liveability of neighbourhoods. Contrary, recent construction developments in existing urban areas generally increase the appeal of neighbourhoods and are significantly associated with an increase in the share of highly educated people. New buildings can meet with current residential demands, provide quality of construction, and are distinguished by relatively low additional purchasing costs. Notwithstanding, new dwellings at expansion sites are negatively related to the attraction of highly educated people (Marlet and van Woerkens, 2010).

Especially urban dwellings that provide a high urban ambiance have proven to positively affect the liveability of neighbourhoods. High-rises and flats are generally considered negative by local residents. On 6ppc-level (the lowest measurement
scale for which statistics are available), the proportion of flats even negatively correlates with the perceived quality of life. Although most people prefer to move to newly built single family homes, most starters appear to look for apartments (in flats or porch houses), especially taking the affordability into account instead of the size of the living area or the construction period (VROM and CBS, 2009). Finally, the proportion of student housing nearby has no significant effect on the liveability.

5.3.2 Qualities of the living environment

Hedonic studies by Marlet et al. (2008) and Marlet (2009) show that the attractiveness of cities in the Netherlands is for the highest percentage determined by quality of the living environment. This concerns user preferences by residents regarding consumptive features of the direct living environment, that could (and even 'should', according to Visser and Van Dam (2006)) be taken into account when designing and restructuring neighbourhoods. Although physical characteristics are less important that often suggested, they do indeed play a role in the valuation of the living environment.

Initially this concerns place-characteristics within the city that have been specifically designed as public spaces (roads, squares, water, green) as well as usability and architectural attractiveness thereof. Secondly, safety is an important aspect to the experience of the living environment. Finally, it also involves the availability of several facilities that cover a larger service area than the area which they are located, such as (nursery) schools and crèches.

1. Public space;

Leidelmeijer and Schulenberg (2010) have done research on specific parts of the public space and the extent to which it is attractive for residents. They concluded that especially monumental care and protection, and supply of well-maintained parks and water contribute to the liveability of an area, whereas squares appeared to play a remarkably smaller role.

Research by De Groot et al. (2010) argues that the proximity of a park over the period 1985-2007 for 3% offered an explanation for higher land prices. Another study by Rouwendal and Van der Straaten (2008) showed that public green space over a distance of 500 meters has a positive effect on land values. Moreover, 63% of urban households indicates to attach a considerable importance to the proximity of a park (Boumeester et al. 2009). Apart from nearby stores for daily shopping, public parks are considered the most popular feature among both urban and non-urban households. In addition, creative ideas such as ponds, green walls and roofs, as well as terraces and gardens on roofs, meet with the (public) perception of nature (Boumeester et al. 2009; Leidelmeijer and Schulenberg, 2010).

In view of these studies showing that the presence of parks are appreciated by households, it is obvious that – especially in urban residential areas where public parks are often scarce – dwellings near parks are more expensive. Remarkably, Marlet (2009) proves in his conclusion that, despite these stated and revealed preferences, the presence of a park is not significantly related to higher housing

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4 Stated preferences emerge through survey-based research on (contingent) valuation of the living environment. Revealed preferences are demonstrated through the Hedonic Pricing Method (HPM) that recovers the hedonic price, through observed housing prices as the implicit price residents are apparently willing to pay for certain dwelling and location specific.
values in 2006, whereas the nearness of parks leads to higher land values (Rouwendal and Van der Straaten, 2008; De Groot et al. 2010). Irrespective of Marlet’s evidence, it would however often be difficult in the practice of urban area development projects to either establish urban parks within an inner-city context, or increase their presence in any way.

2. Insecurity, violent crime and devastation;
Safety concerns the extent to which insecurity and inconvenience play a discouraging part in neighbourhoods, both in factual terms as well as in the perception of residents. Both the objective safety-situation as well as subjective feelings of safety are thus taken into account.
The sense of (un-) safety has to do with a complex combination of the quality of the living environment, the composition and socio-economic status of the population, the geographic location (Marlet and van Woerkens, 2010), and the anonymity of the city (Marlet et al. 2008). The sense of (un-) safety is partly determined by the number of violent crimes, the amount of nuisance and devastation numbers. The amount of nuisance offers, according to De Groot et al. (2010) for 2% and explanation for differences in land values between different locations.
Cities are on average characterised by a higher number of violent crimes per capita compared to rural areas, although this is often offset by urban attractions. Nevertheless, the number of violent crimes in the city appears to be the only significant indicator for the quality of life.
The more violent crimes, the less popular a city is for residential consumers, and the lower prices for dwellings appear to be (Marlet, 2009). Especially for families with (small) children, safety is perhaps the most important location factor since they are principally attracted to living environments that offer safe routes to school as well as safe playgrounds for small children.
Both the objective (registered) and subjective (perceptible) safety may improve through physical and social policies (Marlet and van Woerkens, 2010):
- New constructions and sale of social housing (with the aim of changing demographics);
- Quality impulses to the public space (making it ‘clean, undamaged and safe’);
- Addressing long-term (youth-) employment.

3. Crèches, nursery schools and the quality of education;
For families with children, a reasonable distance to educational facilities (within 500m) contributes to the sense of a favourable location (Leidelmeijer et al. 2008; BCI, 2010). According to Boumeester et al. (2009), 42% of urban households indicates to attach importance to the proximity of a school.
The presence of childcare facilities, however, offers no significant explanation for households’ location choices (Marlet, 2009). Nevertheless, the proximity of childcare is after all considered important in order to attract especially highly educated households with children. In addition, the presence of childcare would offer a positive contribution to the labour market participation and may be an

amenities and characteristics. The hedonic model of housing markets – specifically the house and land price information at a given location – has become an established tool for constructing value models.
interesting addition in mixed residential and working environments (Van den Broek and De Jong, 2007).
De Groot et al. (2010) also indicate that neither the presence of a university, nor a secondary school, offers a significant explanation for differences in land values. Health services and libraries also do not offer a significant explanation according to their research, perhaps because such basic services are generally available in many cities as a result of which they are not sufficiently distinctive.

5.3.3 Urban Attractions
A number of residential attractions can be formulated at the level of the city as well, which are not significantly associated with higher housing prices in a number of analyses. Nevertheless, Marlet (2009) expects the quality of the direct living environment – no matter the price impact of nearby parks, qualitative educational or childcare facilities, on housing prices – to be an important factor in the competition between different neighbourhoods. Residents with an urban preference after all attach importance to urban amenities such as restaurants, cafes, cinemas and a wide variety of shops (Boumeester et al. 2009). Ever since the large suburbanisation (an area characterised by large numbers of residents and businesses leaving the inner city), the fact that downtown housing is still more expensive than rural housing, is no longer solely due to the proximity of work, but more often due to the presence of shops (the consumer city) and other attractions concentrated in inner cities.

In line with the little evidence for the existence of rent seeking in the Netherlands, no studies are known that prove a significant relation between housing or land prices with the presence of public institutions, such as (semi-) government buildings or other public services that have been specifically meant for use by children, youngsters, elderly and ethnic minorities. For that reason, this chapter deals with the availability of commercial facilities, including shops and restaurants, as well as the aesthetics of the city. Wherever overlap with the public space is at risk, facilities are, contrary to the public space, in casu understood to be covered

1. Availability of a diverse and nearby choice of shops;
Concerning shops, a common distinction is made between daily shops and fashionable luxury shops (for fun-shopping: see section 4.2.2). Not only the quality of shops appears to be a reason to live in a particular city, but also the availability. However, the number of shops open at Sundays does not reveal any significant explanation for higher residential prices (Marlet, 2009).
Literary amenities (libraries and fancy bookstores), refined provisions (organic markets and sushi bars), and high-culture (hip art and design galleries and antiques’ auctions), are all important parts of urban life, but they only represent a critical factor for a small slice of the population. They will come along naturally, as arts and amenities tend to, with economic growth and wealth creation: focusing on arts and amenities first gets the urban equation completely backward (Kotkin, 2006) Only 19-30% of households actually claims to attach importance to the availability of shops for durable goods and luxury items (Boumeester et al. 2009). However, the average price of land rises in cities that offer larger amounts of shops that offer fashion and luxury goods. The price of land increases up to 11% in neighbourhoods that provide better access to shops as such, compared to a 3% increase in shops for everyday facilities (De Groot et al. 2010). Generally, luxury shops settle at
downtown locations as these locations are best accessible and hence provide the largest threshold (see section 3.1.2).

As indicated, a lack of adequate everyday facilities in a neighbourhood leads to a 3% decrease in land values (De Groot et al. 2010). Van Leeuwen (2010) distinguishes three groups of products which are mostly bought close to the place of residence, which are food and groceries, child care and domestic help, as well as hairdressing and beauty care. Nonetheless, a significant proportion of households also considers it important, for instance on the trip from work to home, to do their shopping quickly, efficiently and easily in or near their work environment (Boumeester et al. 2009; Van Leeuwen, 2010).

The greater the distance that residents have to travel for daily groceries, the more attenuation (verschraling) of services exists. Small, everyday amenities, including a supermarket and a bank, are preferably located within 250m, or at most within 500m (within a 5 minutes walk). The proximity of a large-scale shopping centre within 1km can still have a very positive impact on the quality of life, especially if it has a supermarket and a bank branch, although greater distances are generally considered to have a negative impact on the liveability (Leidelmeijer et al. 2008).

Approximately 80-82% of the urban households indicates to value the proximity of shops for daily groceries as well as quality products. A large part of the households also appears to prefer consuming a diversified bundle of goods (Dixit and Stiglitz, 1977; Florida, 2004), which is known as the love of variety.

2. Qualitative and diverse supply of hospitality businesses;

The culinary quality of restaurants in a city is significantly correlated with the average housing values (Marlet, 2009). This emphatically does not concern the quantity of restaurants of other types of nightlife, such as cafes, as kebab joints or cafeteria would otherwise be similarly weighted as for instance five-star restaurants. Nonetheless, solely the presence of sufficient culinary supply already offers an explanation for a 2% increase in land prices (De Groot et al. 2010).

The diversity culinary supplies, however, is also considered to be important (love of variety) as urban dwellers go out to eat more often than non-urban residents do, as a result of which diversity goes, just as quality, hand in hand with urban attractiveness (Glaeser et al. 2001; Florida, 2002). Secondly, a variety in cultural offerings appears to be appreciated most if it is embedded in the aesthetic environment of a historic downtown setting and within walking distance of bars, cafes and restaurants (Gotham, 2001).

Moreover, diversity does not only concern the cuisine offered (Italian, French, Chinese or Surinamese), but also the type of meal (breakfast, lunch, high tea, or dinner), and the type of restaurant (large, small, patio, or skybar). In addition, the design and character of the public space should best interconnect with the hospitality businesses (Kotkin, 2006). From this perspective, Kotkin considers it important to seek for a match with the climate, in order that permitted sites remain attractive for staying outside during both summer as winter (streetlife and vibrancy). Larry Beasley (2010) even argues that pedestrians should be provided weather protection, whenever possible, in order to guarantee as much streetlife as possible.

For both restaurants and cafes, it is important that they are located within walking distance of dwellings, which for example does not necessarily apply for theatres and similar cultural supplies, which may also be found in nearby municipalities. Nevertheless, Boumeester et al. (2009) concludes that a large proportion of urban
households indicates to attach importance to the presence of bars (34%), restaurants (34%), cinemas (19%), although they not necessarily want them to be located in the immediate surroundings of their house. In line with the latter findings, De Groot et al. (2010) concludes that the number of bars offers no significant explanation for differences in land values. Moreover, the presence of shopping centres and cafes have a negative impact on the liveability of neighbourhoods, although nuisance particularly occurs in case of large shopping centres and supermarkets, instead of consumer services (especially small retail like local bakeries and butchers) that provide social control which actually appears to have a positive influence on the quality of life (PBL, 2010).

In summary, restaurants and cafes are preferably:

- set up as sources of vitality, energy and vibrancy (streetlife and vibrancy);
- small scale, high-quality, and diverse in their offerings and also largely available;
- located at a central location in the (historical inner-) city, at walking and cycling distance of dwellings in order to enable spontaneous and unplanned use by urban dwellers;
- functionally adapted to the climate and the surrounding public space.

3. Small ticket events;

The provision of performing arts strongly (indicatively: 16.0% for the G50 and up to 19.3% for the K31, and significantly at neighbourhood level) correlates with the attractiveness of Dutch cities (Marlet, 2009), and provides an explanation for up to 7% for higher values of the land (De Groot et al. 2010). Although the cultural supply in nearby cities is according to Marlet not that important for a city’s attraction, a city’s supply conversely does exert attraction on households to surrounding suburban communities. As such, Rotterdam does not benefit from the cultural offerings in The Hague or Delft, whereas suburbs as Rijswijk, Nootdorp and Pijnacker do benefit from the cultural supply that these cities provide.

According to Gotham (2001), a lively street-level culture (small, alternative music scenes in for example industrial buildings, cafes and jazz clubs or basements) is more important than traditional theatres and operas. He finds that people are not attracted to passive cultural consumption, but to authentic experiences that offer consumers the feeling of being a participant through interaction. Nevertheless, within the human capital theory, theatres and other cultural institutions are often imputed a key role as places for higher educated to meet and interact knowledge. However, only 19% of urban households says to attach importance to the proximity of a theatre (Boumeester et al. 2009). According to Marlet (2009), they are nevertheless willing to pay more for their dwellings because of the optional use of cultural supplies as such (the belief that they are easily able to make use of museums and theatres) and the historical image that it is flawed with.

Lastly, drawing attention to temporary functions appears to be an important success factor to widely publicise to a large audience and to already link a (future) use to the location. Temporary functions, such as art projects, weekly and flea markets, leisure, hospitality businesses and small scale events, also make proposed changes to a location visible in an early stage. From the theory of the experience economy (Pine and Gilmore, 1999), temporary functions meet consumer demands and provide for a local meaning. On that logic, areas can be provided with a new location-identity by anticipating to a positive consumer perception.
In short, the attractive force of cultural supply on households is largely determined by the same conditions that apply for hospitality businesses. Preferably the focus is on activities that are:
- small scale, diverse and perhaps of a temporary nature;
- located at a sophisticated spot in the city, such as a central place within walking or biking distance from (large numbers of) dwellings in order to enable a more spontaneous and unplanned use;
- continuously available (not like museums or festivals);
- focused on the local population (not only for tourists and day-trippers).

4. **Big ticket events;**

For this thesis both events, such as festival and musicals, where live performances take centre stage, and museums, are ranged among big ticket events that are characterised by their non-continuous availability and for they often do not focus on a local audience. Amenities as such attract large numbers of visitors, but do not offer a significant explanation for higher rent levels or property values (Marlet, 2009).

One exception to this is the football index; an indicator which shows a significant correlation with housing prices at higher urban scale levels. Nonetheless, the football index does not appear to be significant at the level of the living environment (section 5.3.2). There is also the danger of the index being a proxy indicator for low culture, as it is not a significant attraction for the highly educated and creative class (Marlet, 2009).

5. **Aesthetics of the inner-city;**

The nearness of a city’s downtown is generally a good indicator of the attractiveness of a neighbourhood; the farther from the centre, the more affordable dwellings will be in general (Marlet, 2009). This phenomenon has been known for decades as the monocentric city model.

Besides, the presence of a historic city centre relates to the average price of dwellings in all districts of the city (the presence of historic waterways did otherwise not appear to offer a significant explanation for this), and even appears to be significant at district level (Marlet, 2009). According to De Groot et al. (2010), a larger presence of National Monuments results in an 8% increase in the costs of land. Investments in preserving and integrating cultural heritage in the neighbourhood also shows a significant relation to the increase of highly educated in that area (Marlet and Van Woerkens, 2010). Neighbourhoods apparently need a mix of buildings that differ in age and state of upkeep (Jacobs, 1961), to what Florida (2004) adds that especially highly educated, creative people value the authenticity of a historic downtown.

Research among above-average households with the tendency to move (Boumeester et al. 2009) has shown a preference for traditionally designed buildings. Of all households (both urban and non-urban), 60% indicates to favour traditional architecture. The main difference between urban and non-urban oriented households is that the preference for experimental architecture appears to be relatively large (about 20%) among the urban consumers.

A comprehensive case study (Blijleven, 2003) has also shown that the construction of retro districts in Helmond – influenced by the New Urbanism movement – increased the attraction value of the town through the association with historical
typologies. In line with this research, Ennen (2004) also showed that historicising architecture may increase the attraction value of downtown areas.

5.3.4 Urban region and hinterland
The attractiveness of cities is not only explained by city-specific factors, but also by the advantages and disadvantages that arise from its geographical location (the first nature factors). This mainly relates to amenities in a city’s hinterland, such as the location of beaches and nature reserves, but also the influence of facilities and services abroad. In his research, Marlet (2009) determines the attractiveness of the urban region and hinterland on the basis of a market potential that measures the relative difference between various cities (in essence their competitiveness), which is a common method of measurement.

1. Nearby natural and coastal areas;
The proximity of nature, the possibilities for nature recreation (Marlet, 2009), and proximity to coastal areas (Cushing, 2004) may attract, ceteris paribus, relatively more migrants. If nature and recreation areas are within acceptable travel time, they can add 5 to 12% to the value of dwellings, compared to houses which are not located in the vicinity of nature (Luttik, 2000). Secondly, locations located at sea showed a 3% increase in land prices (De Groot et al. 2010). Also of interest are the variety of nature, nature in the broader surroundings, the spatial quality of rural areas as well as route structures for cycling and walking (BCI, 2010).

Rotterdam is unfavourably located in relation to nature due to its extensive industrial areas and port-businesses. Recent plans for the Randstad, as proposed by the Ministry of Housing, Spatial Planning and Environment (VROM, 2008), opt for more nature reservation in the urban surroundings (such as the elementary parts of the Green Heart) and use it for agricultural or recreational purposes. In conjunction with this conservatism (a type of restrictive building policy) a major construction task for dwellings, which is proposed on the other hand, is to be achieved by densification within the city limits.

2. Facilities for open-air activities;
Facilities for open-air activities such as sports and recreation are all constructed attractions which all had a moderate effects on households’ destination choices in the United States (Cushing, 2004). Nevertheless, 61% of the Dutch city dwellers take the view to have a preference for leisure in their community (Boumeester et al. 2009), although facilities as such are not significantly associated with higher housing prices (Marlet, 2009). Nonetheless, the proximity of a park may increase the value of land to 3%, while the proximity of nature can lead to a 4% value increase (De Groot et al. 2010). However, only 20% of them considers the proximity of sports as important, although 42% of the city dwellers love to sport and believe that it contributes to the quality of life (Boumeester et al. 2009). However, according to De Groot et al. (2010), the proximity to sports offers no significant explanation for differences in land prices. The appeal of sports is only significant when a wide range of large and small sports is offered. Nevertheless, it is considered plausible that families with children attach more importance to the presence of sports facilities in their location choice (Van den Broek and De Jong, 2007; Leidelmeijer and Schulenberg, 2010).
3. Facilities and services abroad;
Although there is much debate about the importance of facilities abroad (especially from border regions), there are several studies that indicate large absence of cross-border commuter shuttling, which is there considered irrelevant (Boekema, 2000). Marlet (2009) takes for this reason that the same goes for amenities abroad. From that perspective it seems likely that Rotterdam does not directly benefit from the facilities nearby, for example in Antwerp (78km), Ghent (111 km), or Brussels (121 km).
5.4 **HUMAN CAPITAL**

The composition of the population concerns the different (groups of) people that live in an area. The characteristics of the population structure are determined on factors such as ethnicity, age structure, educational and income levels, and unemployment (PBL, 2010). In addition, the social cohesion (or coherence) among the population is important, which refers to the interaction between people (greetings, chatting, familiarity with their names, e.g.) and the stability of the neighbourhood as expressed in the mutation rate.

A homogeneous low cultural composition of the population, which is characterized by low education, low income levels, high unemployment rates and a large number of immigrants often produces a significant negative correlation with the degree of social cohesion (Leidelmeijer *et al.* 2008). Secondly, a planned differentiation of the population offers both new as well as current residents little solace, as they largely appear to remain social contacts within their own group above all: *birds of a feather flock together*. It is therefore remarkable that many urban renewal projects explicitly pursue heterogeneous (differentiated) socioeconomic compositions of the population (for example the numerous attempts to gentrificate (old) neighbourhoods), whereas this often has a negative effect on the general social cohesion. A decent degree of social cohesion can however occur in neighbourhoods with a large incomes disparities. Negative effects on social cohesion are therefore expected to stay out if urban renewal would focus on a population that differs in education levels and age.

Nonetheless, policies of many global cities also show attempts to create a social climate to attract a specific population, which is in many cases concerned with the so-called human capital and the creative class. These cities therefore on the one hand focus on Talent and Technology, aiming to attract and retain students, knowledge-based industries and the ICT sector. On the other hand they try to create a climate of Tolerance with room for immigrants, bohemians, the gay scene, individual diversity and diversity in businesses (Jacobs, 1961; Florida, 2002)5.

In Dutch cities, the size of the gay scene, the artistic scene (Bohemian Index) and the ethnic diversity (Melting Pot Index) appears to relate quite strongly to the size of the creative class (Marlet, 2009). This was examined in response to a book by Manuel Castells (1983) in which the effect of the presence of homosexuals was examined in relation to housing values. The size of the gay scene proved to be a proxy-measure for regional openness, as they are attracted to places with an open and diverse character. Openness as such moreover showed to bear an attractive force on talented people, whereby the size of the gay scene proved to have a substantial effect on housing values across all regions (Florida and Mellander, 2009).

Richard Florida explains the relationship between tolerance and the size of the gay scene as follows: “to some extent, homosexuality represents the last frontier of diversity in our society, and thus a place that welcomes the gay community welcomes all kinds of people” (Florida, 2002; pp. 256).

According to Cortright (2005), footloose workers, particularly college-educated 25 to 34 year-olds, rather than footloose firms will become the critical drivers of regional economic growth. Marlet (2009) also showed that economic growth is prospered by attracting high educated and creative households. Despite the fact

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5 Talent, Technology and Tolerance are also referred to as Richard Florida’s (2002) 3 T’s.
that talent passed by the creative class is able to attract businesses again, most economic development policies have essentially ignored the issue of attracting privileged people, focusing particularly on business climate, tax incentives and regulatory reform (Cortright, 2005).

Moreover, the creative class is not slavishly following jobs, but rather looks for attractive urban amenities: outdoor facilities, a vibrant downtown and a technology university belt (Florida, 2002; Hospers and Van Dalm, 2005). So it is increasingly more important for cities to provide adequate amenities in order to attract more than their share of (young) talented people. In the hope to attract this group, many successful Western cities are currently competing for this group of young potentials by investing in cultural flagship projects, architectural masterpieces, and leisure centres (Hospers and Van Dalm, 2005).

Furthermore, research has shown that highly educated people are more likely to move between regions than lower educated people (Cortright, 2005), being a positive fact for cities trying to attract this mobile group. For this reason it appears important to know where highly educated and creative people want to live, and why. In spite of a careful analysis of their migration patterns in the United States over a 17-year period which concluded that location preferences vary from individual to individual and that migration is driven by a process of matching individuals to locations that suit their preferences (Kodrzycki, 2001), similar findings are not expected for the Netherlands given the scale of the country and its level of urbanization (Marlet, 2009).

### 5.4.1 Human capital and the creative class

Late 20th century, increasing attention arose to the Human Capital Theory (as first mentioned by Adam Smith in 1776), which assumes that accumulation of knowledge and ideas takes place through its generation and absorption by highly educated people. Skilled and highly educated people as such interact through face-to-face contacts (Jacobs, 1969) for who knowledge accumulation is a ‘social activity’ (Lucas, 1988). In spatial terms, more opportunities for face-to-face contacts are offered in dense cities, which are therefore considered to be an ideal ‘pool’ for human capital accumulation (Jacobs, 1969).

Although strong empirical evidence based on education-level indicators supports the Human Capital Theory (Glaeser and Saiz, 2003), a refined theory was introduced by Richard Florida in 2002. His theory is basically an improved standard for measuring actual skills, instead of just the level of education. Florida considers a creative class that is not necessarily highly educated, but be highly important for economic production, spending and new business start-ups as well. Yet the larger part of the creative class is high educated, hence the creative class may be considered as a broadening of the ‘normal’ human capital class with knowledge value industries, such as workers, innovators, and entrepreneurs in new media, science, and software development (Kotkin, 2006) and trendy, innovative, and fashionable bohemian vanguards (Florida, 2002) such as graphic artists, advertisers, designers, and writers. Using this new standard of human capital, Marlet et al. 2008 found that the composition of the population is especially important on city-level and proved that higher levels of human capital are correlated to employment growth in Dutch cities (Marlet and Van Woerkens, 2004; 2007c). This is in line with Shapiro’s (2006) study of productivity growth demonstrating how wages, rental
prices and housing prices increase much faster due to greater numbers of skilled workers.
Finally, it should be noted that students belong to the normal population, but should be considered a target group as well, since they will automatically belong to the highly educated population after completing their studies. Cities that are at first able to attract young people for study purposes, and subsequently manage to maintain them to their side in the age group of 25-30 (graduates), will keep an edge over other cities, because of relocation tendencies that sharply decrease after that age.

5.4.2 Pattern of relocation behaviour
According to Hooijmeijer et al. (2001), relocation behaviour is determined by:
1. the preferences and limitations and the motive of households to move;
2. the means available to households; and
3. the opportunities and constraints of moving.
The former conditions are the trigger to move, which is often determined by a mismatch between the current living situation and the desired living situation, such as changes in working, educational, living career or composition of the household). A distinction can be made between the specific living requirements and the non-specific demands (the distance to certain activities).
Subsequently, the means available to a household depend on their age, but is decisive during a move as well. The fact that giving notice to a letter is much easier than selling a house is a risk for the resources available to households if they plan to sell and move.
Finally, conditioning factors can raise opportunities, or just constraints, for moving. Tax benefits (tax rebates on mortgage interest rates, rent subsidies, taxations), as well as low mortgage interest rates belong to the opportunities, whereas distorted markets (for instance through building constraints and significant differences between the qualitative or quantitative supply and demand) and high interest rates (Hooijmeijer et al. 2001) are considered as constraints. According to the NVB (2010), currently a mismatch often exists between the residents’ demands and the building programmes, hence they regard it essential to keep or get the supply of new buildings more in line with the market.
In the Netherlands, the greatest propensity to move exists between the 20th and 30th year of life. From the 27th to the 40th year of life, the tendency to move declines to less than 6%, and from the 40th to the 50th year to about 3%. This underlines the importance for Dutch cities to attract young potentials (students, newcomers, young and high educated or creative people) and to maintain them as residents until the time they have started a family.

5.4.3 Housing attractions to young potentials
Both international (Glaeser and Saiz, 2003; Florida, 2004; Shapiro, 2006) as well as national studies (Marlet and Van Woerkens, 2007c; Marlet, 2009) have already shown the potential of creative young potentials. For that reason, this section will slightly elaborate on the housing attractions for this group, on criteria that they are young on the one hand (such as students and starters), and on the other hand are either creative, or will (soon) belong to the highly educated population.
Starters predominantly act hedonistic in their location choice, but generally seem to prefer inner-city living environments with some kind of high density. A study among starters indicated work being an important reason to move (Hoefnagel, 2011) and its availability being an important aspect for their location choice (Marlet, 2009). The presence of a sufficient amount of urban attractions (see section 5.2.3), however, has great impact on the utility of a starters’ dwelling, as they frequently go outdoors. Another very important factor is the safety (Marlet, 2009), at which Marlet and Van Woerkens (2007a) point out cities with a predominantly highly educated population to be safer in general. But for safety, vividness (the possibility to combine activities through a highly diverse supply of facilities, public meeting and recreational places, cultural activities and the presence of work) scores highest in the valuation of the living environment (Hoefnagel, 2011).

In terms of housing typologies, approximately 60% of the starters indicates to prefer rented apartments because of the flexibility (the financial freedom and ease of mobility on the housing market). Compared with the past, many highly educated young people change jobs several times at the start of their career and often do not have a permanent contract (for reasons of job shopping and job hopping), which explains their flexible stand towards housing. The preferred quality of the living environment, their room for expenditures and the limit of purchasing is strongly influenced by their financial means. With income increases and improvements in their function, their aspiration-level increases as well, as a result of which the satisfaction with the current situation may decrease (Hoefnagel, 2011). It is therefore important to attract young starters by means of relatively small and affordable, yet high-quality apartments in an attractive city, so they can easily settle and develop a certain commitment and positive feeling towards a city. It is also important to develop sufficient amounts of affordable private houses for this group to provide them with opportunities to move at the time they have more financial resources at their disposal.

In line with their main reason for moving, starters prefer better accessibility above quantitative space (meaning a central position in the mono-centric city model: section 3.1.1) and show a willingness-to-pay more for this. After all, they travel much by bicycle and public transport, and for that reason consider to adjust the norms for parking downwards, as long as a cycle shed is provided instead. In addition, a large part of the starters considers the presence of outdoor areas (such as balconies or roof terraces) as important.

Even clearer than among starters, work appears for highly educated and creative people to be the main reason to move (Marlet, 2009). After several years, most high educated gain a high income and can therefore afford to live at the most popular places in town. Research by De Groot et al. (2010) shows that they are indeed willing to pay a higher price for housing in general, and are consequently more often living in the more expensive cities. Two reasons explain why higher educated people are increasingly willing to pay high prices for private housing in cities that they regard as attractive (Knapp and Graves, 1989; Clark, 2004):

1. they value the attractions, such as culture and hospitality businesses; and
2. they are highly mobile and flexible, as a result of what they tend to move more often in order to optimise their career prospects.

Regarding the creative class, it is remarkable that the availability of performing arts, as well as cafes, the percentage of pre-war and single-family dwellings, and the
proximity of nature, explains why a larger amount of this group is living in certain cities compared to others (Marlet and Poort, 2005), whereas these aspects were not significant in general.

Finally, highly educated housing consumers prefer a playful street pattern, with diverse, stylish, ‘warm’ buildings and greenery in the neighbourhood. In addition, 28% of households with an above average income is enthusiast about building their own house, as well as 20% of them willing to pay extra for control during the construction of the building (VROM and CBS, 2009). This is consistent with trends of the individualistic society wherein people are more informed and hence expect more participation during construction.

5.4.4 Direction of causality
The quality of housing and built environment together with attributes of the natural environment affect population growth directly and the economy indirectly. In addition, the clustering of firms performs a direct attraction for households, thus the planning thought that predominated ever since the reconstruction period (“wederopbouw”) until about 1990. In 2007, in line with this up to 63% of the employees were living in the direct surroundings of their location of work. In addition, 14% of employees was living in the surrounding neighbourhoods, 6% was living elsewhere in the same city and only 17% was living in another city (PBL, 2010a). An important question raised, is whether the attraction of employers leads to more households in the surroundings, or that the larger population leads to more jobs. Unlike the last century, it is now assumed that mainly households are capable of attracting firms. Nonetheless, uncertainty seems to exist concerning the causal relationship between the increase of amenities, human capital and the number of jobs available.

According to the human capital theory by Pigou (1928) and the consumer city theory by Glaeser et al. (2001), the decision where to locate is primarily with households, whereupon firms follow those households to those attractive locations that offer appropriate amenities. De Groot et al. (2010) refine this reasoning based on statistical research which shows that both the production- and consumption side are contributing about equally to the explanation of differences in the prices of land in the Netherlands (in total they explain 77% of the price of land: 34% is explained by the production side and 43% by the consumption side). Within Dutch cities, the consumption side seems to dominate, which is in line with the consumer city theory. This is caused by the given, that the production is more wide spread over the cities and the immediate surroundings of those cities.

In case a greater supply of human capital settles in an area, attracted by the urban attractions, it is likely that firms will be drawn to the area as well. After all, when seen from the perspective of the composition of the population, the purchasing power of the higher educated may provide support (if they form a critical mass) for more urban amenities such as retail, cafes and restaurants. This dynamic process has been identified as the phenomenon jobs follow households (Johansson and Forslund, 2006).

On the other hand, a large stock of amenities in a city may increase the share of highly educated people through its attractive force as well, implying that amenities rely on the presence of large numbers of households but also function as a living attraction to the same households. Hence there is doubt about the direction of
causality because of the potential existence of a reversed causality which is illustrated in figure 27.

Figure 27: direction of causality

Source: personal interpretation

The direction of causality is explained as follows (starting from the right arrow on the left side of the figure):

- A larger amount of living attractions leads to an increase of the number of households (Shapiro, 2005; Glaeser et al. 2001), especially high educated and creative people (human capital) (Clark, 2003);
- A larger number of creative people causes more cultural output (Jacobs, 1984), which again acts as a living attraction on new households. As a result, the increased demand for dwellings causes a rise in rents and property values. Due to restrictive building policies, displacement is in many cities the only way that the stock of human capital may increase, which implies displacement of the lower incomes.
- Besides a larger labour supply, especially the supply of qualified (high educated) workers will increase as lower income groups are displaced. This will attract firms, causing employments rates (and incomes) to increase (proven significant by Marlet (2009)) which will cause economic growth (Clark, 2003).
- An increase in the number of jobs may cause again attracts more inhabitants to the city, as jobs are a living attraction as well.
5.5 ECONOMIC PROFILE

For firms, the economic profile concerns the business performance, the dynamics, the public knowledge infrastructure, the amount of private R&D and the government support on these issues. The effect of these factors was explained in chapter 3 and related to their location in chapter 4. Despite being a decisive factor for firms, the economic profile is not a primary location factor for the majority of households (BCI, 2010), although Wouters (2010) indicates that the economic profile nonetheless slightly influences the location choice of young and high educated people.

It is assumed that this effect can mainly be explained through employment growth, as this is the only indicator which seems important for young households. Starters and the highly educated after all mainly appear to move to cities that provide an adequate amount of jobs. Certain amenities and creative institutions may create attractive urban spots, but are not a strategy towards future success. The saying that hungry people’s first priority is not to eat cake also goes for urban attractions, which indicates that cities should also focus on increasing the workforce participation and employment opportunities, also for ordinary people, to attract households (Kotkin, 2006). Nevertheless, Kotkin’s vision should be refined as a focus on art, culture and a focus on amenities can indeed be a priority in making a positive contribution to the employment.

In addition, the economic profile is among other things measured by the relative specialisation (of firms) and the number of retail stores and restaurants compared to the population/employment-function. Sufficient availability of work (see section 5.4.3) and shops (see section 5.3.3) in a city is especially important for (young and high educated) starters.

5.5.1 Growth in employment

In his statistic research on 50 Dutch cities, Marlet (2009) shows that there is a unilateral causality that working follows living. In cities, the population has a pivotal role instead of businesses, although the accessibility of jobs is mentioned as the most important factor of a location (hence the uncertainty about the direction of causality in section 5.4.4). The composition of the population in a city, however, is the crucial link between the advances of agglomeration (economies of scale) and residential attractions on the one hand, and the local economy on the other. Cities where people want to live are characterised by higher economic growth: the growth and composition of the population accounts for the differences in employment growth between cities (Marlet, 2009).

The largest share (40%) of the employment growth is explained by the composition of the population, that is the human capital: the high educated and the creative class, which was discussed in the previous section. The quantitative growth of the population also for 24% offers an explanation for growth in employment (see section 5.3.4: direction of causality). The population growth is largely dependent on policy issues, such as whether or not being permitted to build (building restrictions and regulations).

Improving accessibility (agglomeration) would offer an 18% contribution to the growth of employment, and lastly the economy is a determining factor (18%) for the employment growth (Marlet, 2009). The latter is mainly determined by the diversity
of the sectorial structure (especially corporate services, hospitality businesses and retail) and the job opportunities.

Figure 28: explanation of the differences in employment growth

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition of the population</td>
<td>40%</td>
</tr>
<tr>
<td>Population growth</td>
<td>24%</td>
</tr>
<tr>
<td>Agglomeration</td>
<td>18%</td>
</tr>
<tr>
<td>Economy</td>
<td>18%</td>
</tr>
</tbody>
</table>

Source: Marlet (2009)

Composition of the population
Figure 28 shows that employment growth is for 40% determined by the composition of the population. This mainly concerns, in line with the human capital theory (see paragraph 5.4), the size of the creative class (including creative people, young potentials and highly educated starters).

Just as Marlet (2009), Combes et al. (2009) too demonstrate a location-effect: the share of high educated people in a city goes along with employment growth in the era thereafter. Moreover, a high educated person will be more productive in a large and densely populated city with many other high educated people, compared to less densely populated areas. The likelihood for urban professionals to meet in cafes, restaurants and cultural institutions is after all larger in densely populated areas (Jacobs, 1984), where they increase their knowledge through spillovers and thereby knowledge-level within the company they work for, and the overall knowledge of the city in which they live (see also section 3.3.2 on knowledge spillovers, section 4.3.3, and section 5.4.1). Marlet and van Woerkens (2010) even indicate that the economic strength of a city and its business climate can be positively influenced with simple policies (less stringent land settlement policies) and commitments to (qualitative) hospitality and retail businesses.

In addition, the reinvention theory states that cities with an industrial past are better able to make the transition to a service economy (helping to reduce unemployment), in combination with a high educated population, than cities with an industrial past and a relatively low-skilled population, again subscribing the importance to attract a highly educated population. Above all else, there seem to exist four channels through which highly educated people stimulate the local economy:

1. Highly educated people are more productive and thereby boost the rise of the knowledge economy (De Groot et al. 2010);
2. Highly educated people are more likely to start-up successful businesses (Cortright, 2005; Marlet, 2009) and participate more often in cultural and political networks;
3. Highly educated people spend more (among which arts, culture, food, leisure, and lifestyle products) and thus disproportionately contribute to lower level industries as well (the trickle down effect: see section 4.3.5);
4. Highly educated people are traditionally a symbol of solidarity and stability, but are better equipped to adapt to a changing economic environment also.

Population growth
Glaeser et al. (2001) have shown how differences in consumption possibilities can account for growth differences between cities. The growth of the population is
Understanding Agglomeration

a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District

directly affected by housing qualities, qualities of the built environment as well as attributes of the natural environment. Section 5.4.4 already indicated that differences in population growth, at its turn, have an indirect effect on the economy. When relating city size to the quality of life, big cities are on average no worse to live in than small cities, and denser cities are possibly even nicer to live in than less dense cities (Albouy, 2008). In this context, densification through housing economically advanced people offers more benefits than housing that same group in less densely populated areas. The extent to which Dutch inner-cities can be densified appears mainly dependent on the extent to which building policies function restrictive as well as the influence of politics (and NIMBY’s: see the capital dilution effect in section 3.3.3).

Agglomeration
Cities generally offer more economic opportunities as more people and businesses are located in urbanised and agglomerated regions, offering more varied and greater job opportunities and potential labour supply. This is what makes cities attractive locations for businesses (which is also largely determined by their accessibility) and a good workplace for people. Although property values in large urban areas are higher than elsewhere in the region, wages also appear to be about 7% higher, suggesting a certain degree of compensation requirements (see section 3.3.3). Conversely, according to De Groot et al. (2010), a higher gross wage results in a 1% increase in land values.

Economic opportunities in urban areas at their turn depend on the composition of the population, the sectorial structure and the degree of agglomeration (Marlet and van Woerkens, 2010). The latter indicates economies of scale offered by large (densely populated) agglomerations, through which all kinds of services – that are largely appreciated by mainly young and favourable people – will come about at these locations (Marlet and van Woerkens, 2010).

Economy
Although some (neo-) classic location theories assumed that market forces would eventually level differences between regions, some regions appeared to perform better than others in generating economic growth. Model estimates by Marlet et al. (2008) show that economically favourable cities house a highly educated and creative population, do not have a unilateral employment structure, and that they are little affected by traffic jams that frustrate the accessibility of firms located in the inner-city.

The difference between urbanisation and localisation economies was, among other things, already explained in section 3.3.1 (the scopes of agglomeration economies), which was completed in the previous section with Jacobs’ (1961) reasoning that cities with a diverse sectorial structure (urbanisation economies) grow faster than more specialised economies (localisation economies). This reasoning has been proven correct within the Dutch context based on several empirical studies (Van Oort, 2002; Frenken et al. 2004). Marlet (2009) also argues that instead of specialisation, diversity appears to be a vital economic success factor for increase of employment and growth of the city. Moreover, a unilateral (industrial) employment structure results in a relatively high unemployment rates, whereas sectorial diversity leads to lower unemployment rates (Marlet and van Woerkens, 2010).

Although the sectorial structure especially appears of interest at city level, hardly any starting points exist at this level to directly influence local policy, marketing or
management. According to Marlet et al. (2008), direct stimulation of the local employment (structure) through local policies has little effect. Moreover, traditional economic policy aimed at acquiring firms, are according to them often not successful in the longer term.

Concluding that diversity and inter-industry spillovers in high density environments (section 3.3.2: Jacobs externalities) are crucial to the development of a dynamic economy is consistent with the findings of Feldman and Audretsch (1999) Where encouraging and influencing local policies does not prove successful in the longer term, growth of the population is supposed to do so. It was already explained that new economic activities may be attracted to a location through strengthening opportunities and qualities of the existing factors of production. The continuous arrival of economic activities (by means of entrepreneurs, innovative firms, the highly educated, and the high incomes e.g.) will bring further centripetal forces (see section 3.4.2) into operation according to the process of cumulative causation (Myrdal, 1957), which is characterised by a constant improvement of the (regional) production environment.
SYNTHESIS OF PART II

In chapters 3 to 5 indicated which factors attract firms and households based on location preferences and dimensions, with what a statement was made over the qualities these user groups expect. These chapters provided an insight in the supply a specific location should provide in and which requirement it should meet: agglomeration will merely only occur in locations where user preference find a linkage to the supply end of the market.

In chapter 4 it was made clear that formerly firm location factors were of importance, including the presence of raw materials, however these interests have shift to so called soft location factors in the recent decades. Furthermore, the relationship between the (dis-) economies on the one hand, and location factors considered relevant by multinationals according to studies of Cushman & Wakefield (2011) and Ernst and Young (2011) on the other hand were identified and clarified. The importance of these location factors can be linked to the same 4 domains as were applicable to households in chapter 5. Each location factor, could be linked to a certain domain based on the previously mentioned studies. This coupling could clarify the relative importance of the 4 domains for firms. The table below gives, as an indication, a summary of the relative importance multinational adhere to the 4 domains.

Figure 29: importance that multinational attach to the 4 domains

<table>
<thead>
<tr>
<th></th>
<th>Cushman &amp; Wakefield</th>
<th>Ernst &amp; Young</th>
<th>Averages of the normalised outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical environment</td>
<td>35,6 %</td>
<td>29,9 %</td>
<td>31,8 %</td>
</tr>
<tr>
<td>Quality of life</td>
<td>8,2 %</td>
<td>10,1 %</td>
<td>9,2 %</td>
</tr>
<tr>
<td>Human capital</td>
<td>19,0 %</td>
<td>24,5 %</td>
<td>21,8 %</td>
</tr>
<tr>
<td>Economic profile</td>
<td>37,2 %</td>
<td>37,5 %</td>
<td>37,3 %</td>
</tr>
</tbody>
</table>

Source: adapted after Cushman & Wakefield (2011) and Ernst and Young (2011)

Besides a link between the 4 domains and the location factors that are of importance to multinational, a similar link with the domains can be made for 4 households typologies and another 5 business typologies. The relative importance these groups attach to the domains is shown in figure 30 and figure 31. Figure 30 shows that the values of figure 29 were used, displayed in the right column. The other percentages of the other 9 groups were established in a similar way. Finally, it should be noticed that location preferences are dynamic (temporal and socially dependent) and are based on different perspectives of the reality.

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1 The arrangement of the coupling is shown in Appendix 2.
Figure 30: importance that firms attach to the 4 domains according to their user preferences.

<table>
<thead>
<tr>
<th>Firms</th>
<th>Retail and amenities</th>
<th>Business services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical environment</td>
<td>39,4 %</td>
<td>20,0 %</td>
</tr>
<tr>
<td>Quality of life</td>
<td>29,8 %</td>
<td>15,0 %</td>
</tr>
<tr>
<td>Human capital</td>
<td>6,5 %</td>
<td>30,0 %</td>
</tr>
<tr>
<td>Economic profile</td>
<td>24,3 %</td>
<td>35,0 %</td>
</tr>
<tr>
<td>Multinationals</td>
<td>31,8 %</td>
<td>15,0 %</td>
</tr>
<tr>
<td>Physical environment</td>
<td>31,8 %</td>
<td>15,0 %</td>
</tr>
<tr>
<td>Quality of life</td>
<td>9,2 %</td>
<td>15,0 %</td>
</tr>
<tr>
<td>Human capital</td>
<td>21,8 %</td>
<td>45,0 %</td>
</tr>
<tr>
<td>Economic profile</td>
<td>37,3 %</td>
<td>25,0 %</td>
</tr>
<tr>
<td>R&amp;D facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic profile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top-quality production</td>
<td>20,0 %</td>
<td>40,0 %</td>
</tr>
<tr>
<td>Logistics and distribution</td>
<td></td>
<td>5,0 %</td>
</tr>
</tbody>
</table>


Figure 31: importance that households attach to the 4 domains according to their user preferences.

<table>
<thead>
<tr>
<th>Households</th>
<th>Young and high educated population (25-35)</th>
<th>Households with young children (25-40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical environment</td>
<td>20,3 %</td>
<td>19,5 %</td>
</tr>
<tr>
<td>Quality of life</td>
<td>51,6 %</td>
<td>58,4 %</td>
</tr>
<tr>
<td>Human capital</td>
<td>22,8 %</td>
<td>19,5 %</td>
</tr>
<tr>
<td>Economic profile</td>
<td>5,3 %</td>
<td>2,7 %</td>
</tr>
<tr>
<td>Households with mature children (40-64)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical environment</td>
<td>19,7 %</td>
<td>20,0 %</td>
</tr>
<tr>
<td>Quality of life</td>
<td>69,2 %</td>
<td>80,0 %</td>
</tr>
<tr>
<td>Human capital</td>
<td>9,7 %</td>
<td>0,0 %</td>
</tr>
<tr>
<td>Economic profile</td>
<td>1,3 %</td>
<td>0,0 %</td>
</tr>
<tr>
<td>Elderly (65+)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The percentages on the opposite page, make the relative importance visible that 10 user-groups (firms and households) attach to 4 domains and form an indication of the extent to what the policies should focus on certain values in order to attract or retain certain target groups. This synthesis, therefore will provide a short overview of the theories regarding living- and working- preferences for both firms, retailers and households, that were discussed in previous chapters.

Preferences by firms;

Accessibility (PE) As Pellenbarg (2002) pointed out, transport costs are a primary factor for firms. Moreover, long travel times and high transportation costs are experienced unattractive by many firms as they might have to provide in compensation requirements (section 3.3.3). Accessibility by car and public transportation (multi-modality of regional, national and international qualities to access) and parking facilities are strong location factors and form the prerequisite for a favourable location environment.

Proximity (PE) Firms also attach importance to mutual spatial proximity because of the opportunities for input sharing (the share of input suppliers) and labour market pooling (the proximity of sufficient qualified workers).

Appearance (QL) Besides the possibility to settle on a certain location (enough available real estate), the visibility of the building is of importance, as is the visual appearance of the building (exterior) and its environment (image, status, visual quality en spaciousness).

Quality of life (QL) Besides the hard location factors, soft location factors are increasingly important location criteria for firms, given these factors attract other businesses and especially knowledge workers. The attractiveness of cities for knowledge workers is of great importance to retain or attract ‘knowledge activity’ in cities. If other areas possess more consumption advantages (facilities, services or amenities) this may cause firms to choose another location (see section 3.3.2).

Labour market (HC) The proximity of a high quality labour market is a soft location factor that becomes increasingly important for companies, making more aware of the quality of life the city offers to its employees.

Information (HC) The network-structure (social networks) generated by hospitality businesses appears important for firms due to the opportunities to meet (face-to-face contacts) and for the unforeseen exchange of information. Knowledge spillovers as such are most likely to take place at cluster level and gradually attenuate with the distance from the business centre (Singh, 2010).

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2 The domain to which a preference belongs is abbreviated after each preference: PE = physical environment, QL = quality of life, HC = human capital, and EP = economic profile.
Diversity (EP) The reasoning of Jacobs (1961) that cities with a diverse sectorial structure (*urbanisation economies*) grow faster than more specialized economies (*localisation economies*) has been proved to function within the Dutch context by multiple empirical studies (Van Oort, 2002; Frenken et al. 2004). Although housing of *upstream* firms can lead to the beneficial *trickle-down effect* (Marlet, 2009), companies seem more likely to settle in less mixed locations.

Retail preferences;
Accessibility (PE) Besides the accessibility and parking facilities, for many retailers it is of great importance to be situated in the central area in the (historical inner-) city, with small distances from housing, that can be travelled walking or cycling, so that the citizens can spontaneously and unplanned make use of the facilities.

Availability (PE) Besides convenient opening times and the presence of suitable retail space, the presence of other facilities is of importance (which leads to *brand zones*), as this facilitates combination visits (especially fun-shopping). Between retail and other functions, like entertainment, restaurants and bars, leisure and culture, synergetic effects could result.

Promotion (QL) Besides the atmosphere and amenities (spatial qualities and physical comfort), the possibility to personalize the building plinth is of importance. Generally, *perimeter blocks* are considered suitable for retailers given that these areas generally consist alternating buildings and offer sufficient *interface area* for retail and other commercial purposes.

Density (HC) With a sufficient population density, a larger local outlet arises where mainly smaller retailers will situate than in mono-functional neighbourhoods. In addition, more people nearby confer a benefit on each other by helping to make more products available.

Economic base (EP) Retailers benefit from higher housing densities as these provide a larger outlet, especially in case of a diverse population (Brakman et al. 2009) that differs in lifestyle and income level. A large local market provided by the spatial concentration of residents and other downstream customers (*forward linkages* to a sufficient amount of customers) offer more opportunities for *input sharing*.

Residential preferences;
Affordability (PE) The majority of graduates and students prefer an affordable, relatively small but high quality rented apartment (flat, apartment of house with porch) in an attractive city. As they get older, the interest in alternative forms of housing and buying a house increases.
Accessibility (PE) Especially students and graduates, value, besides the accessibility of work, the accessibility of leisure facilities. Consumers do not necessarily settle near their work, but also the, in areas at a walking distance, available urban attractions (amenities, shops, events and activities) (Boumeester et al. 2009).

Space (QL) Regarding the house, not only high quality but also a spaciousness of the house (4 to 5 rooms), and an outdoor space (garden, balcony, terrace or other outdoor space such as courtyards, (common) gardens or yards) are highly valued. If the house has a balcony, it is important the balcony offers sufficient privacy.

Variety (QL) Residents seem to increasingly favour low-energy, classic-looking homes in a living environment with lots of variety in the buildings. Compared to 20% of the urban resident consumers that have a preference for experimental architecture, 60% prefers traditional architecture (Boumeester et al. 2009). Residents have a preference for variation in the buildings, in order to retain the identity of their own home.

Amenities (QL) Residents attach importance to the identity of the area and the value of experience, and are prepared to pay more for the optional use of amenities (restaurants, bars, art and recreational facilities) and (temporary) events.

Shops (QL) Of urban households, 80 to 82% indicates to attach importance to the proximity of shops for daily quick, efficient and easy shopping and for more qualitative goods (Bouwmeester et al. 2009; Van Leeuwen, 2010). Especially presence of food and groceries (as well as a supermarket and a bank), child care, domestic help, hairdressing and beauty care in the direct living environment (500m) is considered to be important (Van Leeuwen, 2010).

Nature (QL) Both the proximity of a park (De Groot et al. 2010), public green areas (Rouwendal and Van der Straaten, 2008) as smaller ideas can meet the nature needs and experience (Boumeester et al. 2009; Leidelmeijer and Schulenberg, 2010) and have a positive effect on the value of land. Regarding the valuation of the environment, it is important that the environment is clean, safe and energetic (Hoefnagel, 2011).

Private housing (QL) The proportion of social housing at the level of a district, is strongly negatively related to the prices of residence (Marlet, 2009). Social housing have a negative effect on the experience within the area and the assessment of the liveability.

Human capital (HC) A homogeneous low cultural (Glaeser et al. 2001; Florida, 2002) or socio-economically heterogeneous composition of the population should not be pursued, as this often has a negative effect on social cohesion. Attracting privileged people that differ in age (mainly human capital), or that
have small differences in levels of education (for instance the creative class) will have a positive effect on the social cohesion in an area.

Discussion
After summarizing the main aspects that form the bases for the location choice of firms, retailers and households, the question remains how they relate to one another. The following discussion will clarify conflicting aspects and make connections in order to provide a good general idea of the location preferences.

High or low densities?
The largest number of opportunities for human capital accumulation (Jacobs, 1969: see section 5.4.1) is usually offered at dense and central urban locations – cluster level (Singh, 2010) – where rent and land values are generally high. This is due to firms that preferably settle near other firms that provide positive externalities, and they are sometimes even willing to pay a premium for this, which is reflected in higher land values as such (Sinai, 2010).
A high population density is also important for retailers and firms with respect to the variety and number of customers that can be reached and because of the potential for input sharing and labour market pooling. By focusing on inner city development of housing, the difference between the threshold and the range will become larger, which will attract more entrepreneurs to the centre and the offer will be focussed locally. Also resident consumers are prepared to pay extra for these living environments provided that generally the urban attractions, will be present in a higher density. The importance of density, function mix and (network) centrality will be examined further in chapter 7, after which in chapter 8 their relationship to the RCD will be explained.

Accessibility or quality of life?
Good accessibility leads to lower costs, less time to travel, and less congestion (congestion force). The higher density of living and working, through which employees find residence closer to their work, this leads to smaller distances between living and working. This will hamper the increase of travel costs, travel time and congestion force. Consumptive motives have become more important compared to productive motives, at scale of cities. Therefore, the accessibility of jobs (the most important production factor) explains only 28% of the attractiveness of Dutch cities (Marlet, 2009). A process of household sorting has started, which implies that the degree to with a city succeeds to excel in her consumptive end is decisive for the success on the production end.

Firms or people?
As indicated above, household sorting currently takes place: footloose workers, rather than footloose firms, will become the critical drivers of regional economic growth. Consumption advantages contribute to the quality of life of workers as a result of which spatial concentrations of people and consumptive provisions will increase (see section 5.4.4) Although quality of life is not a direct reason for firms to settle, they still consider it important to attract a sufficient amount of knowledge workers. Diversity of the sectorial structure (urbanisation economies) moreover
appears to have a more positive influence on the economic growth compared to a specialised economy (localisation economies).

Demand or supply-driven development?
According to Hooimeijer et al. (2001), residents in the housing market are mainly hampered to move by factors including building restrictions and large differences between the qualitative and quantitative demand and supply. Regarding the latter aspect the NVB (2010) acknowledges the existence of a mismatch between the wishes of residents and construction programs. Without having to discuss the current living preferences regarding their house, in general terms it can be said that there is a need for products that find linkage in the market and are providing in these needs.

In addition, the land quote (see section 6.3.1) is large burden for the developing parties and these are reflected in the rents, which leads to less competitive (less affordable) houses are made available in the market. From this perspective, it makes sense to be sparing with the remaining ground in convenient, good accessible, locations in downtown urban areas (independent of the type of construction).

Integrated land use and transportation policies should allow for compact cities to develop as clusters of highly accessible and dense nodes, supporting easy movement, as well as residential developments, commercial services, and centres of employment. The spatial concentration of people provides a support base for indivisibilities, such as schools and infrastructure, within a relatively small area which would lead to lower transit emissions as well as less energy-intensive developments (Ottaviano, 2008).

Finally, it is necessary to deal with zoning in an alternative way, regarding the construction restrictions, so that building programs can be better suited to the preferences, both qualitatively as quantitatively of residents. This issue gives rise to an in depth research to the way in which inner-city areas are developed in the Netherlands.

Homogeneous or heterogeneous population?
Cities should provide a climate of tolerance (Jacobs, 1961; Florida, 2002) and adequate amenities in order to attract more than their share of (young) talented people (Florida, 2002; Hospers and Van Dalm, 2005), as these people are not slavishly following jobs, but rather look for attractive urban amenities. From the standpoint of housing differentiation, an ideal composition seems to exist for social cohesion if the majority (>75%) of residents is owner occupier (Leidelmeijer et al. 2008).

Implications for Rotterdam Central District
Given the presence of train, RandstadRail and subway, bus and tram stops and its location at the Weena Boulevard, the RCD belongs to one of the most accessible urban areas of the Netherlands. Although this is a strong point, the production side of Rotterdam is mainly dependent on the consumption possibilities. Rotterdam would differentiate itself by offering its own unique identity and own distinctive combination of attributes that a significant set of knowledge workers will find attractive.
The planned urban area development is to add an enormous amount of urban amenities, yet the question arises whether the hurried travellers in combination with the low urban population density, will provide sufficient activity. Although the Municipality of Rotterdam (2010) has expressed the ambitions to accommodate more people in the city centre, the current plans for the RCD will provide for nearly 500 new homes. The municipality should, as attractor and social responsible for the urban area development, put more focus on attracting highly educated people (mainly students, young potentials and creative, highly educated starters), which would be in line with the reinvention theory (see section 5.5.1).

Furthermore, it is unlikely that the RCD will form a integral part of the city centre (goal) as long as the separation of Van Traa, that in 1946 advised a monotonic separation of functions (see section 2.1.1), is maintained. With the conservation of this separation, it is also unlikely that the RCD will function as the entrance of the city, as is part of the aspirations. Nor will it meet the, in the Programmaplan Binnenstad 2010-2014 (2010) intended aspirations. Part III will provide a more detailed overview of the aspects liveability, density, function mix and network integration.

By a smarter utilization of the available land (as was already indicated in chapter 2, there is a possibility to increase the density, that is beyond the densification in the current urban area development plan), the land quote could be reduced which could lead to the introduction of new houses at a more competitive level. This would create larger potential target market, of which the promising rental segment in which students and highly educated graduates are interested. In order to strengthen social cohesion and reducing the share of rental properties (with a share of 74%, the share in Rotterdam is well above the national average (Boumeester et al. 2009)), the city should however, also attract owner occupiers. Although the RCD, currently is not an attractive living environment for families, the largest threat is formed by the extensive requirements and guidelines (in 2009 appointed in the BKP, the PlanMER and the Welstandsnota). The municipality foster if it would focus less on all fixed aspects in the zoning and pay more attentions to the great deal of possibilities.
PART III  analysis framework: quantitative approach
INTRODUCTORY REMARKS

In previous chapters various theoretical bases explaining the agglomeration of a wide range of target groups (both businesses and households) were explored. The assessment showed that agglomeration can be explained theoretically using several factors and effects (first and second nature factors (Krugman, 1995), internal and external economies, localisation and urbanisation economies), on the other hand agglomeration can also be explained from specific preferences that underlie the attractiveness of an area for businesses and households (the domains: PE, QL, HC and EP). Finally, the theoretical part, which explains agglomeration from fundamental research, and the user preferences primarily based on empirical research were combined in the previous synthesis of Part II.

The research question actually links the theory of agglomeration and location preferences to the practical implications of urban area development. In this section, the theories explained in Part II will be operationalized and translated into qualitative factors. Although the main objective is a theoretical understanding of an urban space, the plans for the RCD will be compared with what follows from these theories.

The synthesis preceding this chapter, already indicated that a more detailed research was needed into the development process of urban areas in the Netherlands. First, the course of urban area development processes in the Netherlands will be considered and discussed. In addition, a framework will be provided, that elucidates the relation between the various aspects that are associated with the process and product. The framework will be extended in Chapter 7, to translate the framework into several quantitative indicators. Using these indicators, the importance attributed to density, function mix and (network) centrality will be further explored and with which the translation to the Rotterdam context will be made.
URBAN AREA DEVELOPMENT

6.1 URBAN AREA DEVELOPMENT

In the first section of this chapter, the concept of *urban area development* will be explained and decomposed into a few aspects that can be influenced. These aspects – that will be explained in the following paragraphs – are:

- the actors, their mutual contracts and forms of cooperation;
- the financial plan, in which, in addition to valuation methodologies attention will be paid to the effects of the current economic crisis on the real estate market (urban area development is very sensitive to the fluctuations in the real estate market); and finally
- the management of urban area development processes.

6.1.1 Defining urban area development

Urban area development can be understood as an umbrella term for large-scale spatial area developments for which no fixed, generally accepted definition exists (Wolting, 2006). Despite the lack of a clear definition, several authors have expressed what they mean by this concept.

Louw and Van der Toorn Vrijthoff (2002) point out the need for spatial interventions at several real estate properties in (integral) urban area developments. One generally speaks of integrated urban area development, which Huisman (2006) considers as a basic condition, in case a number of functions is taken into consideration in when developing an area. Integrated may also indicate the concept of integrating different disciplines to achieve success in urban area developments (Franzen et al. 2011).

According to Louw and Van der Toorn (2002) it is further essential to perform such interventions in a contiguous (geographical) area, changing its spatial structure through, for example, intensification of the land when (re-) building or – constructing (existing) properties, changing or mixing functions, or when undertaking use- or policy oriented interventions.

In his inaugural speech as practice chair professor at the TU Delft, Friso de Zeeuw (2007) deduces this vision as the art to connect functions, disciplines, parties, interests and funds, in order to (re-) develop an area. His definition emphasises urban area development to be seen as a complex process in which various public and private actors jointly try to set up spatial developments at different scale levels, while their demands, shares, commitment and influence often at the same time differs.

In order to formulate a comprehensive definition, most descriptions of urban area developments correspond to a certain extent with the following five aspects:

Process: The business case for an urban area development is designed as a phased process during which the emphasis shifts from the
development of a location to the exploitation of the units (e.g. real estate, infrastructure, public space);

**Context:** There is a joint vision for the geographically limited area;

**Content:** The content is the programme for the urban area development aimed at creating spatial constellations in which various functions can flourish into a coherent and integrated whole. It is essential for the content of urban area developments to be in line with the socio-cultural, spatial and economic context (Franzen et al. 2011) and that all intended functions are fully considered from the various disciplines within the multiple actor environment.

**Actors:** At different scale levels, different actors with varying interests and concerns are at work (multiple actor environment). According to Franzen et al. this implicates complementary cooperation through interaction with the activities of both public and private organisations, as a result of which most urban area developments are conducted as a Public-Private Partnership (PPP) since the 1980s (Franzen et al. 2011);

**Means:** The expected budgetary or financial exploitation scheme of an urban area development has to be balanced by settling all expenses (De Zeeuw, 2007) through retaining generated profits for reinvestments within the area.

*Urban area development* may, based on abovementioned aspects, best be defined as follows:

“*Urban area development is a (complex) spatial and integral (re-) development process of a geographically defined area, usually divided in several phases. The interests and concerns of the public and private actors involved are embedded in a partnership agreement containing the spatial, financial, and organisational phases that constitute the joint vision for the area.*”

Van ‘t Verlaat (2000) also considers the management process of *urban area development* to hover at the interface between the actors, context, content and the means for realisation, as shown in figure 32.

Figure 32: schematic overview of urban area development

Source: Van ’t Verlaat (2000)

The four abovementioned aspects need to be optimised in relation to each other in order to constitute a successful urban area development process and outcome (Franzen et al. 2011). In practice, the content is realised for and by the actors, within the context, and by utilising the available means.
Concerning the context, a distinction should be made between the spatial context (the land and buildings) and the socio-cultural, political, institutional and economic context. Spatial interventions should be in line with policy constraints on the one hand (administrative and technical preconditions, policies and legal frameworks), which is highly dependent on the proposed content. On the other hand, the content (also referred to as the \textit{spatial quality} by Van ‘t Verlaat (2003)) has to connect with the actors’ demands, which is largely determined by the context, especially the economic climate and the end users’ housing needs.

Based on this distinction, the process of optimising urban area developments can be represented as a framework, incorporating the context in this process (Daamen, 2005). The incorporation of the context in the process and the relationship between the various aspects is shown in the left triangle in figure 33 through the angles \textit{market}, \textit{means}, and \textit{content} (spatial quality). The triangle itself in fact acts as the context within which the urban area development is organised.

In Franzen \textit{et al.} (2011), Van ‘t Verlaat en Wigmans indicate that the best results are achieved if the three angles – between which a centrain degree of tension exists – are optimised relative to each other in the development process. As market, means and content are hardly influenced, let alone optimised, the optimisation should mainly be sought in the intervening aspects: the \textit{financial plan} (costs and benefits), the \textit{support} (through the various stake- and shareholders), and through optimisation of the \textit{spatial plan} (concerning both the product as well as the urban area development process). Beside optimisation, a certain degree of dynamics that is characteristic for urban area development processes should be taken into account, which is represented by means of the curved arrows.

Finally, \textit{finances}, \textit{support}, and the \textit{spatial plan} should be balanced, since these matters are highly interdependent. The \textit{spatial and financial plan} are aligned to the \textit{market} (the market demands, economy e.g.), attuning the \textit{financial plan} and the \textit{support} is based on the availability of means for realisation, and finally the \textit{process} and \textit{product} (the \textit{spatial plan}) are aligned based on the \textit{content}. The alignment and optimisation of the aspects is shown schematically on the right side in figure 33.

\textbf{Figure 33:} process (organisational) and development framework for urban area developments in the Dutch context.
Following on from the explanation of the process and development framework, the next sections will provide details on the support, financial plan, and the spatial plan. The current (hopefully exceptional) crises will also briefly be discussed in explaining the financial plan (section 6.3.4), given the large market-impact on regional developments.
6.2 SUPPORT
Agglomeration can be steered if both product and process at a certain location would better correspond to a wider range of actors compared to other locations. This means that both the real estate and the area itself (the products) should find match with a very large number of users with different needs and requirements concerning their dwellings, workplace and environment, that were set out in the previous chapter. On the other hand, a development process should be drawn for real estate and urban area developments in which various parties can participate. The potential on both the demand and supply side maximises through offering both the number of users (stakeholders) as the number of shareholders involved more possibilities in an open process and product.

The playground of urban area developments, as already indicated, consists of a large number of actors that influence the process based on different interests and from different roles, and are thus to some extent all responsible concerning the contents of urban area developments. Despite the complexity through this (often) large number of actors involved, it appears crucial for the parties to be involved in the process in order to achieve the desired developments results.

6.2.1 Stakeholders and shareholders
A distinction between stakeholders and shareholders should be made before dividing the parties into categories. Shareholders are those parties having a particular position in an area, for example through land ownership. The government, developers, housing associations and private residents are its best known examples. Shareholders include everyone who’s interests are – positively or negatively – affected by an urban area development. Shareholders are therefore, mostly to gain additional support, involved in the development process (a horizontal linkage) at some time. This usually, apart from the shareholders, concerns local residents, shopkeepers and existing businesses, travellers, and visitors.

According to Klein and Van Twist (2008), the separation in the vertical organisation structure plays an important part besides the horizontal dependency of actors (synergies by combining different qualities, information and resources in the organisation). Their remark is targeted to the strict public-private separation between policy and implementation issues.

The main features and characteristics of both stake- and shareholders will briefly and categorically be explained below, although both actors as well as their interdependencies differ in each area development process.

1. Controlling governments (municipal administrations and services);
Governments are major players in regional developments as they often own lands, determine what the development plan for an area looks like, are responsible for the land development and ultimately for issuing the building permits. Being a land owner, economic interests and a justifiable budget-orientation often play an important role for governments, besides having a social responsibility to improve the welfare and quality of life in cities through the social benefits of urban area development (Franzen et al. 2011). An increase of the employment rates, the housing stock, or the number of visitors, may also be a municipal objective of urban area developments as a result of this responsibility. A strong city (socially,
is therefore the primary organisational objective for municipalities, which usually results in a long-term commitment to areas.

2. Developing market players (real estate developers, housing associations, building contractors);
Independent real estate developers are private market parties taking risks in investing both equity and debt capital in real estate developments. Their ultimate goal is to rent the property out or rather sell it at a profit by maximising the difference between costs and revenues (the margin) at an acceptable risk. Some contractors also dispose of a development branch in order to provide their core-business with a continuous stream of work. Contractors as such focus just like regular project developers on profits by selling their projects to an investor, but hence also attach importance to generating continuity. The development benefits and the continuity of the development portfolio appear to be decisive for most real estate developers, which leads to a short-term commitment to a particular (urban) area. Housing associations on the other hand, usually for a long time remain intensively involved in a neighbourhood in order to continuously ensure a good living environment (physical, social and economic) for the lower and middle income groups. Finally, alongside the management of social housing and facilities, many housing associations are also active as developers of their own portfolios. They thus develop only a limited number of real estate typologies and are therefore not able to take many risks. Although housing associations focus on yields instead of profits (by selling), nearly all developing parties do have a focus on developing in one or more market segments.

3. Financiers and investors;
Most developers are dependent on investors, although some of them are affiliated with banks or other kinds of investors that make project financing run smoothly. Financiers (mostly banks) expect certainty in advance regarding a project or area development and therefore often only provide financing by means of a (mortgage) loan as soon as a minimal percentage of the building has been sold or rented out (Van 't Hof, 2010), so that the underlying property can serve as a guarantee. Loans as such usually cover 80% to 90% of the total costs of development\(^1\), on which the financier will be paid an interest income which height mainly depends on the financial risks. The ultimate buyers of projects are either investors or private residents. Investors put, apart from the presence of a tenant, particular emphasis on long-term return (growth in (end-) value, IRR) on their investment (Franzen et al. 2011) as well as continuity in their investment portfolio at an acceptable risk. Investors usually spread their capital over different investment categories, including various categories of real estate and stock derivatives, in order to limit their risk. Private residents are considered end users of the property and are therefore discussed below. Both end users (such as residents) as well as investors are (with the exception of institutional investors) often externally funded (mortgages and

\(^1\) Development costs involve both the development of the building as well as the purchase of land and sometimes even the acquisition costs, demolition costs and the cost of preparing the land for construction and residential use.
other types of loans) and have a medium to long term commitment to the area as they benefit from value developments of properties.

4. **End users (inhabitants, retailers, office workers);**

It often appears difficult to outline a general demand-profile of end users given the duration of urban area developments as well as the large number of potential end users, so their importance sometimes gets neglected especially in early stages of developments. The considerations of end users to settle somewhere are often based on the costs for a building in proportion to the quality offered by the building and its surroundings (Franzen et al. 2011). Nevertheless, any basis for urban area developments stands on the market demand that exists for the functions proposed for an area. The final end user determines which property meets its housing needs and what it is worth to him. That cash flow is to investors (or for private parties) the main determinant for the property value in their final real estate calculations, which is the price that can be paid to the developer (further clarification to the land development will be provided in section 6.3).

### 6.2.2 Public-private partnerships

Until the last century, municipalities used to buy or own lands for which urban plans were made in case development of an area was considered desirable. After making the plots ready for construction, they were often sold to a few developing parties. The financial and development risks were often with the municipality investing early in areas without having the guarantee that the plots would be sold to the market at a profit.

In the early 80s, the New Public Management was introduced, dictating that public services would operate more efficient and more effective if their focus would be on providing policies and leave the implementation to others through outsourcing. As a result of this new type of management, various forms of public private developments for urban renewal were realised in the mid-80s. After several years of reduced enthusiasm regarding public-private partnerships, the aim to make room for the market and facilitate more PPP-projects was declared by the government in the late 90s.

Different forms of cooperation are possible between the aforementioned actors that are involved in urban area developments, which mainly differ in the degree of cooperation and the position that market parties and government adopt. Currently most urban area developments are controlled top-down by the government, in order to maintain the districts’ identities and to retain the ability to take corrective action if deemed necessary. Top-down steering of urban area developments with an organisational structure as such is called the blueprint approach and is a form of active land development (see figure 34). Under this approach, plans that are ultimately intended for the so-called end-users (the users and owners of the area) are imposed from above by governments and (to a lesser extent) developers.

The counterpart of the blueprint approach is planning in which only ambitions and (general) objectives are laid down, which is also designated as organic planning. In that case the government plays, contrary to the blueprint approach, its role as a facilitator, sometimes provoking initiatives through small (spatial) incentives or by adding program which investes to invest. From this point of view, the emphasis is on user requirements concerning the location and the real estate, where the
qualities of existing properties and temporary use of areas and buildings are given a more prominent role. Yet, a bottom-up approach as such is often more drastic and involves more risks and a longer haul.

A public-private partnership is a formal agreement between private parties concerning, inter alia, the land allocation and exploitation that lies at the basis of the realisation of buildings in a particular area. The cooperation provides a degree of certainty and limits opportunistic behaviour between parties, which is often necessary before parties are willing to invest (Topper, 2010). The figure below shows whether a municipality has a facilitating or active role in the land development, and to what extent public and private parties are cooperating.

![Figure 34: schematic overview of urban area development](image)

Source: adapted after Bult-Spiering and Dewulf (2006).

1. **Traditional;**
   In traditional cooperation (often based on DBFM (O) – contracts), the government only sets requirements to the use of the area, everything else is left to one or more market players working together in a consortium. The public partner has an active area policy (the public partner is responsible for the initiative, vision, programme, plan execution, land development and management of the public space) and only allows the market parties to execute the project development.
   The land is prepared for building by the public party at their own risk, the pieces of land are then sold to the market parties. The costs incurred for the design of the public area and the infrastructure, are settled in the issuing price wherever possible (Kenniscentrum PPS, 2006).

2. **Building claim;**
   In case of a building claim, all parties are usually involved in the initiative and feasibility stage. Subsequently, the areas the developing parties do not possess are acquired, after which the bare land is transferred to the public partner. However, the municipality is responsible for the land development risks, the preparation of the land for construction and the final construction of the public area. In order to
avoid disagreements, the division of responsibilities, activities, costs and risks are often determined in advance and recorded in an agreement between the parties. After the public partner has prepared the land for construction, the land is sold back to the project developer, whereby the municipality can include the obligation to build in the purchase agreement. The obligation to build requires the buyer to realise the construction of a specified programme (the framework established by the government) within a certain time frame (usually a date is determined by which the construction should start at the latest). With these agreements the volume (number of objects), the programme (type of objects) and planning to realize are predetermined (Kenniscentrum PPS, 2006).

3. Joint venture;
The joint venture is actually called the only real PPP, as public and privat parties collaborate in each stage of the development (with exception of the realization phase). The parties establish, and participate in a common Land Development Company (LDC), to which all possessions of land are transferred. The openness offered financially by the LDC makes it possible for the participating parties to share the land development risks and the impact on the land development process (and with that on the real estate development). Thus, the LDC as entity is responsible for land preparation and land allocation to the participating parties of the LDC, after which the market parties will start de area development (Kenniscentrum, 2006).

4. Consession;
In a consession the market parties are asked by the public partner to contribute ideas to optimize the project both financially and programmatically, this is done in the feasibility stage of the project. Based on the ideas, the public partner ultimately defines a number of preconditions (the deliverable programme and the quality thereof), and divides the costs and risks equally between the public and privat partners. This division is recorded in a consession contract. After tendering the concession, the land- and real estate development as well as the establishment of the public space and infrastructure, come to the account and risk of the market parties. After a certain supervision period, the public area and infrastructure is returned to the government (Kenniscentrum PPS, 2006).

5. Self-realisation (exploitation agreement);
An exploitation agreement is the ultimate form of facilitating area policy, since the public party is only responsible for the initiative and final design of the public space. However, the costs are charged to the market participants. The market parties are responsible (for own account and risk) for the acquisition of land, an urban area vision, a program that falls within the planological boundaries of the zoning plan, and conducting a land and property exploitation (Kenniscentrum, 2006).

6.2.3 Contract- en partnership-arrangementen
Finally, according to some public-private partnerships that were examined by Klijn and Van Twist (2008), a distinction can be made between a contract and partnership arrangements:
1. **Contract-arrangements;**
   In contract-arrangements (mostly DBFM(O)-contracten) the structure of the PPP-construction strongly emphasis on defined and separated responsibilities between the collaborating parties. In the pre-phase the public partner specifies the intended endproduct, but does not interfere with the content in the execution phase. After tendering the public party fulfils only a supervisory role, the market players are responsible for the realization of the project. This type of design is commonly used for infrastructural projects, which represents approximately 54% of the total number of PPP-projects.

2. **Partnership-arrangements;**
   Partnership-arrangements on the other hand are founded on a collective plan- and exploitation design, based on the consensus between mutual interests, ambitions and goals. On the one hand, marketparties are more involved in the design within this type of collaboration, on the other hand, the government can contribute to the added value of an area by co-production of a station, cycle shed or tunnel in the realization phase. A collaboration of this type is primarily used for urban area development projects (Klijn and Van Twist, 2008).
6.3 **FINANCIAL PLAN**

The financial plan, as shown in figure 35, on the one hand depends on the *market* and on the other hand on the available *means*. Alvorens aandacht te schenken aan de *market*, zal allereerst worden ingegaan op de *means for realisation*.

Besides financing – which is an evident necessity for the realisation of projects – the means for realisation also involve land- and redevelopment policies and other instruments for spatial planning in Dutch law and regulations. These means, or instruments, are usually not derived from area specific objectives, but are at a higher level related to policy making that is in accordance with the relevant legal frameworks. This includes funding by means of grants, subsidies and other public budgets that play a significant role in the land development process.

In addition, the implementation of these funds, given the usual top-down approach, depends on knowledge, manpower, equipment (availability of land), and the leadership qualities of the decision makers (Daamen, 2005).

**Figure 35: schematic overview of the financial and contractual development process.**

The development phases and related agreements (see section 6.2) are already included in the figure. Additionally, it is noted that the value of properties is determined by the housing costs that end users are willing to pay, making the real estate calculation process run from back to front (Van ’t Hof, 2010). Regarding the financial plan (in figure 35 referred to as financial engineering), the land price and the price for the property are the main transactions between the parties (as described in section 6.4.2). These transactions are the two main financial transfers, usually involving external financiers (see section 6.2.1), which is indicated in figure 35 with the large, striped arrows. The investment amounts required for these transactions are generally too high to be borne by a single party, making investments from other parties (financiers and investors) necessary. The complexity of urban area developments is further enhanced by the fact that the financial feasibility often depending on the settlement between profitable and unprofitable parts of a project (Topper, 2010).

6.3.1 Land costs
The first major transaction in urban area developments takes place between the land exploiter and the developer. This section will therefore discuss the most common methods for determination of the land costs.

a. Production costs method (kostenprijsmethode)
According to this method, the price of land is directly derived from the costs that a municipality has to make before selling the land as developed land. This means that the final price of the land is composed of the costs for acquisition, demolition, cleaning up, costs for preparing the land for construction and urban planning costs. Prices are often determined per location or calculated as an average cost of different locations, but functions in fact always as a minimum price (production costs offers no benefits to the municipality). The cost-price of land is therefore usually paid in the development of social services and social housing. It is thus necessary for municipalities to settle the marginal earnings on social housing and services with functions that do have a profitable top.

b. Comparative and quota method
According to the comparative method, the cost-price of land is derived from the cost-price of land of similar objects in other locations in the city or region. Especially the cost-price of land of private plots, industrial site and social real estate are established based on independent valuation reports, often based on the comparative method.
The comparable quota method bases the cost-price of land not on comparable property (which often leads to permanent cost-prices of land per location), but bases the cost-price of land (per type of real estate and per VON-segment) as a percentage of the commercial price of the property raised. Both methods are primarily used to determine whether the use of the residual land valuation method has lead to realistic cost-prices.

c. Residual land valuation
The residual land value is the difference between the marketvalue of the real estate and the construction and additional costs to actually realize the real estate.
The market value of the property can be determined using various methods, such as the imputed rent capitalization method, also known as the comparative method. The imputed rent capitalization method is primarily used for the valuation of non-residential buildings (including offices and shops) by multiplying the rental value with a capitalization factor. Both the rental value and the capitalization factor are determined based on previous lease transactions.

For the determination of the value of non-residential buildings in the economic course of trade, a comparison is made with the average rental rates of comparable properties. Using the rent capitalization method, the valuation is comparatively based and subsequently multiplied by the capitalization factor. The capitalization factor is determined based on previous sales numbers, collected data on the leasing transactions, interest rates, inflation, etc.

The residual land value is roughly equal to:

$$Residual\ land\ value = V.O.N.-price - BTW - Construction\ costs - Additional\ costs.$$  

The land quote follows from the residual land value method, and is determined as follows:

$$Land\ quote = (Residual\ land\ value/\ Sales\ value\ excluding\ VAT) \times 100\%$$

### 6.3.2 Factors affecting the price of land:

Obviously, the availability of land (which can be a firm location factor, when a plot should include options to expand) is important for the price of the land, or as the American writer Mark Twain once remarked “Buy land! They don’t make it anymore”. The price of land will increase if cultivated land limits the number of options of establishment. In line with this increase, the cost-price of land can increase due to the ‘positive externalities’ of established companies which can attract other companies (leading to an increase in demand).

Both the price of land as the real estate prices frequently reflect the quality of the surroundings and environment, whereby the popularity of the real estate and the location commonly determine the price of the land (see the previous section for the calculation methods). In addition, the price of land reflects the quality of public facilities located in the vicinity. The mono-centric city model makes clear that the best accessible locations are valued with the highest cost-price value of land (PLVI\(^3\)), for example, if a location is within 500m of a station. At least 31% of the price of land is explained by the accessibility of a location (De Groot et al. 2010).

Apart from the accessibility of a location, the difference in prices of land (the surplus of valuations of land) between the rural and urban area are mainly caused by the greater offer of attractions in cities. At least 45% of the price of land appears to be determined by location specific characteristics, such as the presence of shop and hospitality facilities and the nearness of parks or nature (De Groot et al. 2010).

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1. Key figures are often used for the determination of Construction and additional costs
2. The PLVI is the Peak Land Value Intersection: the highest price paid for land in a city.
6.3.3 Market value of real estate

The market value is the most probable price at which a property (and the rights attached to it) are expected to be traded between a buyer and a seller one day. Businesses regard real estate merely as a means of production and thus only considers the market value relevant in case of transactions. Although businesses are common to deal with book values (which sometimes leads to hidden reserves), almost every party usually appears to make its own calculations according to the different methods that exist to assess the financial aspects of projects. This section will briefly discuss the valuation methodology of homes and offices although different market profiles make use of different methods to valuate objects, lands, contracts and risks.

1. Housing value;

The housing value, as well as the cost-price of land value, forms often a reflection of the quality of the property and the living environment. Visser and Van Dam (2006) en Marlet (2009) offer a hedonistic explanation for differences in housing values in the Netherlands, which shows that housing value can be explained on the basis of the physical property characteristics, the (social, functional and physical) environment characteristics, the attractions of the city and the urban region.

According to Visser and Van Dam (2006) these characteristics determine almost 55% of the price. Marlet (2009) explains 60% of the housing value based on a few indicators on these scales and up to 90% if the availability of jobs is included in the analysis (see chapter xx for details). The normalized average of their statistical research shows that 54.7% of the differences in housing value can be explained from the property and the living environment and that 60% of the housing value is explained by the living environment and the city.

<table>
<thead>
<tr>
<th></th>
<th>Housing qualities (norm.)</th>
<th>Qualities of the living environment (norm.)</th>
<th>Urban attractions (norm.)</th>
<th>Urban region and hinterland (norm.)</th>
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<tr>
<td>Visser and Van Dam</td>
<td>18,2 %</td>
<td>27,2 %</td>
<td>17,7%</td>
<td>9,4%</td>
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<td>(2006)</td>
<td></td>
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<td>Marlet et al. (2008)</td>
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<td>40,0%</td>
<td>22,0%</td>
<td>26,0%</td>
</tr>
<tr>
<td>Marlet (2009)</td>
<td>19,3 %</td>
<td>24,3%</td>
<td>13,4%</td>
<td>43,0%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>19,6 %</strong></td>
<td><strong>35,1%</strong></td>
<td><strong>17,7 %</strong></td>
<td><strong>27,7 %</strong></td>
</tr>
</tbody>
</table>

Sources: Visser and Van Dam (2006), Marlet et al. (2008) and Marlet (2009).

2. Office value;

Next to the economic situation and region, the rent of an office building is largely dependent on the renting contracts and the specific characteristics of the building.

For the purpose of this thesis, three widely used methods for valuations of real estate objects will be elucidated, namely the GIY- and NIY method, the DCF method and the rent capacity method. Nonetheless, the valuations of real estate objects and the determination of rent prices are frequently not transparent since ‘the amount the fool pays for the object’ is almost always what is paid for the object and often nobody knows the exact value of the object (in real estate terminology ‘who

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4 The average over the overall table is taken as a starting point after which the results have been normalised, since Visser and Van Dam (2006) did not consider this scale level.
knows may say it’). In this framework the American professor Peter F. Drucker described that buyers pay only the utility of a product and for that what brings them value. The customer is not prepared to pay for the qualities the supplier has added, but only for his own gains.

2a. GIY/NIY-methode

In the case of the Gross Initial Yield (GIY-) method, the annual gross rental income is divided by a competitive gross yield. Both the gross market rent and the gross yield are generally comparatively (based on market evidence) determined. The formula is often corrected for any incentives, vacancy or overdue maintenance, these are made constant and are subtracted from the eventual market value. The Net Initial Yield (NIY-) method is similar to the GIY-method, but the annual gross rental income is adjusted for the exploitation expenses. Resulting in a net annual renting income which is then divided by the Net Initial Yield.

2b. DCF-method

According to the Discounted CashFlow (DCF-) method, the value of an office is determined by all cash flows that will take place (the future cashflow) during the exploitation phase (or part thereof) that are made constant based on a market discount rate. The DCF-method is to a lesser extent based on comparative market determinants (such as the BAR and the expected Gross or net rental income), but is based on the cash flows (rental income and (special) expenses), an end value and discount rate over a certain period. Nevertheless, in determining the value of properties according to the DCF-method – as well as the BAR/NAR-method – a large number depend on the economy, which usually is considered uncertain in the long run.

2c. Rent according to capacity

For valuations of some real estate objects (especially retail and restaurants) it the capacity rent method is utilized. According this method comprise the housing costs (rent) a percentage of the possible revenue determined based on the exploitation possibilities and industry figures.

A study by SEO Economic Research for offices in the region Rotterdam towards specific building characteristics, showed that the presence of sufficient parking lots, accessibility and the location were the most important price determinant factors (Berkhout and Hop, 2002). These results are not surprising, however more remarkable is that the number of parking facilities is less determining in centre locations. Apparently the shortage of parking space is taken as a given, which is compensated by other favourable location factors. Another remarkable outcome of the study was that the accessibility by car an by public transport are valued equally. Finally, like in valuating objects, there are multiple methods to calculate the financial feasibility of an urban area development, however the DCF-method is most often used. Similar to the DCF-method, that is used to value office buildings, in urban area developments the occurrence of a ‘bahttub’ in the cash flow should be avoided. To establish this, it is attempted to shift income to an earlier moment and to spread the investment over a longer time span or to divide over multiple actors.
6.3.4 Market: economic crises

In the field of urban area development, the market is usually subject to very long lead times, in which projects are subject to changing (market-) conditions (Topper, 2010). This research has taken place against the backdrop of a market that is in motion and in which it is unclear whether there will be recovery or a further decline of the market. Due to the long lead time of urban area development, the process and design of the PPP-construction is very sensitive for these market conditions.

At the end of the economic boom the abundant capital markets (the *wall of money*) contributed to the process in which project developers pushed aside the government in the property and real estate market. Furthermore, urban area developments in the Netherlands were frequently characterized by the misrepresentation of the businesses that were clearly too ambitious. The misrepresentation increased the chance of the project being accepted by a municipality. Consequently, the financial shortfalls in the plans for urban area development before the economic crisis were very voluminous in some cases (Brok, 2010).

At this point in time, due to the increased uncertainty, almost all parties, normally involved in the urban area development are taking a step back. The high uncertainty with regards to the future financial position (for example, mortgage conditions and growth expectations) lead to a situation in which both consumers and companies postpone any relocation decisions. The plummet of demand in various segments is become apparent from the stagnation flow within the real estate market, the construction and with that in virtually every aspect of the real estate market. The lack of demand has lead to price declines in the housing market, which has lead to pressure on the rent prices.

Since user markets are also affected, the risk of vacancy as well as the risk of rent (price) reductions has increased for both housing, shops and offices (Brok, 2010). As a result, the current market no longer built on risk, projects should almost entirely be sold or rented before traditional lenders (banks) will finance a development. Furthermore part of the traditional lenders has stopped financing real estate projects, which forms a threat to the liquidity of the market which has led to the adjustment, phasing, cutting up, reconsidering and entire abandonment of many projects (Brok, 2010).

All in all, the real estate business has to deal with the results of the crises, with unoccupied office buildings, unsold houses, devaluations of land land positions and the more tight financing conditions of banks. Authorities are subject primarily to reduced revenues from land and devaluations on overvalued land and real estate positions. This has already led to significant budget cuts, reductions and elimination of contributions by the government to unprofitable summits of investment projects (Brok, 2010), such as with social housing.
6.4  SPATIAL PLAN

As indicated in figure 33 (see section 5.3.1), the spatial plan consists of a process and a product. Regarding the urban area development process, several managerial approaches exist to integrally and simultaneously balance the process’ components ‘drawing, calculating, and signing’. Besides these management forms, the spatial development process itself is divided in several phases to achieve a certain product.

6.4.1 Approach and management of projects, programmes and processes

Weggeman et al. (2006) make a clear distinction between 3 relevant management methods for the design, management and realisation of urban area developments:

1. **Project management**;

   Project management is focused on the organization of project activities with the aim of realizing the needs and expectations of stakeholders. The project approach mainly concerns the internal project management given there is a clear objective (the end product). For this, the preconditions and the time frame are fixed in advanced and during the process there is less attention for the continuous interaction with the environment (Klijn et al. 2006). The following FOTIQ-aspects (Franzen et al. 2011) are the focus areas within the project management:

   - **Finance**: the current and future costs and benefits;
   - **Organisation**: division of roles, functioning of the decisionmaking processes, management;
   - **Time**: the establishment and monitoring of proper planning
   - **Information and administration**: the provision and management of data;
   - **Quality**: formulating and testing predetermined and required quality levels.

2. **Programme management**;

   A program consists of a multitude of projects that are realized sequentially or in parallel. The related management activities have objectives that go beyond the boundaries of a project. The objectives are the achievement of a certain level of ambition in stead of a predetermined, specific endresult. Within this form of management the aim at is **efficiency, flexibility, speed and feasibility**.

3. **Process management**;

   In case a development is more dynamic of nature, it appears to be more difficult to use a project approach (Klijn et al. 2006). On the one hand, a project can thus develop as a process if the projectowner realizes, during the course of the project, that the problem is more comprehensive or more complex than originally thought (**internal dynamics**). On the other hand the project can develop into a process by the substantive involvement of external parties (**external dynamics**).

   The policy and tactical focus of process management is in many cases applicable to projects and programs that initially were mainly content and operationally focused. If a project of program is realized based on process management, the focus of a project shifts form a specific endresult to the achievement of one or more projects within the financial and managerial possibilities. Teisman (2001) formulates this as the management of a process, without fixating the content on a specific solutions as an endproduct. Franzen et al. (2011) establish that the definition of projects within the process management is formulated more indicative, which can lead to uncertainties regarding the feasibility of the final result.
Following an extensive literature review and a survey of 32 managers of PPP-projects Klijn et al. (2006) conclude that many managerial dilemmas can be grouped in a theoretical split between project- and process management:

In short, the process management tries to reach a certain goal on the one hand, but within the management itself a goal searching orientation exists, emphasising fluctuations in the process. The largest gains are made in the early stages of developments as unstructured and persistent issues involving dynamics, complexity, diversity of interests and perspectives of many actors are to be assumed at that stage (Klijn et al. 2006). Urban area developments therefore often start with a type of process management, until the scope shifts to programme management and eventually project management.

Besides, the emphasis is on the soft side of the organisation, such as cooperation, and building consensus and support among multiple parties in the project organisation and in the decision-making process, involving varying interests (Daamen, 2005), tasks, responsibilities and authorities. This requires more emphasis
on the strategy, the composition of an organisation, the management style and culture and this frequently offers opportunities for ‘financial engineering’ and innovative contracts.

Finally (because of the ambiguity) the process, procedures and projects are designed more flexible, in order to look for balance, coherence and heterogeneity. Arrangements with respect to the process are often designed more flexible when arrangements with respect to the project are perceived as rigid. Process management does not pursue quickly coming up with a solution, as this may neglect the necessity of knowing the interests and may as well give the impression that other interests are not taken seriously (Klijn et al. 2006). Nevertheless, Wigman and Kooijman (2003) indicate that more focus should be given to the issues of fragmentation, complexity, flexibility and contingency (chance), in the practice and theory of process management.

### 6.4.2 Land development phases

Decisions are usually based on information gathered in the various stages of the project. At the end of each phase, it is important for the PPPs to record arrangements in form of an agreement between the collaborating parties. The usual development phases and contract moments were displayed in figure 35 and will be explained in this section.

1. **Initiative (sketches);**
   In the initial- / preliminary phase, parties (in some case separately) start to investigations to gain more insight in the possibilities, limits and relevant frameworks of an area after which the mutual ambitions can be recorded in a memorandum, including a letter of intent and a documentation of the ambitions. These documents cover quality concepts and alternatives, with as main goal the identification of the problem and task, and to give direction by sketching the (physical, financial and instrumental) capabilities and ambitious to forge consensus between the parties involved (Agentschap NL, 2010).

2. **Feasibility phase I: definition and design (master plan);**
   Based on the letter of intent, the various parties declare the intention to start a joint project based on the developmental vision (the cooperation / development agreement). Within which the goal is formulated, the indicative process steps and the relationships, which – in many cases – is closed with an administrative decision by B&W. In cases with great complexity, the agreement is usually set only halfway through the masterplan phase (based on a preliminary design) to meet the need for more assurance (Agentschap NL, 2010).

   After formulating the goal, the relationships and the process clear enough, a start will be made with the masterplan. The masterplan does not form a blueprint, but the basis for phasable and flexible definition of the urban area development, with which light is shed on the feasibility and risks of the project. For this purpose, the effects of various options (program, spatiouse structure and financing) are mapped. Eventually the masterplan formulates at least the desired program, spatiouse structure, multiple analyzes (including an analysis of the financial and social feasibility, an environmental analysis, etc.). Based on the masterplan, the board of B&W can make decisions regarding the principles, procedures, adaptation to the zoning, finance and subsequent steps.
3. **Feasibility phase I: preparation (building plan and details on the final design);**
   Within the urban preconditions of the master plan, subsequently both the final urban plan and the quality plan are established. In these plans, the program is further developed into for example the access of all traffic, the amount of parking facilities, de environmental constraints (air, noise, etc.) and the water management. In addition, the financial estimates are refined and the final land exploitation is formulated and decisions regarding the program, preconditions and possible collaboration agreement are made on a managerial decision level. Based on the final design, one or more realization- and developmentagreements are closed between the parties for the preparation (like building plans, building specifications, procurement and licensing procedures) and execution of the plans for buildings, infrastructure and the public space, which is often give rise to the preparation of land for building.

4. **Realisation (working drawings);**
   At the start of the realisation (which is after the licensing procedures) a moment of contract is included, being the issuance- or sale agreement for the effectuation of the actual transactions of land. The building plans are realized by the contractors, the assignment is commissioned by the developers. The municipality is responsible for the maintenance of building and zoning plans.

5. **Exploitation and maintenance;**
   After completion of an area, the transfer to the owner / administrator takes places. Whereby issues regarding the area management are recorded in the exploitation agreement. The public space is usually managed by the municipality, however it can transfer the care for regular and major maintenance to private parties.
7.1 QUANTITATIVE FRAMEWORK

The previous chapter has provided information regarding the organisation of an urban area development process within a given context. This chapter will take a closer look at the spatial implications of agglomeration on the spatial plan: the liveability, density, mix of functions and urban network. A new framework will be provided in this chapter in order to understand relations within the spatial plan on the basis of measuring instruments that are coupled to the new framework. First, this section will provide details on the design of the framework, the choice for the instruments and their background. The subsequent sections will elaborate on the relationships between the instruments of measurement and the implications for a spatial context.

7.1.1 Framework of analysis

Based on their research on multiple land use and spatial quality, Hooimeijer et al. (2001) indicate that any spatial planning proposal is embedded in a broader spatial, social, and temporal context. To this end they conceptualise and operationalise various dimensions of spatial quality in which they explicitly state that the concepts used may be modified and that accents may be shifted if necessary. Location preferences are based on different perceptions of reality and dynamic (socially and temporally dependent) after all, which was already brought up in the synthesis of Part II.

As the context of urban area developments is both spatially as well as socially rather obvious, the temporal context is interpreted as the volatility of economic and political processes, which is therefore translated as the market. This is otherwise in line with Hooimeijer et al. (2001) as they did already indicate political and economic processes to pursue both public and private interests, and thereby determining the market. Market parties have only been indirectly and end users have not at all been covered in their research, which perhaps explains why they were not included in their original model.

In one of their models explaining sectorial and facet related aspects, Van ’t Verlaat and Wigmans (Franzen et al. 2011) also indicate the existence of physical, economic and social dimensions. They distinguish, as well as Hooimeijer et al. (2001), an ecological and (socio-) cultural facet, which are however in this thesis respectively aggregated with the physical (environmental) and context (socio-cultural) dimension of society.

The variability of the concepts are in the form of a matrix defined and made clear by Hooimeijer et al. (2010) through addition of the triad use, perception, and future. The subsequent conceptual matrix demonstrates that urban area developments are aimed at the physical functioning of an area through strengthening physical, social and economic structures. The (spatial) context, the society, and the market are
dynamic in nature and therefore also correspond to the utility, the perception and the future value. Finally, some italicised terms appear in the table below that are only meant indicatively as they are not that sufficiently relevant to be clarified elaborately given the subject of this thesis.

![Conceptual Dimensions in Urban Area Developments](image)

<table>
<thead>
<tr>
<th>Use</th>
<th>Perception</th>
<th>Future Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context (physical)</strong></td>
<td><strong>C</strong> Diversity Space Identity Sustainability Heritage</td>
<td></td>
</tr>
<tr>
<td><strong>Market (economic)</strong></td>
<td><strong>M</strong> Efficiency Specialisation Attractiveness Image Agglomeration Stability</td>
<td></td>
</tr>
<tr>
<td><strong>Society (social)</strong></td>
<td><strong>S</strong> Rights Specialisation Composition Safety Stability Culture</td>
<td></td>
</tr>
</tbody>
</table>

Sources: adapted after Hooimeijer et al. (2001) and Franzen et al. (2011).

### 7.1.2 Quantifications within the framework

Where the concepts overlap (the intersection of the sets of C, M and S) three inherent causes can be formulated (see figure 40). These inherent causes were chosen as they can subsequently be made measurable by using some of the various urban analysis tools (indicators) that have been developed in recent years. Contrary to weak or vague descriptive approaches usually used by urban designers, urban geographers and sociologists (Hillier and Hanson, 1984; Van Nes, 2011), these indicators offer a more quantitative understanding of the socio-economic impacts of spatial design proposals.
Understanding Agglomeration

a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District

In the figure above, the overlapping surface of the context (C) and the market (M) is considered the functionality of an urban space. The functionality of an urban area on the one hand relates to the market as possible economies of scale are determined by the amount of function mix (such as the HME, consumption advantages, and input sharing e.g.) and the density (such as the availability of space and workers (labour market pooling), knowledge spill overs, and the size of the threshold e.g.) at the same time. On the other hand, density and function mix very much determine the character of a physical context (Van den Hoek, 2009). Thus it is chosen to make use of the Spacemate method on the one hand, and on the other of the Mixed-Use Index as both have been designed according to the same logic (both methods are based on floor areas).

Secondly, the accessibility of an urban area is defined to be located at the overlapping surface of the market (M) and the society (S). According to Hillier and Hanson (1984), economic opportunities and social impact are largely determined by

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**Figure 40: quantitative indicators linked to the conceptual framework**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Inherent causes</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>Network (permeability)¹</td>
<td>Space Syntax</td>
</tr>
<tr>
<td>Functionality</td>
<td>Function mix and density²</td>
<td>MXI and FSI</td>
</tr>
<tr>
<td>Liveability</td>
<td>Social (46%) and spatial (54%) indicators</td>
<td>LBM</td>
</tr>
</tbody>
</table>

Source: personal interpretation

¹ The inherent cause ‘network’ is only regarded physically, although intensive social components exists as well (such as official or personal relations through social networks). A more comprehensive explanation will be provided in section 7.5.

² The density of an area can as well be measured as the number of occupants or dwellings per hectare, yet this study makes use of the ‘FSI’ (Floor Space Index) as unit of measurement which was developed by Berghauser Pont and Haupt (2004) (see section 7.2.3).
the network, hence involving regular indicators of social and economic structures (such as unemployment rates, education levels and the size of labour markets) as well. The Space-Syntax-method mainly offers a representation of the spatial form and structure indicating the connectivity, accessibility, permeability and visibility of a network by means of a colour coding and integration values. These coding and values offer both a graphic as well as a quantitative (using integration values) representation the affecting of roads on the spatial structure and socio-economic activities.

Lastly, the relation between the society and the physical context is measured by the liveability of society and urban areas. For this purpose, use is made of the Leefbaarometer (LBM) that assesses the liveability of neighbourhoods (quality of life) with regard to its people (human capital). The Leefbaarometer is an ordinal measuring instrument that estimates the liveability of an area based on social (46%) and spatial (54%) indicators (see section 7.2.1 for more information on the LBM).

Both the Leerbaarometer (LBM), the Mixed-Use Index (MXI), the Floor Space Index (FSI), as well as the Space Syntax-method are quantifiable analysis tools that all indicate aspects of urban performance. Based on the literature, it is assumed that the closer the indicators get to the centre of the diagram (the intersection of the three sets: $C \cap M \cap S$), the larger the:

- agglomerating force will be through quality of life (as a result of a higher LBM-score);
- degree of agglomeration, as density (a high FSI-value) attracts both firms (especially retail) and households, in part through cumulative causation;

This means that the threshold becomes smaller whereas the range becomes larger (see also section 3.1.2), which also increases the support for mixed-use environments leading to a proportionately distributed MXI (33⅓ / 33⅓ / 33⅓).
7.2 MEASURING INSTRUMENTS

The underpinning for using the succeeding units of measurement in the framework have already been explained in the previous section. Virtually all of these analytical and observational methods are standardised in order to ensure intersubjectivity (De Jong and Van der Voort, 2005). Successively, the methods will be explained elaborately in the following sections.

Figure 41: Description of the instruments used.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Meaning</th>
<th>Index-scaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leefbaarometer (LBM)</td>
<td>Attractiveness of the living environment</td>
<td>Index-score from 1 to 7.</td>
</tr>
<tr>
<td>Space Syntax</td>
<td>The integration of a physical network.</td>
<td>Blue to red as well as by integration values 0 to infinite.</td>
</tr>
<tr>
<td>Floor Space Index (FSI)</td>
<td>An area’s density.</td>
<td>The amount of GFA [m²] in relation to the amount of space in the area [m²].</td>
</tr>
<tr>
<td>Function Mix Index (FMI)</td>
<td>The amount of jobs versus the number of houses.</td>
<td>0 (living) to 100 (working).</td>
</tr>
<tr>
<td>Mixed-Use Index (MXI₁)</td>
<td>The square meters of office space versus amenities versus residential space.</td>
<td>0 (working) to 100 (living).</td>
</tr>
<tr>
<td>Mixed-Use Index (MXI₂)</td>
<td>The degree of function mix in an area</td>
<td>The percentage of GFA [m²] occupied by one function as to other functions [%Housing/ %Working/ %Amenities].</td>
</tr>
</tbody>
</table>

Source: personal interpretation

7.2.1 Leefbaarometer

The developers of the Leefbaarometer define ‘liveability’ as “the degree to which the living environment meets the needs and requirements that are made by humans” (Leidelmeijer and Van Kamp, 2003; Leidelmeijer et al. 2008). In 2006, the Leefbaarometer (LBM) was commissioned by the Ministry of VROM/WWI to measure the extent to which neighbourhoods would be perceived liveable by their residents. Since 2006, all Dutch municipalities conduct the measurement biennially at municipal level, CBS-district level, CBS-neighbourhood level, zip code level and cluster level³.

The Leefbaarometer ultimately rates the liveability of a neighbourhood on an ordinal 7-point scale⁴ that is based on 49 objective indicators (Leidelmeijer et al. 2008) which are distributed over 6 dimensions (see Appendix 3). Remarkably, the proximity of natural areas, forests and the coast are however not assigned to a dimension within the Leefbaarometer.

The weighting of the Leefbaarometer’s six dimensions relies on results from previous studies performed by Marlet and Van Woerkens (2007b, 2008). The

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³ Data on the liveability levels of Dutch municipalities can be found on [http://www.leefbaarometer.nl/](http://www.leefbaarometer.nl/)

⁴ The 14 classes that the Leefbaarometer distinguishes at 6PPC-maps are thickened by a factor of 2 (see factor ½ in front of the formula on the bottom of the next page) as Leidelmeijer et al. (2008) considered the distinction two fine.
relationship between the indicators and the weighting of the domains thus leads to an outcome in the form of a number between 0 and 7, referring to the valuated neighbourhood liveability according to the subsequent colour-coding.

Figure 42: Meaning of the Leefbaarometer-scores

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
<th>Colour and sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Very negative</td>
<td>---</td>
</tr>
<tr>
<td>1-2</td>
<td>Negative</td>
<td>--</td>
</tr>
<tr>
<td>2-3</td>
<td>Neutral</td>
<td>-</td>
</tr>
<tr>
<td>3-4</td>
<td>Moderately positive</td>
<td>+/-</td>
</tr>
<tr>
<td>4-5</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>5-6</td>
<td>Very positive</td>
<td>+</td>
</tr>
<tr>
<td>6-7</td>
<td>Extremely positive</td>
<td>+++</td>
</tr>
</tbody>
</table>

Source: Leidelmeijer et al. (2008)

The 6 dimensions mainly offer an explanation for the factors that deal with the quality of life and the population structure (human capital). Contrary to the importance that was assigned to the physical environment (accessibility) and economic profile in the previous chapters, the LBM does not contain any indicators on these domains (see Appendix 3). However, Bureau Louter (Louter and Van Eikeren, 2010) examined the relationship between various location factors that relate to these domains. They showed that there is actually a strong relationship (+++) between the economy on the one hand (the economic profile) and the location and infrastructure on the other hand (the physical environment). Moreover, these two themes appear to correlate positively (+) with the size of the labour market and the workforce quality (as measured by education).

Nevertheless, the living environment turns out to be hardly affected by the physical environment (accessibility) and economic profile. In fact, these domains turn out to make a location a more attractive place for living, although they have nothing to do with the liveability in themselves. Cities with a strong economic structure and good accessibility, such as Zoetermeer, Arnhem and Dordrecht, are in fact not necessarily more liveable or viable than poorly accessible cities with a weaker economic structure, such as Maastricht, Leeuwarden or Groningen.

As indicated, for the composition of the LBM each indicator is weighted based on the indicator’s influence on the liveability of neighbourhoods that was proven in

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5 The formula used to calculate the LBM-score is as follows:

\[
LB_{\text{index}} = \frac{1}{2} \times \left[ \alpha X_{1} + \sum_{i} \frac{a_{1}}{2} - \frac{a_{2}}{2} \right] + \sum_{i} \frac{a_{1} \cdot X_{i}}{2} - \frac{a_{2}}{2}
\]

\(\alpha\) Coëfficiënten uit modellschattingen;  
\(X\) Indicatoren;  
\(\sigma\) Standaarddeviatie;  
\(\mu\) Het gemiddelde van de samengestelde index.

6 Louter and Van Eikeren (2010) studied the relationship between a number of themes are largely consistent with the composition of the domains from chapter 5, but because of the small differences these have not been represented as R-squares but simplified to a 7-point-scale (comparable with the scaling used for the Leefbaarometer).
previous statistical studies. Lastly, Leidelmeijer et al. (2008) therefore indicate that understanding the weighting of the different dimensions may be an important tool for municipalities to prioritise policies.

**Figure 43: Domains and dimensions of the Leefbaarometer**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Dimension</th>
<th>Examples of indicators</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical environment</td>
<td>Housing stock (5.1)</td>
<td>Housing density, housing types (age of construction, owned/(social) rented)</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Safety (5.2.2)</td>
<td>Disturbances of public order, nuisance, vandalism, theft, violent crime e.g.</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Public space (5.2.2)</td>
<td>Water in the environment, value of sold rental properties, demolition of homes.</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>Public facilities (5.2.2)</td>
<td>Proximity of supermarkets, banks and large shopping malls.</td>
<td>4%</td>
</tr>
<tr>
<td>Human capital</td>
<td>Composition of the population (5.3)</td>
<td>Unemployment, income and education levels, native origins.</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>Social cohesion (5.4)</td>
<td>Rate of mutation, household compositions and age structures.</td>
<td>10%</td>
</tr>
<tr>
<td>Economic profile</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Leidelmeijer et al. (2008)

Although increasing the liveability of a neighbourhood may seem easy through simply focussing on the most heavily weighted dimensions, these appear to be interdependent. The effect matrix below shows the effect of changing dimensions in the vertical column to the dimensions in the top horizontal row.

**Figure 44: effect matrix of changes of the dimensions in urban environments.**

<table>
<thead>
<tr>
<th>Housing stock (19%)</th>
<th>Safety (19%)</th>
<th>Public space (12%)</th>
<th>Public facilities (4%)</th>
<th>Composition of the population (36%)</th>
<th>Social cohesion (10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing stock</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Safety</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Public space</td>
<td>++</td>
<td>0</td>
<td>0</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Public facilities</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Composition of the population</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Social cohesion</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: own calculation (using IBM SPSS Statistics version 19) and Ehrismann (2011), pp. 38.

Most gains on the Leefbaarometer will – in view of the weighting of the dimensions and their interdependencies – be made through investments in, and focus on:

- the housing stock: very positive on the composition of the population (36%);
- the public space: positive on the housing stock (19%), the composition of the population (36%) and the social cohesion (10%);
- the composition of the population: very positive on the housing stock (19%), the safety (19%) and on the public space (36%); and
- the social cohesion: positive on the housing stock, the public facilities (4%) and the composition of the population (36%), and very positive on the safety (19%) and the public space (12%).

7.2.2 UCL Depthmap and Space Syntax

Space Syntax is an analytical technique, consisting of a set of methods to analyse a space at different scale levels and to present an understanding of the various characteristics of that space. The technique is best used in the global design phase (Teklenburg et al. 1994) to predict effects of urban plans. The method is used to depict (pedestrian and vehicular) flows in city streets through measuring the relative integration and connectivity of spaces that follow from the complexity of reaching other streets in a network. Moreover urban structures are according to Hillier and Hanson (1984) simple social arrangements. As these arrangements relate to how people prefer to use cities, the Space Syntax-method is also used to understand these social processes through contemplating the influence of a street pattern on an area’s social and economic vitality.

In footnote 1 was already indicated Space Syntax only analyses spatial structures, and therefore no social components of the network. Nevertheless, streets, sidewalks, and sometimes parks and squares can according to Jacobs (1961) also be considered as a basis for social networks through the city. Moreover, Space Syntax also excludes a vertical dimension (it is limited to two-dimensional analyses), although the visual aspect might be included in Space Syntax through a visibility analysis. In addition, Van Nes (2011) indicates that Space Syntax also ignores place characteristics, architectural styles, cultural atmosphere and diversity.

For a Space Syntax analysis, an application called UCL Depthmap is used to analyse a digital model that is based on a graphical representation of the actual urban layout (Teklenburg et al. 1994). In UCL Depthmap, an urban area is divided into a set of axial lines (the axial map) in which a Space Syntax analysis essentially calculates the degree in which the axial lines are connected to each other, for example to determine the metric distance to all other locations (the metric centrality), the number of direction changes to other streets (the topological centrality), the extent of angular deviation to all other locations (the geometrical centrality) (Van Nes, 2011). Although the quality of infrastructure is a factor in the centrality of a location, most firms do not mention it as a primary location factor (Pellenbarg, 2006).

The axial map is used to compute properties of the lines at different scale levels:

Local: The local angular integration is calculated if an axial map is analysed with a radius of three (R=3). In that case, all lines (street segments) are related to intersecting lines that are accessible through turning only three times. Lines are called central towards their direct neighbours if they offer more than the average number of intersections of their intersecting lines.

---

7 UCL Depthmap is an open-source software application developed by University College London (UCL) that is used to perform spatial network analyses in order to understand social processes within the built environment.
Global: For a global analysis, the integration of lines is calculated through relating them to all other lines of the axial map (R=n). The amount of global integration is determined through the number of turns that have to be made from a street segment to reach all other segments in the network using shortest paths. Lines that are topologically near to other lines are called central towards the global system of the axial map.

On the basis of metrical radiuses, topological, and geometrical distances, the Space Syntax method is able to calculate the integration value of a network (Van Nes et al. 2012), representing the most integrated streets with hotter colours (usually orange and red), and less integrated streets with cooler colours (green and blue). As mentioned, the amount of integration is visualised on the basis of a colour gradient which is shown below in figure 45.

<table>
<thead>
<tr>
<th>Amount of integration</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>High integration</td>
<td><img src="image" alt="Colour Gradient" /></td>
</tr>
<tr>
<td>Medium integration</td>
<td><img src="image" alt="Colour Gradient" /></td>
</tr>
<tr>
<td>Low integration</td>
<td><img src="image" alt="Colour Gradient" /></td>
</tr>
</tbody>
</table>

Source: personal interpretation using UCL Depthmap

Integration describes the amount of integration or segregation through the average depth of a space to all other spaces in the system (Hillier and Hanson, 1984). In addition to the colour gradient, each line has an integration value assigned to it which is used to determine the potential social and economic vitality at different scale levels. A high integration values indicates that a line is better accessible and hence more likely to be chosen as part of a route (Hillier and Hanson, 1984). For that reason, high integrated streets offer more potential for social and economic vitality, while lower integration values conversely indicate less social and economic potential.

### 7.2.3 Spacemate

During the last 60 years there has been an initial complexity to the term density for the many definitions of the concept, as well as due to difficulty to measure it in different scales of analysis (mainly related to the question where the boundary of an area should be drawn). Nevertheless, density has played a significant role in the urban design and planning and revealed itself as an important, or even critical design variable all these years.

In 2001, Meta Berghauser Pont and Per Haupt developed the Spacemate-method, starting from four quantitative parameters describing the density of an area\(^8\).

---

\(^8\) For the purpose of this thesis, the Open Space Ratio (OSR), the number of Layers (L), the Network density (N) and the urban block width (w) have not been fully taken into
Whereas other methods, such as spaciousness (\textit{Weitraumigkeit}) or the amount of dwellings per hectare, formed no clear standard for expressing the density of a built up area (Van Nes \textit{et al.} 2012), the Spacemate method fulfilled a foremost practical clarification as well as quantification for the urban density. According to the method, density is determined based on the amount of floor space (in square meters of GFA) as to the size of the plan area. As a result, the Spacemate-method is related to urban form, enabling to look for relations with, for instance, the block sizes, network, and other performances. The FSI is otherwise comparable with the acronyms and abbreviations FAR (\textit{floor area ratio}) and FSR (\textit{floor space ratio}), which likewise describe the ratio of the total floor area of buildings to the gross area size of the building plot.

In case buildings have more floors or are built deeper, the FSI, GSI and L become larger, whereas the OSR becomes smaller. Both strategies to densify increase the density, but also reduce the amount of relished daylight. Concerning the building structure, those having a pointed footprint lower the density compared to strip-buildings, building- and patio-blocks. In case of equal building heights and depths, patio patters reach the highest densities, whereas stand-alone towers lead to the lowest density. Based on several case studies on such structures, Berghauser Pont consideration. Yet some of them do appear in some of the figures, indicating these can be derived from the theories as well, and secondly that these variables might prove new insights on lower scale levels likewise.
and Haupt (2004) developed 8 typologies which are spread over 5 degrees of urbanisation (living environments), which is shown in the figure below:

Figure 47: clusters of building types and living environments

7.2.4 The Function Mix Index (FMI) and Mixed-Use Index (MXI)

In 2009, the Function Mix Index (FMI) was developed by the Planning Agency for the Living Environment (PBL) to measure the multifunctionality of areas. On the basis of numbers (addresses and workplaces) the FMI offers a first insight into the mixing of functions in residential and working locations. In order to calculate the FMI, the amount of jobs is being divided by the number of home addresses, which leads to a index-scaling between 0 (living) and 100 (working).

However, it is important to make a specific distinction between the different functions and their corresponding size. The FMI offers a rather broad distinction in functions to use it as a basis for urban plans, as the index is only a ratio between the number of housing units and jobs. Moreover, from an urban planning point of view it is more useful to calculate in floor surfaces (such as GFA) instead of units or jobs. One such method providing a quantitative insight into the distribution of different functions is the Mixed-Use Index (MXI) by Joost van den Hoek (2008). The MXI makes a distinction between housing and non-housing functions according to a categorisation that is specified in figure 48 on the next page.
Figure 48: further categorisation of uses

<table>
<thead>
<tr>
<th>Functions</th>
<th>Non-housing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Housing</strong></td>
<td><strong>Working</strong></td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td><strong>Amenities</strong></td>
</tr>
<tr>
<td>Inhabitants</td>
<td>Employees</td>
</tr>
<tr>
<td>Inhabitants and visitors</td>
<td>Inhabitants and visitors</td>
</tr>
</tbody>
</table>

Social housing
Rental housing
Private housing

Offices
Laboratories
Factories and plants
Logistic and distribution

Retail and commercial facilities
Cultural and religious functions
Administrative/ societal functions
Hotels, restaurants and bars
Educational functions
Health care
Sports, recreation and leisure

Source: adapted after Van den Hoek (2008; 2009)

The MXI can then be determined according to two methods:

1. **Twofold method**;
   The MXI is composed similarly to the FMI, yet it does not compare the number of residential units to the number of jobs, but indicates the ratio of housing to non-housing in amounts of Gross Floor Area (GFA). That way, a MXI-value of 50 indicates a balanced mixed-use, whereas a MXI-value of 0 indicates that no housing is present, and an MXI-value of 100 indicates 100% residential use (Van den Hoek, 2008).

2. **Threefold method**;
   Adjacent, the MXI is displayed as the ratio between living, working and amenities in terms of percentages (Van den Hoek, 2009), hence adding up to 100%: MXI = (%Housing / %Working / %Amenities).

The twofold method hence leads to a value between 0 and 100, which is of practical use to compare the function-mix of various district. The threefold method distinguishes three types of functions and is therefore especially useful for detailed analysis on specific areas.

Major advantage of the MXI is that it measures data in m² of gross floor space (GFA) per hectare, rather than in jobs or inhabitants. Van den Hoek (2009) follows the logic of the urban indexation of density by the FSI (Floor Space Index), which is defined by Berghauser Pont and Haupt (2004) as the amount of floor space divided by the lot size (see figure 46 in section 7.2.3). Furthermore, the MXI is defined as the proportionate share of floor space (GFA) that is occupied by the three elementary functions (housing, working and amenities). Hence, measuring the mix in terms of floor space and functions relates directly to urban planning principles.
To convert a FMI-value to a MXI-value, it is important to know the amounts of office and residential space that a person disposes of on average, for which subsequent data are used:

- According to the National Facility Cost Index van (AOS Studley and General Support, 2011), the size of the workplace per employee reduces from 18,7 m² (LFA) in 2011, to 11,5 m² (LFA) in 2015. According to NEN2580, the LFA is roughly 55% of the GFA. Hence, if the average workplace is set at 11,5 m² LFA, this results in a required floor space of 20,9 m² per employee in 2015;
- Anticipating the case-study (see mainly chapter 8), it should be noted that an employee in Rotterdam currently disposes of 29,7 m² (GFA). Hence for studying the relation between the FMI and the MXI makes use of an average workplace size of (20,9 m² + 11,5 m²=) 18,7 m² GFA, according to which the GFA under NEN2580 boils down to 34,0 m² per workplace.
- Calculating the average living space per person living in Rotterdam (again for the case study), each inhabitant turns out to have an average living area of approximately 54,0 m² at its disposal.

If one would for example assume a FMI of 70 (which is similar to 30 inhabitants against 70 jobs), this results, considering the abovementioned data, in a (twofold) MXI of 42,5. The figure below illustrates this relation in form of a graph:

Figure 49: relation between the Function Mix Index (FMI) and the Mixed-Use Index (MXI)

Source: personal interpretation and calculation

In cooperation with Rotterdam’s planning agency, Joost van den Hoek (Bosscher et al. 2010) has compiled files making the functional structure and ratio of different functions clear per block, neighbourhood and community based on their floor size in square metres. By experiment, he observed that the ratio of floor space for living, working and amenities very closely relates to the character of a neighbourhood, which is in line with the strong similarities between the FMI-maps and the maps showing the LBM-scores (PBL, 2009; see also figure 50).
7.3 RELATING FUNCTIONALITY TO LIVEABILITY

The similarity between the FMI and the (twofold) MXI was already demonstrated in the previous section. Based on previous studies and given the similarity in method of calculation (VROM, 2007; PBL, 2010b) it is assumed that both indices are able to show a possible relationship with the liveability (LBM). The Leefbaarometer is the most important indicator for the perceived quality of life; a high score is therefore attractive for both firms as households. For this reason it is useful to study the correlation between the LBM-domains and the indicators for function mix and density.

Overall, it can be stated that especially the presence of facilities (shops and restaurants) and the presence of a lot of other businesses in the neighbourhood, establish a reason for firms to locate in a specific area (PBL, 2010a). It even appears that the liveability is directly related to the economic activity in a neighbourhood. In addition, the economic activity in residential districts is determined by some other characteristics such as demographics, physical characteristics and features of the economic structure (Marlet, 2009).

The concept of functionality is, as indicated in section 7.1.2, apart from the function mix (FMI and MI) also determined by the density (FSI). This section will discuss the relationship between the density and the function mix, although the relationship between the density and the liveability will only be explained in section 7.4.

7.3.1 The relation between the functions mix and the liveability

In section 5.5.1 it was already pointed out that denser cities are possibly even nicer to live in than less dense cities (Albouy, 2008), was already indicated by Newman and Kenworthy in 1999 with their evidence that low density environments consume more energy and resources for transportation compared to high density clusters that are able to sustain a more efficient public transport network.

A study by the Planbureau voor de Leefomgeving (PBL, 2010b) also shows that multifunctional restructuring projects that took place to date, have not led to significantly more negative scores for the living environment. In a comparison made by the PBL (2009), the FMI-maps of six Dutch cities show obvious similarities with maps showing the LBM-scores. Because of the alleged correlation between both indices, the PBL retrieved at which FMI-value the domain scores of the LBM are highest (or the least bad in case of negative correlation).
Concerning the underlying factors for the Leefbaarometer, the level of facilities scores – as expected – higher in mixed areas (FMI: 50 to 80). Mixed areas are likewise characterised by better scores on the public space domain and on the composition of the population. Mixed areas also perform better than unmixed areas in terms of social cohesion and supply of housing, with the exception of monofunctional residential areas. The safety-level is below the national average in mixed areas, at which a FMI from 50-60 yet appears to score best. However, the highest LBM-scores are achieved in areas that have a FMI between 60 to 90 (PBL, 2009).
Figure S1: FMI and LBM

<table>
<thead>
<tr>
<th>Dimensions of the Leefbaarometer</th>
<th>Weighting</th>
<th>FMI-ranges</th>
<th>Weighting * FMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing stock</td>
<td>19%</td>
<td>70-90</td>
<td>14,25</td>
</tr>
<tr>
<td>Safety</td>
<td>19%</td>
<td>0, 50-60</td>
<td>6,97</td>
</tr>
<tr>
<td>Public space</td>
<td>12%</td>
<td>70-90</td>
<td>9,60</td>
</tr>
<tr>
<td>Public facilities</td>
<td>4%</td>
<td>80-90</td>
<td>3,40</td>
</tr>
<tr>
<td>Composition of the population</td>
<td>36%</td>
<td>60-70, 80-90</td>
<td>27,00</td>
</tr>
<tr>
<td>Social cohesion</td>
<td>10%</td>
<td>0, 70-80</td>
<td>5,0</td>
</tr>
<tr>
<td><strong>Average/ total</strong></td>
<td><strong>100%</strong></td>
<td></td>
<td><strong>66,22 (yellow line)</strong></td>
</tr>
</tbody>
</table>

Source: PBL (2009)

All in all, the table and figure above show that a FMI between 55 and 85 will on average lead to the highest LBM-score. When converted, this means an MXI of 23.3 to 58.5, or about 41% of living space compared to other functions. In his triangular shaped diagram (see figure 63 in section 8.6.4), Joost van den Hoek names the area where there is about 33% of each of the functions (amenities, housing and working) multi-functional (Van Nes et al. 2012). Although this may appear logical, it remains unclear how such multifunctional areas function and whether they are perceived liveable.

7.3.2 The relation between the functions mix and the density

Just as it is generally not easy to compose an optimal mix of functions for an area, matching it optimally to the density is difficult as well. Van den Hoek’s research has shown a relation between the FSI and the degree of function mix. In areas with the lowest densities, no mixed-use areas were present, as in areas with the highest densities, all areas were mixed (Van Nes et al. 2012).

This is associated with densification contributing to making a location economically viable as larger populations in a city can keep, or make, other services cost-effective. The threshold will be smaller and the range larger, if the accessibility remains equal as the density increases. This implies a larger outlet for products and services will be larger with an increasing density. The buoyancy associated with higher densities as such is expressed in 24-hour vibrancy as well as diversity in the supply of goods.

Yet, density is only considered to make certain urban functions or activities viable, provided that the number of people within a given area exceeds the threshold value. As shown in figure S2, Lozano (1990) points out that the threshold to support a wide variety of facilities and activities that are easily accessible to each dwelling lies at least at 130 dwellings per hectare. According to Berghauser Pont and Haupt
(2004), this is similar to 260 inhabitants per hectare, and a FSI of 2.0 with a minimum GSI of 0.15.

Jacobs (1961) argues that an even higher density is necessary to ensure a lively urban area. The bandwidth described by Jacobs starts at 175 dwellings per hectare (350 inhabitants per hectare or FSI: 2.2) and has a maximum of 350 dwellings per hectare (700 inhabitants per hectare or FSI: 4.4). Densities that exceed 350 dwellings per hectare, according to Jacobs, lead to standardisation and, therefore, to an absence of diversity (Berghauser Pont and Haupt, 2004). In addition, they consider a GSI between 0.43 and 0.58 as the most favourable to achieve urbanity and a lively urban area (Berghauser Pont and Haupt, 2004).

Nevertheless, some authors (Gans, 1991; Boonstra et al. 2009) entitle Jacobs’ far-reaching believe in the influence of architecture and urbanism as a form of physical determinism and an urge for manufacturability. According to Gans (2005) Jacobs also ignores the economic, cultural and social factors in explaining the actual vitality of neighbourhoods. Nonetheless, Jacob’s theories are merely a part of the conceptual framework which was provided in section 7.1.2, also considering economic and social factors.

Figure 52: thresholds for urbanity as expressed by Jacobs (1961) and Lozano (1990).

7.4 RELATING THE FSI TO THE LBM-DOMAINS

The following sections will elaborate on the relationship between the indices from a literary perspective. In the history of planning there has been vigorous debate on the matter whether high densities bring about successful and pleasant cities, or not. In human- and individual-oriented studies, high densities have often been referred to as something to avoid. The Leefbaarometer as well assesses areas with high densities within a 200m radius as negative (- - ).

Conversely, urban theorist Jane Jacobs (1961) claims that a sufficient concentration of people (implying high densities) stimulates a rich city life. The valuable facilities and services that the consumer city provides (Glaeser et al. 2001), such as a rich cultural life, many bars and restaurants as well as a historic centre, would especially in high dense cities appear to outweigh diseconomies of scale, such as smaller houses and insecure environments (as mentioned in the synthesis of Part II). In addition, high densities and the compact city are more often seen as prerequisites for sustainable urbanization and economic growth nowadays (Lozano, 1990; Hall, 1999; Florida, 2002; Glaeser, 2011).

Hence the question rises which densities stimulate Jacobs’ rich city life, and, above all, what effect density has on the quality of life. According to Uytenhaak (2008), an optimal ratio between volume and space is indeed crucial for a city’s liveability, especially if the development’s attempt is to stimulate agglomeration. After all, if higher densities should be associated with a variety of diseconomies, that would lead to a centripetal force counteracting agglomeration.

7.4.1 The effect of density on housing

Higher densities are usually required as a result of the high urban land quotes, although this is – mainly by residents – perceived as a lower quality of life due to the smaller lots and smaller living spaces (a disadvantage of immobility, see section 3.3.3). For that reason, in the city there is often resistance to large amounts of real estate, especially in case of high-rises. Inner-city building is becoming increasingly important within the densely populated Randstad as it reduces land consumption. Densification hence helps to contain urban sprawl and is thus capable to conserve the valuable natural environment of the city. The golden mean in this case seems to avoid useless public spaces (junkspace⁹) in order to densify within the city limits, but without immediately building higher constructions.

This, however, also encounters resistance, mainly due to already present homeowners that firstly benefit from a tight housing stock and secondly prefer to prevent any change in or near their neighbourhood, because of their desire to maintain an established condition (see section 3.3.3). Nevertheless it appears that residents also benefit a larger housing density as they can then live wherever they want while everyone is able to make use of (more) urban attractions (Marlet, 2009). On the one hand, some area will consequently gain more urban dynamics through their densification (the proximity of a sufficient amount of destinations, such as shops and restaurants), while on the other hand the rest of the (inner) city will also benefit this increase in attractiveness, for instance through a larger outlet and increases in knowledge spillovers.

Finally, it is shown that the housing of large numbers of households in the inner city deducts a source of nuisance (for example arising from noise and smell) to the environment as density helps to create walkable neighbourhoods.

⁹ A functionless residue of inner-city building blocks is intended with junkspace.
7.4.2 The effect of density on safety
In general, the variety of functions grows when the density increases, which appears to be a compensatory factor in centrally located, multiple, urban environments, as a result of which acceptance of nuisances by inhabitants will be higher as well (PBL, 2009). Nevertheless, the possible negative liveability-aspects associated with densification (such as business burglaries, disturbance and degradation) reduce the growth potential of businesses, decrease the likelihood that they can survive whereas the likelihood that they migrate increases (PBL, 2009). It is thus important that the safety is ensured by increasing the density, in order to ensure that both the residential and working environment remains attractive.

7.4.3 The effect of density on the public space
Most problems associated with high density environments are usually due to poorly designed developments, not with density in itself. Especially the design, management and use of public spaces appears to have a far more significant effect on (for instance) crime than density or income levels. Also in the Netherlands, new high-dense city or town centres that were to contain a variety of functions, have often been pragmatically translated into rigid master plans wherein insufficient attention existed for a balanced function-mix (Van den Hoek, 2009).

7.4.4 The effect of density on public facilities
Even though density and larger populations, just like geographical constraints, are associated with higher rents (Koppels, 2010), this also leads to a larger land value surplus, providing more options for municipalities to spread the fixed costs of public facilities within a relatively small area over a larger population. Besides, density allows occupants to be close to new or existing services and facilities and provides opportunities to live in close proximity of their work. Finally it appears that locating activities closer together reduces auto-dependency and private vehicle use (Newman and Kenworthy, 1999), expanding transportation choices by bus, bicycle and rail transit, as a result of which these modes of transport will be more competitive and economically viable as well (Berghauser Pont and Haupt, 2004).

In that sense, compact developments offer greater efficiency in use of public services, facilities, places to work and infrastructure since necessary expansions of these functions and infrastructure have more support and will therefore be less costly per capita. Yet not only the number of urban activities has to become larger through densification, but also its variety to ensure a rich community life that is based on density (Lozano, 1999).

7.4.5 The effect of density on the composition of the population
As long as diseconomies of scale fail to appear, inner-city housing will mainly provide favourable opportunities to increase a city’s attractiveness, stimulate its local economy and hence also enhance the welfare of its residents. Yet, as a result of increasing pressure on available space through extensive densification (section 3.3.3: the disadvantage of immobility), certain target groups will be unable to pay for inner city living (if compensation requirements stay off; section 2.3.3). It is therefore important that (high-) dense housing developments support the accommodation of a broad range of lifestyles through mixing lower, medium and
higher-density projects in one neighbourhood, in order to maintain or obtain variety in shops and activities (as indicated in section 5.3.3). Diversity as such appears to be, as indicated in section 5.4, a vital economic success factor for increasing employment and eventually the size of the city (Marlet, 2009).

7.4.6 The effect of density on the social cohesion

Higher densities are associated with an increase in the number of facilities and therefore with the availability of more hangouts such as bars, restaurants, entertainment and other places to go out. Doubling densities in the US demonstrated to cause the average productivity of labour to increase by between 17-28% (Davis et al. 2007), which is largely due to agglomeration economies such as knowledge spillovers, the HME, and spatial proximity. Such side effects of higher densities increase the likelihood of developing successful businesses and may, as a result of the increase of human capital, positively impact the social cohesion. Regarding the employees, density was to account for at least 30% of the aggregate real wage growth that had occurred in the US over the past 35 years (Davis et al. 2007).

7.4.7 Correlation between indices

The strong correlation between the LBM and the FMI suggest that the liveability of a neighbourhood is partly determined by its function mix, or vice versa. The correlation (Pearson) between the Leefbaarometer (LBM), the FSI and the MXI are examined in order to validate this suggestion. To this end, data of 22 neighbourhoods in Rotterdam, as well as 22 neighbourhoods in Amsterdam, was used, of which the results are shown in the following figure:

**Figure 53: Correlation between the LBM, FSI and MXI according to Pearson’s**

<table>
<thead>
<tr>
<th>Correlation between</th>
<th>Liveability (LBM)</th>
<th>Density (FSI)</th>
<th>Function mix (MXI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liveability (LBM)</td>
<td>1</td>
<td>0.120</td>
<td>-0.301*</td>
</tr>
<tr>
<td>Density (FSI)</td>
<td>0.120</td>
<td>1</td>
<td>-0.573**</td>
</tr>
<tr>
<td>Function mix (MXI)</td>
<td>0.301*</td>
<td>-0.573**</td>
<td>1</td>
</tr>
</tbody>
</table>

* = Correlation is significant at the 0.05 level

** = Correlation is significant at the 0.01 level

Source: calculation using IBM SPSS Statistics version 19

The figure above indicates a significant – yet not necessarily causal (De Jong and Van der Voort, 2005) – relationship between the liveability (LBM) and the function mix (MXI). In general, it can be stated that a lower function mix is associated with a higher scores on the Leefbaarometer. Despite that the liveability is apparently perceived higher at working locations compared to locations that primarily have a residential function, this does not mean that a lower MXI necessarily results in a higher quality of life. The 44 studied neighbourhoods after all had an average function mix of 65, implying that a MXI below 65 generally leads to higher LBM-scores compared to neighbourhoods of which the MXI is higher than 65.

From figure 53 it also appears that a relation exists between the function mix (MXI) and density (FSI) at the highest level of significance. This relation too is not necessarily causal as it is likely that the variables are interdependent (mutual
interference) and, in addition, the correlation may (partially) be explained by a variety of other (unknown) factors.

In view of the highly significant correlation, however, it is true to say that areas with a higher density are generally characterised by a lower MXI (more firms).

Finally, the correlation between the density and the liveability is examined, between which no significant correlation appears to exist. However, this does not imply that the lack of significance indicates the absence of any relationship between the two variables. After all, it is possible that the Leefbaarometer still correlates with the density, as it is constructed of 6 dimensions that may correlate individually. Moreover, based on the literature (section 7.4), it is expected that a certain relationship exists between an area’s density (FSI) and its liveability (LBM). The figure below shows the correlation between the LBM-domains and both the function mix and density. As appears, not all domains are correlated with density or function mix. The density strongly correlates with 3 domains (safety, public facilities and social cohesion) that together explain the LBM-score for 33% according to their weighting.

Safety appears to be the only LBM-domain that strongly correlates with both the density and the function mix. Remarkably, safety is the only LBM-domain that is strongly correlated with the MXI, although 3 other domains (housing stock, composition of the population and social cohesion) show a slightly weaker correlation. Nevertheless, these 4 domains contribute for no less than 84% to the Leefbaarometer.

Figure 54: correlation between the LBM-domains on the one hand and the FSI and MXI on the other.

<table>
<thead>
<tr>
<th>LBM-domains</th>
<th>FSI</th>
<th>MXI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing stock (19%)</td>
<td>0.609</td>
<td>0.043*</td>
</tr>
<tr>
<td>Safety (19%)</td>
<td>0.002**</td>
<td>0.008**</td>
</tr>
<tr>
<td>Public space (12%)</td>
<td>0.111</td>
<td>0.198</td>
</tr>
<tr>
<td>Public facilities (4%)</td>
<td>0.000**</td>
<td>0.320</td>
</tr>
<tr>
<td>Composition of the population (36%)</td>
<td>0.811</td>
<td>0.005*</td>
</tr>
<tr>
<td>Social cohesion (10%)</td>
<td>0.009**</td>
<td>0.032*</td>
</tr>
</tbody>
</table>

* = Correlation is significant at the 0.05 level  
** = Correlation is significant at the 0.01 level

Source: calculation using IBM SPSS Statistics version 19
7.5 RELATING THE NETWORK TO SOCIAL AND ECONOMIC DIMENSIONS

The maps in UCL Depthmap consist of axial lines and segments that are most commonly used to analyse movements\(^{10}\). With this a distinction should be made between two network layers that constitute important urban structures:

The **slow** network: This network layer is predominantly used by slow traffic movements, such as pedestrian flows and bicycles. The slow network is important as it functions as easy support for housing, retail, facilities and businesses. As this type of network is pedestrian oriented, particularly the likeliness to use a route compared to all other possible routes is important, which is referred to as the *through-movement*. In Space Syntax, use is made of *local angular* analysis for this purpose.

The **fast** network: This network layer is used for faster traffic movements, such as cars and trains. The differences of this network in comparison with the previous network (such as differences in size and speed) ensure that the fast network may be a barrier to the slow network. Regarding the network it is important that the accessibility potential of each street segment with respect to all others (the integration) is high, which is referred to as the *to-movement*. For this purpose a *global* analysis is performed on the segment map.

A Space Syntax analysis is used to obtain a better understanding of a city’s spatial structure. This spatial structure, the urban network, is on the one hand shaped by society, on the other hand it can generate or affect certain (socio-) economic processes in a city (Van Nes, 2011). This allows using a Space Syntax analysis in considering the likelihood that certain types of socio-economic processes will occur. The next section will explain how the potential of an economic centre can be determined on the basis of the slow network and the fast network.

7.5.1 Economic centres

The configuration of the network, as indicated, on the one hand defines the *through-movement* and on the other hand the attraction value (*to-movement*) for firms along the street network. According to Jacobs (1961), urban blocks should be short (between 125 and 130 metres) allowing multiple pathways and routes to the same location (high connectivity), in order to offer broader supports for commercial areas to exist\(^{11}\). Experience shows that both movements are indeed considered important by retailers due to the mutual influence of their shops on each other as shops present in a street are able to attract customers, which in turn attract new stores (Van Nes, 2011).

Space Syntax is also able to calculate how a street grid influences these types of movements through a network and where economic activities are likely to take place because of that. Trade and finances usually take place along the main

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\(^{10}\) Besides the axial lines, Space Syntax also distinguishes the spatial concept of *convex space*, which is used for interaction, and the *isovist field*, which is used for orientation (Van Nes, 2011).

\(^{11}\) In addition she adds that this leads to an increase of the traffic safety.
shopping streets (the most integrated streets), which areas are therefore defined to be the most vital economic centres. All of these activities are heavily dependent on the structure of streets (metrical, geometrical and topological centrality) to reach all potential customers (Van Nes, 2011; Van Nes et al. 2012). In general, economic centres meet the following 4 conditions:

1. A high global integration (R=n) of axial lines in the street grid ensures a good inter-connectivity between local street grid and main route streets;
2. Shops tend to locate along the streets if integration is high in the local angular analysis (low metrical radius: R=3). The most integrated lines in most cases\textsuperscript{12} represent the busiest shopping streets in a city’s centre and are hence considered potentially attractive locations for shops (Teklenburg et al. 1994);
3. For a good shopping location, streets also provide a high integration with a low metrical radius (R=3); and
4. A high integration with a high metrical radius (R=29) is required as well, although adding larger roads in Dutch inner cities will generally have a low impact, as large amounts of people use a bicycle for shopping (Van Nes, 2011). Nevertheless, firms do preferably locate in close proximity of roads, qualitative telecommunications, railways and airports (Pellenbarg, 2006).

7.5.2 Integration
Over time, the location of various functions will adapt to new conditions in the physical environment when modifying the street pattern. For his PhD-thesis, Desyllas (2000) examined the relationship between changes in the integration of the street pattern in Berlin before and after the wall was torn down. He showed a strong correlation between the rental and purchase prices of both dwellings as well as offices. Similarly, Topçu et al. (2007) studied the strengthening of a pedestrian connection between the centre of the Turkish city of Konya and a local sub-centre. They showed that increasing pedestrian integration values (local angular analysis) with 4,4% on average led to a nearly 15% increase of the rental values for commercial spaces (especially the service sector, such as cafes and restaurants). Although not all by-passers are buyers, the number of by-passers appears to be an important variable in determining the rent for shops. The observation that commercial activities are attracted by pedestrians appears apply to station areas as well according to Peek and Louw (2006). Retailers are prepared to pay a higher rent for locations with a high flow of pedestrians, which inevitably could lead to more revenue. From the flow of visitors the potential shoppers and subsequently the buying public in relation to the amount of visitors can be derived (DTZ Zadelhoff, 2011). Nevertheless, Peek and Louw (2006) warn that the dependence of retail outlets on passenger flows can lead to a situation wherein rushed travellers are disrupted by shopping people, therefore they propose a strict spatial separation.

\textsuperscript{12} If pedestrians are immediately affected by intense vehicular traffic, certain highly integrated lines (for pedestrians) may not coincide with the location of shops (Teklenburg et al. 1994).
7.6 RELATING THE NETWORK TO FUNCTIONALITY

Although the network is obviously analysed physically mainly with the Space Syntax method, the previous section already showed a relation with the social and economic dimensions. Van Nes et al. (2012) indicate that there is a challenge to combine the Space Syntax method with either the FSI or MXI-method in one model. Their research concerning the south of Rotterdam has shown that the higher global as well as local angular integration on the street net, the higher density (a high FSI as well as GSI) at adjacent buildings and the higher the function mix (MXI) inside these buildings. It is thus considered important for high urban areas (characterised by a high density) that they dispose of high local as well as high global integration values.

Although their research is only based on a single part of one city and conclusions for that reason cannot be generalised, they also conclude that the network has a significant influence on the degree of function mix (Van Nes et al. 2012). In section 2.1 it was already shown that the limit of the RCD –though arbitrary – at the same time are treated as the border of the station area. Besides the insight Space Syntax could provide regarding the urban fabric in the station area as place, train stations, at the same time function as a node in the (rail) network. Bertolini (1999) developed the Node-Place Model as an analytical tool to assess the potential of locations for public transport-oriented urban development:

- The accessibility of a location is seen as the potential for human interaction at a specific location. The more people are able to reach a place, the more interaction is possible at that location;
- The degree of diversity and intensity of activities is used as a measurement of the realized potential for interaction at a specific location. The more activities take place at a location, the more human interaction will take place in that location.

The primarily bivalent nature of station areas that Bertolini (1999) indicated, is explained by Peek and Louw (2006) with reference to figure 55 and the following commentary:

- In the transportation discipline, station areas are considered as nodes that function as (1) connectors between the present transportation modes, and as (2) efficiently designed and well accessible transportation nodes in a larger, connecting network;
- In the urban planning and real estate discipline, station areas are considered as places that usually have very large development potential as these locations function as (3) public meeting places within the network city, and as (4) central parts of the urban network.

Figure 55: four disciplinary approaches to railway station (re-) developments

<table>
<thead>
<tr>
<th>primary focus: Location</th>
<th>secondary focus: Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node Connector (1)</td>
<td>Place Meeting place (3)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transportation node (2)</td>
</tr>
<tr>
<td></td>
<td>Urban centre (4)</td>
</tr>
</tbody>
</table>

Source: Peek and Louw (2006)
In Bertolini’s (1999) Node-Place Model the bivalence leads to 5 location types:

1. **Stress locations**
   Locations with a (very) good traffic access and a (very) high degree of intensity and diversity of locations. These locations are less interesting for development, mainly because the space for further development (for both access and activities), despite the generally large market demand, is limited.

2. **Dependency locations**
   Locations with low levels of traffic access and low levels of diversity and intensity of activities, which makes these locations not interesting for development.

3. **Accessible locations**
   The traffic access of these locations reflects the diversity and intensity of activities taking place in the location.

4. **Unsustained nodes**
   The potential for interaction, is not fully utilized in these locations due to a lack of activities, although they the traffic access is good taken from a traffic-related perspective.

5. **Unsustained places**
   A location where many activities take place, however, the traffic access is poor that have the potential to improve the traffic access.
PART IV conclusion and recommendations: interpretation of the result
INTRODUCTORY REMARKS

In the previous chapters, some aspects were pointed out that could possibly improve the working- or living environment. The aim of these improvements is obviously to make the area more appealing to potential residents and to attract more businesses. The following two chapters form the interpretation of the results, in chapter 8 the preceding theories are translated into spatial implications of those theories. Subsequently in chapter 9 the overall conclusions and recommendations are given.
8.1 INTRODUCTION
In the preceding chapters multiple theories regarding agglomeration have been discussed, which has mainly led to the conclusion that agglomeration on the one hand, is dependent on the demand from the market and on the other hand is strongly influenced by the resources available in the market.
In chapter 3 the demand was perceived from the perspective of urban economics, and chapter 4 and 5 considered the location preferences as from the perspective of user preferences of respectively firms and households. In part III both the financing, collaboration- and management structure were discussed with regard to the current market context. On the other hand, chapter 7 has had a quantitative approach to the implications of agglomeration, using a few indicators and measuring instruments.\(^1\)

8.1.1 Point of view
This research ultimately attempts to determine, what factors can steer agglomeration of firms and households to a specific development location, in order to maximise the demand for real estate serving entire urban area development (see section 1.2). It is assumed that agglomeration of both firms and households will increase if the factors that– attract the firms and households to a certain location – can be optimized. The five points of view, discussed and explained in the previous chapters will be translated into the specific context of the Rotterdam Central District.
The different point of views lead to different final pictures that, based on that specific point of view, make it reasonably likely that agglomeration at a specific location will occur. In separate paragraphs, the most important conclusions with regard to the different points of view in this chapter, will be formed into the so-called final images for the RCD. Since these final images are continuously approached from one angle, they each for a radical spatial translation of the theory.

\(^1\) This concerns the density and function mix of the real estate program, the liveability of the neighbourhood and the functioning of the urban network.
8.2 URBAN ECONOMICS

In chapter 3 the formation of agglomerations was discussed from the theory of urban economics, concluding that firms – from an industrial scope - mainly benefit from *urbanisation economies* within the Dutch context (see section 3.3.1 and 3.3.2). Economies as such are on the one hand achieved by sectorial diversity through *producer and consumer services characterised by many small and young firms* (De Groot et al. 2007), *urbanisation economies* are on the other hand the result of the spatial concentration of firms and households in the city and in its surroundings (Brakman et al. 2009), preferably a concentration of like-minded *human capital*.

Besides, the attractive force of cities and agglomerated regions is influenced by several (dis-) economies of scale. In the figure below, a few physical factors have been related to these economies which have been elucidated in chapter 3 (and 4).

Figure 56: Physical requirements that relate to the (dis-) economies

<table>
<thead>
<tr>
<th>Physical requirements</th>
<th>(dis-) economies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial proximity and density of firms</td>
<td>Input sharing, knowledge spillovers, HME, and disadvantages of immobility</td>
</tr>
<tr>
<td>Dense concentration of households located close to firms</td>
<td>Input sharing, labour market pooling, knowledge spillovers, HME, consumption advantages, congestion forces, and disadvantages of immobility</td>
</tr>
<tr>
<td>Urbanisation externalities <em>(variety and (sectorial) diversity)</em></td>
<td>Knowledge spillovers, and consumption advantages</td>
</tr>
<tr>
<td>Good accessibility through hard infrastructure</td>
<td>Infrastructure sharing, HME, and congestion forces</td>
</tr>
<tr>
<td>Soft infrastructure <em>(education, libraries and hospitals)</em></td>
<td>Infrastructure sharing, and consumption advantages</td>
</tr>
</tbody>
</table>

Source: personal interpretation

With regard to *input sharing* cities could try to support spatial proximity of firms or attract a *firme notice* in order to attract other firms and workers. Notwithstanding, firms do not consider the presence of suppliers as important at local scale. *Input sharing* requires a large local market provided by the spatial concentration of residents and other downstream customers (Ottaviano, 2008). It is to a large extent based on the presence of *forward linkages* to a sufficient amount of customers.

*Labour market pooling* requires a sufficient amount of high-educated labourers. Hence the importance for cities to attract inhabitants to supply firms with various knowledge and workers’ skills. The average distance to the surrounding population is therefore of significant importance (De Graaf et al. 2009). Jobs requiring a higher level of education have a lower spatial density than jobs requiring a low level of education (Simpson, 1992). The spatial concentration of workers with different skills and firms with different needs (*urbanisation economies*) increase the likelihood of good matches.

*Knowledge spillovers* are most likely to take place at cluster level and gradually attenuate with the distance from the business centre (Singh, 2010). Besides the
importance of sheer spatial proximity (Krugman, 1991), *knowledge economies* depend on the presence of urbanisation externalities through variety and (sectorial) diversity.

The extent to which *infrastructure sharing* functions as an agglomeration economy depends on the provision of *soft* infrastructure, such as education, libraries, hospitals, theatres and other (semi or quasi-) collective goods as such. Concerning *hard* infrastructure, the value of an office increases with approximately 16% when located within a 500m radius of a railway station (so it is accessible by foot), but diminishes rapidly as it is located further than 1km from the station. For this reason it is recommended that the Postal Tunnel between the platforms and the Post CS building is reopened in order to provide a direct connection from the trains to the heart of the district².

A large population leads to a larger consumer demand and *more love of variety*. The population outlet imposes an important location factor for consumer-oriented firms as these directly benefit from high densities and easily accessible locations. This goes for financial and business services, as well as for ordinary retailers due to the *trickle down effect* (Marlet, 2009). The *home market effect* (HME) occurs as a result of the concentration of employment and is hence constructed of (1) the size and density of firms, and (2) the population density.

Concerning *consumption advantages*, Glaeser et al. (2001) distinguish four fundamental ways for cities to enhance consumption: (1) distinctive goods and services, (2) aesthetic charms, (3) specialised collective goods such as universities and specialised schools, and (4) a high population density to allow more and faster (social) interactions. *Quality of life* does not impose a primary location factor for most firms, whereas infrastructure and labour markets do, although it increasingly becomes more important. Nevertheless, *consumption advantages* contribute to the quality of life of workers, hence firms may be attracted by spatial concentrations of workers which are for their part attracted by consumptive provisions.

Natural advantages mainly consist of *first nature* factors of the landscape (Krugman, 1995), but are not to be influenced as such. Marlet (2009) concludes that *rent seeking* is neither relevant as firms and households are hardly guided by the government in their location choice in the Netherlands.

Concerning the diseconomies it appears that particularly the price and amount of available space are indicated as important location factors for firms. It is important to keep the urban land values low in order to provide affordable office space (favourable lease terms) as well as affordable and large dwellings. This may be achieved by more intensive use of the available land in order to avoid *disadvantages of immobility* to arise. Moreover, offices and dwellings should ideally be located within close range to ensure that *congestion forces* do not occur, which implies high densities and sufficient qualitative infrastructure.

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² Reopening the Postal Tunnel has already been examined by the alderman and the Department of Public Works (Dients Gemeentewerken) in 2005. At least 1,5 million euros would be necessary to make the Postal Tunnel suitable again for slow traffic, which investment was considered too large at that time (Onnink, 2006).
The map above shows a translation of the theory that has just been discussed to a final picture, covering all critical aspects that emerged from the urban economics, incorporated into an urban map. Although the key adjustments appear from the index, the most important adjustments that lay behind this spatial translation, are again summarised in section 8.7.
8.3 LOCATION PREFERENCES OF FIRMS

Modern location theories (land uses, location choices and user preferences) are used in order to lay down the physical location preferences of firms as Krugman’s (1998b) centripetal and centrifugal forces are, to a greater extent than economies and diseconomies of scale, an unsuitable set of geographic factors in a black box which is labelled ‘external effects’ and possibly altering the economic geography but practically unusable for a spatial context.

In the past decades, firms have become footloose as a result of the level playing field (see section 4.1.1), which is further reinforced by the increasing globalisation (Sassen, 2001). Nevertheless it appears that they prefer to settle at highway locations, or within walking distance (250m) of a NS-railway station, a tram- or bus station, as they attach great importance to good car and public transport accessibility and also to sufficient room for parking. Moreover, as a location of business the RCD competes at the highest scale level due to its good accessibility. From the 1990’s onwards, location choices by firms have, according to Pellenbarg (2002), largely been dependent on tertiary factors:
- governmental control on locations;
- knowledge centres and IT-infrastructure;
- level of institutional thickness;
- representative identity of the corporate location;
- quality of the living environment;
- quality and ethos of workers;
- environmental aspects (environmental zoning/contours and sustainability).

Nonetheless, their choice for certain locations can as well be explained on the basis of hard location factors that are mainly related to market accessibility, proximity to outlets and a sufficient pool of nearby workers. The number of jobs within a radius of 1000 meters around the centrally located intercity stations in the 4 largest Dutch cities increased with 17% in the period 1996-2008. As many as 80% of these businesses settled within a radius of 500 meters from the station (Van de Coevering et al. 2009).

In addition, the availability of plots is important concerning the presumed height of land values, which will eventually be discounted in the lease or rental price. Soft location factors relate primarily to the visual appearance of the building and its surroundings as well as the structure of suppliers, their workers’ place of residence and social networks. The most important location factors are listed in section 4.1.1 en 4.1.2 and are once more shown in figure 56:
Figure 57: overview of the most important hard, soft and negative location factors for firms.

<table>
<thead>
<tr>
<th>Negative location factors</th>
<th>Soft location factors</th>
<th>Hard location factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient suitable metres of real estate</td>
<td>Environmental appearance</td>
<td>Accessibility by car</td>
</tr>
<tr>
<td>High rent levels for properties</td>
<td>Exterior appearance of the office</td>
<td>Parking lots</td>
</tr>
<tr>
<td>Mergers or acquisitions</td>
<td>Proximity to workers</td>
<td>Accessibility by public transport</td>
</tr>
<tr>
<td>No access to pools of labourers</td>
<td>Proximity to clients, customers and associates (the HME)</td>
<td>Options for considerable growth</td>
</tr>
<tr>
<td>Lack of urban synergies and mixes of functions</td>
<td></td>
<td>Convenient shops within walking distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visibility</td>
</tr>
</tbody>
</table>

Sources: Richa Singh (2010), NVB (2011)

Amenities, such as retail businesses, serve as a firm basis for the quality of life and are therefore characterised by their large number of visitors compared to their workforce (Van den Hoek, 2009). The retail- and service functions offered will better match the consumers’ economic bases (Gijsbers, 2006) if a location disposes of a high density of consumers, preferably of like preferences (Waldfogel, 2006).

In addition, retailers benefit from good accessibility and availability of a critical mass of retail businesses (Van Leeuwen, 2010). Supermarkets also seem to value the proximity of a parking very much (Stienstra and Bisschops-Severens, 2010).

Spatially, the shopping area should consist of a concentrated combination of a big variety of functions, companies, activities (love of variety), and qualitative and pleasurable public spaces (Gijsbers, 2006) that offer great physical comfort to customers. Furthermore it is important that the shopping centre has a logic embedment in the urban fabric through clear walking and cycling routes. Streets should have a clear starting point at their beginning and some kind of goal at the end (Boekema et al. 1998). Natural routes as such provide for a flow of customers whereas the configuration of streets defines the shape and size of building blocks that should be composed of altering building typologies.

Regarding the shopping typology (see section 4.2), so-called run-shops especially benefit from good accessibility and convenient opening times. Fun-shops on the other hand to a great extent depend on an area’s appeal which is determined by a multifunctional shop supply and pleasuring surroundings (including the design of the public space). All of this has to do with the experience, atmosphere, identity/branding, differentiation (love of variety), as well as the retail mix and combination s with entertainment and leisure. Fun-shopping is the only way of shopping in which synergy-effects between retail and other businesses, such as entertainment, hospitality, leisure and culture come into play.

The RCD is actually a transition zone as it is on the one hand used by office users and (often rushed) rail passengers, while it is also the entrance to the central shopping area of Rotterdam (the Lijnbaan) on the other hand. Shops within the RCD can therefore be considered as a support for the central shopping area, which calls for fun-shopping, but it is because of the large number of travellers also suitable for
run-shopping. At an inner-city location such as the RCD, goal-shopping is neither considered suitable, nor favourable. A study by EIM indicates that the RCD should provide over 50 stores, of which one-quarter should consist of small shops (80-400 m²) and the remaining part of larger retail outlets (400-2800 m²).

The map above again shows a translation of the theory to a final picture, this time covering all critical aspects that emerged to be location preferences for firms. The key adjustments again appear from the index, and the most important adjustments within this spatial translation are again summarised in section 8.7.
8.4 LOCATION PREFERENCES OF HOUSEHOLDS

The synthesis of Part II already provided an enumeration of the 9 major residential preferences. This section will explain how the urban program for the RCD could better connect to these housing preferences, of which a detailed description was given in chapter 5.

8.4.1 Affordability

Increasingly there is a clear preference for inner-city dwellings despite the fact that less expensive housing is provided further from the centre (Marlet, 2009). However, most households appear to be content with smaller living spaces, especially in inner-cities, as they – mainly starters - still primarily reason from the perspective of their own pockets but prefer to live in the downtown. However, the average land quotes in the Netherlands have proven a rise to 34%, which is quite unattractive for the realisation of new urban dwellings as these land prices are usually discounted in housing prices. It is therefore recommended to provide for less stringent land settlement policies and to deal economically with the remaining available lands, especially at inner-city locations, in order to adjust the prices down and able more households to settle at downtown locations.

8.4.2 Accessibility

Concerning the physical environment (land and accessibility), both firms as well as households consider it important that sufficient land, buildings and qualitative infrastructure are available. Differences in residential land values are for generally 25% explained by the accessibility by car, for 6% by the accessibility by public transport and for 2% by the proximity of a railway station.

Based on the criteria set by Bertolini (1999) to determine a location’s node-value, this value has increased enormously for the Rotterdam Central District through the development of (bicycle-) parking facilities, a higher frequency of public transport (trains, metro’s and RandstadRail), as well as a larger number of railway stations that can be reached within 45 minutes.

Although the Rotterdam Central District regionally and nationally provides sufficiently in these aspects, residents also value good accessibility to urban amenities at neighbourhood level. Moreover, Bertolini (1999) also recommends to restore the balance between the node- and the place value. That on the one hand includes increasing the intensity of activities through an increase in the number of residents in the area (within a 3 kilometres range) as well as the number of jobs (in retail, hotels, catering, education, health, distribution, cultural, industrial and administrative services), and on the other hand includes increasing the diversity in the area through seeking for a better mix of functions.

8.4.3 Space

Beside residents’ valuation of extra indoor living space, outdoor spaces (gardens, balconies, terraces, or other outdoor spaces such as courtyards, (common) gardens and yards) as well produce a plus on housing prices, that is (per square meter) three times higher for urban homes compared to rural ones. A balcony or roof garden can be a substitute for a garden, as long as it is large enough to sit outside and offers
sufficient privacy (Boumeester et al. 2009). Boumeester et al. (2009) also call the number of single-person households for who apartments can be built ‘reasonable’.

8.4.4 Variety

Jane Jacobs (1961) reasons that cities with a diverse sectorial structure, especially corporate services, hospitality businesses and retail (urbanisation economies), grow faster than more specialised economies (localisation economies). This reasoning has been proven correct within the Dutch context based on several empirical studies (Van Oort, 2002; Frenken et al. 2004). In line with both findings, Marlet (2009) also argues that instead of specialisation, diversity appears to be a vital economic success factor for growth of the city and increase of employment, whereas sectorial diversity leads to lower unemployment rates (Marlet and van Woerkens, 2010). Traditional economic policies aimed at acquiring firms, are according to Marlet et al. (2008) often not successful in the longer term. In order to develop a dynamic economy it would be more useful to provide diversity and inter-industry spillovers in high density environments. Moreover, city dwellers seem to prefer combining different activities, such as work, leisure and education, in their (direct) living environment.

Jacobs (1961) also points out that neighbourhoods need a mix of buildings that differ in age and state of upkeep. Although no more pre-war dwellings can be found in the Central District as a result of the 1940’s bombings and urban fires, the focus of new housing constructions could be on classically looking typologies (traditional and rustic). Moreover, Boumeester et al. (2009) points out that up to 60% of all Dutch households has indicated to favour traditionally designed buildings. Blijleven (2003) also points out that the construction of retro-districts can increase the attraction value of cities through the association with historical typologies. Early post-war buildings (1940-1970), such as the existing low-rise blocks at the Delftssestraat, have a negative impact on the valuation of the liveability in neighbourhoods (Leidelmeijer et al. 2008). Besides that reason, the existing buildings in the Delftssestraat might as well better be demolished because of the low architectural quality.

Nonetheless, historicity does not count for intangible aspects, such as retro-buildings and a city’s skyline, which have shown to be important as well. It is in this sense especially important to ensure good architecture as a larger presence of National Monuments can for example result in an 8% increase in the costs of land. Whereas high-rises and flats have proven to negatively affect the liveability of neighbourhoods, student housing appears to have no negative impact on the liveability. From the perspective of urban households, the addition of more residential towers in the district is not recommended. Yet some buildings, such as the backside of the Unilever-building, may be replaced by apartments in order to provide more housing.

8.4.5 Amenities

Glaeser et al. (2001) and Florida (2002) conclude that diversity and variety, as set out above, go hand in hand with urban attractiveness. Following similar studies (Marlet, 2009; Glaeser, 2011) the EDBR (2012) also concludes that it is of great importance to preserve the cultural facilities in Rotterdam and further develop them for their economic function and in order to attract new residents. Gotham
points to the fact that a lively street-level culture is more important than traditional theatres and operas. Although Gotham is referring to a small, alternative music scenes in for example industrial buildings, cafes and jazz clubs or basements, a kind of music venue may be planned in the Central District (2.000-5.000 m² LFA). Although only 19% of urban households says to attach importance to the proximity of a theatre (Boumeester et al. 2009), they are according to Marlet (2009) nevertheless willing to pay more for their dwellings because of the optional use of cultural supplies.

Although the importance of historicity was pointed out in the previous section, Rotterdam in comparison to other Dutch cities, except for the low concentration of historic buildings, mainly shows to drop a few mirror stitches on the proximity of culture, cafes and restaurants. Restaurants and cafes are preferably small scale, high-quality, and diverse in their offerings and also largely available. A sufficient culinary supply is preferably located within walking distance of dwellings and offers an explanation for a 2% increase in land values (De Groot et al. 2010). The design and character of the public space should best interconnect with hospitality businesses as such (Kotkin, 2006) and match with the climate to provide for streetlife and vibrancy during all seasons.

Like many other cities, Rotterdam is also has a higher number of violent crimes per capita compared to rural areas, although this is often offset by the previously described urban attractions. Nevertheless, the more violent crimes, the less popular a city is for residential consumers, and the lower prices for dwellings appear to be (Marlet, 2009). In addition to the counterbalance offered by urban attractions, both the objective (registered) and subjective (perceptible) safety may be improved through physical and social policies (Marlet and van Woerkens, 2010):

- Sale of social housing and new constructions in the private rent or buyers market (with the aim of changing demographics);
- Quality impulses to the public space (‘clean, undamaged and safe’);

Finally it appears that up to 42% of urban households indicates to attach importance to the proximity of a school (Boumeester et al. 2009). In addition Van den Broek and De Jong (2007) point out that childcare may be an interesting addition in mixed residential and working environments. In general, multiple studies (Leidelmeijer et al. 2008; BCI, 2010) show that educational facilities (within 500 meters distance) contribute to the sense of a favourable location for families with children.

8.4.6 Shops

A station area like the Central District which is on the one hand characterised by inner-city visitors, and on the other hand by travellers and workers should provide for a combination of run-shopping en fun-shopping. Given the municipal intention to increase the housing density in the centre of Rotterdam, it should be taken into account that approximately 80-82% of the urban households indicates to value the proximity of shops for daily groceries as well as quality products. Small retail services, such as local bakeries, butchers, small supermarkets and a bank office, provide for social control as they are strongly consumer-oriented. Small, everyday amenities as such are preferably located close to the residents (within 250m, or at most within 500m), or located in the main shopping centre at an acceptable walking distance to a parking, which is at approximately 350m maximum (Stienstra and Bisschops-Severens, 2010).
In addition to daily shops, the focus can also be on attracting luxury shops, as the price of land increases up to 11% in neighbourhoods that provide better access to shops as such (De Groot et al. 2010). Fashionable luxury shops are, for example, literary amenities (libraries and fancy bookstores), refined provisions (organic markets and sushi bars), and high-culture (hip art and design galleries and antiques’ auctions). Generally these shops settle at downtown locations as these locations are best accessible and hence provide the largest threshold, which may offer opportunities for the Central District.

Two different categories of shopping areas can be distinguished based on their location pattern (Van Nes, 2011). The first group relates to the linear pattern of shops, located in the traditional urban street grid. Within the context of the Central District, a linear pattern of shops is possible at the Poortstraat and the Delftseplein, connecting Rotterdam Central Station to the Lijnbaan.

The second group is defined according to a cluster pattern. Independent of their scale, these areas tend to provide an open square with some benches for urban activities. Shops in areas as such are sometimes large-scale, indoor and mostly car-based. A clustered shopping pattern as such may partly be possible around the Delftseplein and partly in the new Schiekadeblok. For the urban dynamics it is important however, that shoppers are walking in the streets instead of drawn inwards by large-scale indoor malls.

8.4.7 Nature

The supply of well-maintained public parks and water over a distance of 500 meters has a positive effect on land values (Rouwendal and Van der Straaten, 2008) and contribute to the liveability of an area, whereas squares appeared to play a remarkably smaller role (Leidelmeijer and Schulenberg, 2010).

The fact that Rotterdam scores low in rankings on its natural environment is something almost all urban areas deal with and is besides hardly affectable. Nevertheless, more of the hinterland would be preserved if Rotterdam would continue to densify more within its current city limits.

8.4.8 Private housing

In the period 1996-2008, the housing stock around central intercity stations in the Netherlands has on average increase by 11%. Only 19% of this increase was situated within a 500 meters radius (Van de Coevering et al. 2009), which is probably explained by the fact that only non-residential functions are statutory allowed to shield the tracks (a basic rule which also runs through the Plan-MER for Rotterdam Central District3).

The fact that it is important that residents can identify themselves with the social climate of their new living environment was already highlighted in chapter 5. The proportion of social housing interrelates strongly negative at neighbourhood-level with housing values (Marlet, 2009). The percentage of social housing within 50 meters of other housing typologies interrelates strongly negative with the

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3 Additional legal requirements apply for new housing within a radius of 30 meters from railway tracks due to the carriage of dangerous goods. Building meant for elderly, sick persons or children (for instance childcare facilities or hospitals) may not even be built within a radius of 140 meters from the Central Station.
perception of the neighbourhood and the valuation of the liveability. An ideal neighbourhood composition therefore seems to exist if the majority of residents (>75%) consists of owner occupiers (Leidelmeijer et al. 2008). Nevertheless the NVB (2010) points out that the starters segment offers the best opportunities, especially in inner-cities. Within this segment, most interest appears to exist for rental apartments (in flats or in porch houses) and participation in alternative housing arrangements such as dwellings for overhauling (kluswoningen), patio houses and community housing.

8.4.9 Human capital
According to Cortright (2005), most economic development policies have essentially ignored the issue of attracting privileged people (Cortright, 2005). Many urban renewal projects indeed explicitly pursue heterogeneous (differentiated) socioeconomic compositions of the population, whereas this often has a negative effect on the general social cohesion and hence liveability of neighbourhoods. The main focus of the development of the RCD should therefore be on attracting households, in order to attract businesses as well. As indicated earlier, the city of Rotterdam could start with encouraging market parties to provide more accommodations for students in the inner-city in order to maintain students in the age-group of 25-30 (graduates) that are currently living in the city.

A study among high educated starters (such as graduates) indicated work being an important reason to move (Hoefnagel, 2011) and its availability being an important aspect for their location choice (Marlet, 2009). Besides the presence of work and a safe environment, vividness (the possibility to combine activities through a highly diverse supply of facilities, public meeting and recreational places, cultural activities and the presence of work) scores highest in the valuation of the living environment (Hoefnagel, 2011). The availability of performing arts, as well as cafes, the percentage of pre-war and single-family dwellings, and the proximity of nature, explains why a larger amount of the creative class is living in certain cities compared to others (Marlet and Poort, 2005). High educated starters as well predominantly act hedonistic in their location choice, but generally seem to prefer inner-city living environments in a vibrant downtown with some kind of high density and presence of a sufficient amount of urban attractions, which the creative class also appears to be looking for.

In spatial terms, denser cities are especially for starters possibly nicer to live in than less dense cities (Albouy, 2008). Moreover, it appears that more opportunities for face-to-face contacts are offered in dense cities, which are therefore considered to be an ideal ‘pool’ for human capital accumulation (Jacobs, 1969). It is therefore not surprising that high educated people appear to be more productive in large and densely populated cities. The likelihood for urban professionals to meet in cafes, restaurants and cultural institutions is after all larger in densely populated areas (Jacobs, 1984).

In line with the above, new dwellings at expansion sites appear negatively related to the attraction of highly educated people, whereas recent construction developments generally lead to a significant increase in the share of highly educated people (Marlet and Van Woerkens, 2010). In terms of housing typologies, approximately 60% of the starters indicates to prefer rented apartments. Rotterdam should therefore in the Central District focus on attracting young starters by means
of relatively small and affordable, yet high-quality apartments and by adjusting the norms for parking downwards, as long as bicycle sheds are provided instead. In addition, test-plots may be issued for Joint Private Commissioning (Collectief Particulier Opdrachtgeverschap: CPO⁴) as no less than 20% of the highly educated appears willing to pay extra for control during the construction of their dwellings (VROM and CBS, 2009). Since no city can be 100% sure about the housing preferences of potential future households, residents may be provided the opportunity to build their own dwellings in the inner-city in order to establish a feeling of commitment to Rotterdam among urban dwellers. This implies that the municipality should dare to lower the guard in their urban planning policies.

The map above again shows a translation of the theory to a final picture, this time covering all critical aspects that emerged to be location preferences for households. The key adjustments will again appear from the index, although the most important adjustments within this spatial translation are again summarised in section 8.7.

⁴ CPO is, just like intentional communities and Baugrüppen, a bottom-up planning concept wherein groups of people – supported by professionals – are jointly responsible for the development of their residential and living environment.
8.5 IMPLICATIONS FROM A MARKET-APPROACH

The formation of agglomerations, as well as cluster formation, is the result of an increasing demand for real estate which is at a certain location as well supplied for to a sufficient extent, during a certain period of time. In order to retrieve why agglomeration occurs at specific locations, Part II appointed the concealed reasons behind the demand for real estate.

In section 6.1.1, two frameworks have been provided, based on theoretical descriptions, that brought urban area developments into the picture as an organisational and development process. In view of the previous sections, the emphasis within the frameworks mainly lies on the basis of the triangles (spatial plan: process vs. product). After all, the spatial plan often constitutes the starting point of an urban area development, as support and means are necessary, but usually not directly give rise to an urban area development.

Nevertheless, urban area developments only commence if there is demand from the market or means available in the market, hence this thesis takes the financial plan and the support into account. As it was briefly explained in section 6.3.4, the current financial crises have much influence on the real estate market and therefore on urban area developments. This section will therefore relate the spatial plan to the financial plan as well as the stakeholders (the support) within the practice of the Rotterdam Central District.

8.5.1 INFLUENCE OF THE STAGNATED REAL ESTATE MARKET ON THE RCD

The first urban plan for the area surrounding the Central Station, as well as the preliminary draft of the zoning and environmental impact assessment (EIA) originated in 2005. Following these plans, the market was consulted before July 2007, which led to the expectations of uninhibited growth and demand for real estate properties (see section 2.2.12) until November 2009. From August 2007 the global exchange rates were coloured red in such an excessive way that contingency plans, capital injections and cuts on interest rates were necessary. Following these developments, the real estate market slipped into a deep crisis that still continues to endure today. The justification of the RCD plans are thus, despite the now detailed spatial development and business lobby of the association of the RCS, incomplete and above all, obsolete. The current contract agreements between the municipality and the developers are no longer competitive, given the price of the land was based on an extensive real estate program for which currently, is little demand.

The crisis turned out to be an unforeseen circumstance, for which the plans for the RCD were not equipped, this has led to the following problems:

Bathtub

Although large expenditures have been made for the public transport terminal and related facilities (such as the metro and bus station, the cycle shed, the Kruisplein – garage and the public space), the main point of land exploitation is currently on the issuances of 2 municipal locations (Conradstraat and Delftsestraat). It is expected that the land exploitations will be collected at the end of the exploitation period (2009-2022). Apart from the uncertainty on the expected valuations of land that will be paid, a so-called “bathtub” in the cash flow has occurred.

Leasehold
As was indicated in the *Ontwerp Structuurvisie* dated from November 2009, it was assumed that due to “economic progress” the RCD would be realized within 10 to 15 years. The municipality wanted to stimulate phasing by the issuance of land. However, in July 2009 the municipality of Rotterdam already bought back the land of the Schiekadeblok for €52,000,000 from the developer LSI and placed a canon requirement of 4% that would annually be increased by the CPI of households (average annual increase of 1.5%). With Maarsen Groep en MAB – the developers of the Weenapoint – have reached similar anterior agreements of €23 million to ensure the financial practicability. Although the municipality has raised itself as a lifebuoy in the recent years, the large amount of office space in which these developers should foresee, form a conflicting interest for the issuance of municipal locations. Due to the leasehold structure, the municipality has become dependent on a handful of market players. Because the market barely recovered and the developers are still vulnerable, the financial risks of the municipality are now going through the roof. Given that the municipality can not let the developers down, the municipality and the developers will have to jointly readjust the plans in an achievable and moreover, a realistic plan that on the one hand can stimulate demand and on the other hand continues to stimulate the supply.

### 8.5.2 FLEXIBILITY IN THE ZONING PLAN

Chapter 6 pointed out that the authorities in general have a pivotal role within the processes of urban area development, they have the connections to “het Rijk” and any grants to be awarded and the approval of plans. On the other hand, municipalities often have a financial interest (sales of land cover the costs of infrastructure, public space and even cover wholes in the municipal budget that are unrelated to urban area development) through the issuance of land and they should therefore, based on their social responsibility intend a result that profits the city.

Peek and Louw (2006) already indicated that a large share of one particular property segment subsequently makes the execution of the total programme largely dependent on the dynamics of that real estate segment. There primarily appears to be a preference for commercial functions in station areas, making such areas become quickly dependent on the commercial real estate market, due to which its multifunctionality is also threatened. The changing environmental factors that were discussed previously, however, demand plans that are adaptable and manoeuvrable, so that when changes in the market occur the development process can anticipate on these changes. Increasing the number of, and allowing the development opportunities within the zoning, could lead to a better utilization of the possibilities and momentum of places and those involved (support). Moreover, research showed (PBL, 2010b) that more mixed environment and a flexible approach to zoning, can lead to innovative combinations of mixed spatial use and can have a positive impact on both the financial aspects and the social aspects in the urban area development.

Although flexible urban area developments are often regarded risky, the blueprint approach also brings many risks as it is based on speculation. Knowledge about the expected demand for real estate objects is, given the duration of many urban area developments, largely on assumptions which makes the outcomes uncertain. Since
the consequences of the crises were not foreseen, the zoning for municipalities is even less often an assurance on social benefits. The zoning, accompanied by a few rigid exploitation agreements, leaves little room for changes in the environmental conditions. This could lead to developments for which there is no demand, reduced spatial quality, unwanted financial impact or unemployed opportunities. Some developments will never start, others ran into conflicts between the various parties involved, which also occurred in the RCD.

In section 6.2.2 it was indicated that the pivotal role of the municipality has led to a (dominant) top-down plan and controlling culture, in which especially in the preliminary phases of the urban area development, illusions of security are offered to market players based on the blueprint approach. For both the municipalities and developers however, there is a need for strategic focus on the increase in value of both living- and work-environment, given that the number of issuances of land has decreased and currently the real estate market is driven by demand. On the one hand, urban area developments should therefore be more flexible in design to allow a larger number of developers and a wider range of projects that can be considered. On the other hand, municipalities should be involved during a longer time span and investors should be involved earlier in the process (chain integration) in favour of the developers, in order to maintain a competitive development program and to spread the costs of financing.

The following recommendations are therefore made from a market approach regarding the support and the financial plan:

**Support;**

Besides an established building program, the target groups and segmentation often predetermined in agreements that are hardly flexible. By increasing the flexibility, more actors in the process can be involved, more opportunities are offered to secure the cash flow, there is a smaller risk and financing an investment agreements will be easier to form. The municipalities could provide organizational support and can pursue a certain policy (increasing the facilitation of initiatives in stead of fixing plans) and limit the number of licenses.

**Financial plan;**

With the reduction in demand for real estate, the financing of real estate projects has increased in complexity. In the current market, banks seem willing to finance real estate projects only when there is certainty regarding the prospective tenant (usually requires 70% of pre-rental). At the moment, for each plot within the RCD both the size and the function are fixed.

Despite limited financial resources, available to the developers in the current market, they are still responsible for funding both the costs of the land and the real estate development in most cases. Especially the large purchases of land play a crucial role in the cash flow of urban area developments, as they have to be made early on in the project, without the outlook of a fast return. For developers it would be more favourable to pay for the land at a later moment in time, for example, once the construction of the project has started, in phases during the construction period or perhaps even only after the sale of the realized property.
The map above again shows a translation of the theory to a final picture, this time covering all critical aspects that emerged to be location preferences for households. The key adjustments will again appear from the index, although the most important adjustments within this spatial translation are again summarised in section 8.7.
8.6 QUANTITATIVE ASSUMPTIONS

Besides the risk of station areas to become largely dependent one particular real estate segment – as indicated by Peek and Louw (2006) in section 8.5.2 – there is also the risk of transforming into an anonymous area surrounding the station if the node-value of the station prevails in a global grid. If the four disciplinary approaches to (re-) developments of railway station areas (see section 7.6), as described by Peek and Louw (2006), are subsequently fed back to the perspective of the urban economic theories, station areas that take a central place in the urban network (referred to in figure 55 as number 4) provide the best opportunities for higher densities and lively centres due to the many transit abilities that enlarge the catchment area (Peek and Louw, 2006).

Besides high-quality infrastructure, supported by parking, bicycle sheds, and transit possibilities over ground level, it is also important that an area physically connects to the finer-grained fabric of the urban network and spaces. Furthermore a location should, besides peak hours, also remain attractive in off-peak hours as meeting or residence place, which asks for programmatic flexibility in order to deal with the dynamics of use (Peek and Louw, 2006).

The quantitative assumptions regarding Rotterdam Central District will be based on the conceptual framework that was provided in chapter 7 and was based on the concepts, inherent causes, and indicators as shown below.

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Inherent causes</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>Network (permeability)</td>
<td>Space Syntax</td>
</tr>
<tr>
<td>Functionality</td>
<td>Function mix and density</td>
<td>MXI and FSI</td>
</tr>
<tr>
<td>Liveability</td>
<td>Social (46%) and spatial (54%) indicators</td>
<td>LBM</td>
</tr>
</tbody>
</table>

Source: personal interpretation

Based on knowledge regarding the above indicators, indicative physical adaptations can be proposed when comparing it to the program that is proposed in the existing urban plan. The emphasis of this comparison will be on the function mix (MXI), density (FSI), network (Space Syntax) and liveability (LBM) in the Rotterdam Central District, although the district will also be compared on a larger scale with (surrounding) neighbourhoods. This includes the use of some functional cross sections running through 22 Rotterdam neighbourhoods, which are shown on the next page in figure 59.
8.6.1 Liveability

An important advantage of building in the city, namely higher profits, is quite small in case of Rotterdam compared to other cities. Despite the fact that Rotterdam has a number of potentially valuable inner-city plots left, its value is reduced due to the present liveability issues. For years, the living environment and prosperity of the population have been a weakness of the city. Concerning the living environment, Rotterdam performs well in terms of education and medical care, but less in terms of culture and hospitality businesses (OBR, 2011). Although a lot of economic activity goes on in Rotterdam (mainly production and distribution instead of knowledge/innovation or information), the quality of life and personal wealth of its citizens stays behind at the same time (OBR, 2011).

The centre of Rotterdam scores a 5.5 out of 10 on the safety-index (2010) and between 2 and 3 on the Leefbaarometer (2010), which seems to be a weak point given the ambitious masterplan⁵. The figures on the next page show the development of the liveability as a percentage (0 = 0%; 7 = 100%). In addition, the density (FSI) and function mix (MXI) are also shown as a percentage, with a FSI of 100% indicating the highest density in Rotterdam and a MXI of 100% indicating an entirely residential neighbourhood. As shown, the density and function mix have an inverse relationship: at higher densities, the surface of amenities and offices in an area increases with respect to total surface of dwellings, and vice versa. Although

⁵ By way of comparison, the Zuidas scores a 7.3 on the safety index and between 4 and 5 on the Leefbaarometer (2010).
the density clearly increases towards the centre, the function mix in the RCD drops to 14% due to the enormous amount of offices.

Finally, the liveability of the city centre fluctuates around the average where the northern side of the river New Meuse has a significantly higher score than the southern side. The eastern neighbourhoods also perform considerably better than the neighbourhoods in the west of the city.

**Figure 60: north-south and east-west sections of the FSI, LBM and MXI through Rotterdam**

![Graph showing FSI, LBM, and MXI through Rotterdam](image)

Sources: COS (2011), Buurtmonitor.nl.

Regarding the liveability it was demonstrated in chapter 7 that there is no significant correlation between the Leefbarometer (LBM) and the indicators of density (FSI) and function mix (MXI). Nevertheless, there appeared to be a significant correlation between some LBM-domains and the function mix and density of neighbourhoods, which again is summarised in the figure below.

**Figure 61: Correlation of the LBM-domains to the FSI and MXI**

<table>
<thead>
<tr>
<th>LBM-domains</th>
<th>FSI</th>
<th>MXI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing stock</td>
<td>0.609</td>
<td>0.043*</td>
</tr>
<tr>
<td>Safety</td>
<td>0.002**</td>
<td>0.008**</td>
</tr>
<tr>
<td>Public space</td>
<td>0.111</td>
<td>0.198</td>
</tr>
<tr>
<td>Public facilities</td>
<td>0.000**</td>
<td>0.320</td>
</tr>
<tr>
<td>Composition of the population</td>
<td>0.811</td>
<td>0.005*</td>
</tr>
<tr>
<td>Social cohesion</td>
<td>0.009**</td>
<td>0.032*</td>
</tr>
</tbody>
</table>

* = Correlation is significant at the 0.05 level  
** = Correlation is significant at the 0.01 level

Source: calculation using IBM SPSS Statistics version 19
From the figure on the previous page it appears that the LBM-domains have no negative correlation with respect to the FSI or MXI, which in accordance with the 44 examined areas means that both a higher density as well as more mix in functions leads to a higher liveability-score$^6$.

8.6.2 Functionality
Rotterdam is frequently characterised as a “city with lopsided proportions”, alluding to the imbalances in the city’s mix of functions that will be explained in this section. Based on an analysis of a number of neighbourhoods in Amsterdam, Joost van den Hoek (2009) argues that “a balanced mix of housing, working and amenities is only found in centrally located areas with small grains and high density”. Based on both densities as well as function mixes, this section will examine to what extent the RCD should typologically be considered as part of the inner-city. For this purpose, data from 22 neighbourhoods in Rotterdam that are located on the north-south and east-west cross sections will be used, which are shown in figure 59 on page 8.6.

8.6.3 Urban typologies based on the MXI and FSI
Using the twofold MXI-method, Joost van den Hoek (2009) clarifies the densities corresponding to different urban typologies based on their MXI. The relationship between the MXI and FSI shows that functions in areas with higher densities contain an MXI closer to 50 (a 50/50 division of housing and work). In addition, three main typologies appear, consistent with the thresholds of Jacobs (1961) and Lozano (1990), to support a wide variety of facilities and activities and ensure a lively urban area: the business district, the metropolitan downtown and the late 19th century district.

$^6$ The average density (FSI) of the 44 neighbourhoods was 0.71 and the average function mix (MXI) was 65%.
Figure 62 above shows for 9 location typologies the MXI and FSI that they roughly correspond to according to Van den Hoek (2008). In addition, the 22 neighbourhoods of Rotterdam are included in the figure, demonstrating that the majority of neighbourhoods concerns suburban to modernist city extensions. The neighbourhoods of Cool, Kop van Zuid, and especially the Stadsdriehoek (Inner-City Triangle) are clearly more downtown as these lie more centrally in the figure. Remarkable is the function mix within the C.S. Kwartier (Central Station Quarters), as its MXI is widely divergent compared to the other neighbourhoods. The relative amount of office space will according to the existing plans for the RCD decrease to 64% of the total amount of square meters. The planned addition of over 132.000m² of amenities results in a new MXI-ratio of 11/64/25.

As a result of this the (twofold) MXI will slightly increase from 9 to 12, which is mainly due to a larger increase in the surface-amount of amenities and dwellings compared to the final amount of square meters of offices (see also Appendix xx). The RCD will gradually transform to an area with a similar MXI-ratio as Cool with realisation of the planned programme (see the right triangle in 63).
8.6.4 Functional typologies based on the MXI

If the MXI is shown according to the threefold-method as a percentage ratio, then the RCD should (just like the other inner-city neighbourhoods) lie within the borders of the historical city centre. Yet also according to the threefold-method the RCD is located differently in figure 63, which is due to over-representation of the number of firms and businesses and under-representation of the number of amenities and dwellings. Besides, the figure shows that other downtown neighbourhoods also have a lack of amenities and a dispose of relatively many businesses and firms.

Figure 63: functional typologies

| For the historical city centre (as indicated in the right triangle): |
|---|---|---|
| Minimum | 20 % | 10 % | 40 % |
| Maximum | 40 % | 30 % | 60 % |


The abovementioned percentages for the historical city centre are confirmed by the proportions that were found for the high central and high dense zones in Amsterdam. For the historical city centre of Amsterdam, the mix-balances were averaged at: MXI = 29/20/51 (housing/working/amenities).

Currently, the RCD (as part of the C.S. Kwartier) has a ratio of 9/70/21 (see Appendix xx), whereas in figure xx the distribution of functions that relates to the historical city centre indicates a distribution of 30/20/50. Because of the small number of amenities, the RCD can apparently be labelled bifunctional, yet insufficient dwellings are present in the area to label it mixed use. Given the MXI-ratio, the district typologically lies between a postwar office park and a ring environment.

8.6.5 MXI and FSI Sections

Finally, the “lopsided proportions” that the introduction referred to are examined using the cross-sections through the city of Rotterdam (see figure 59). The sections are based on the current situation of the C.S. Kwartier (of which the RCD is a part) relative to the current situation of the surrounding neighbourhoods.
Regarding the cross-sections, it is remarkable that the centre has a high density with an average LBM-score. Both the north-south as well as the west-east section show that the density (FSI) increases in business areas (MXI= 0-40) and then decreases again in the suburbs at the city edges.

In addition, the suburbs mainly appear to have a residential function (MXI>80), the centre as a whole appears to function mainly for businesses (MXI<30), with the exception of the Stadsdriehoek that appears to be mixed (MXI= 0.51). Only 32,000 inhabitants actually live in the city centre against 80,000 jobs, equating to roughly 5.2% of the total population of Rotterdam. In a (residential) city like Amsterdam, over 10% of the population lives in the city centre, with a ratio of one to one between the number of jobs and inhabitants (both about 80,000).

Figure 64: relative distribution of the functions along the sections north-south (top) and west-east (bottom).

The centre of Rotterdam has about 32,000 inhabitants, against a total of 617,000 inhabitants for the entire city. Amsterdam has approximately 783,000 inhabitants in total, of which 79,000 live in its centre (CBS, 2012).
The FSI within the RCD increases according to the proposed plans from 2.09 to 3.84. This almost amounts to a doubling of the floor surfaces and neatly fits within the thresholds set by Jacobs (1961) and Lozano (1990) (see section 7.3.2). Nevertheless, their doctrines are based on housing densities, whereby Lozano (1990) sets a lower limit at 130 dwellings per hectare, whereas only 34 dwellings per hectare are planned in the RCD. Thus the intention should not be to further densify the district, as this is already substantially done in the existing plans, but instead focus on more dwellings and larger concentrations of people. Moreover increasing the density is not recommended as the (twofold) function mix is generally lower at higher densities and a higher density does not imply a higher liveability.

8.6.6 Network

Given that Space Syntax is able to predict effects of urban interventions on certain types of economic processes (Van Nes, 2011), as mentioned in section 7.2.2, this section will, on the basis of a number of variants in UCL Depthmap, determine whether higher integration values can be achieved through adjusting the network. This analysis is based on the plan for the RCD (named current situation) as designed by Maxwan in 2007.

The previous chapter already indicated that adjustments to the physical structure can positively influence socio-economic processes. Especially the position of the RCD as an economic centre seems vital since both the possibilities to build houses as well as firm plans to do so are limited. As mentioned before, economic centres generally meet 4 characteristics:

1. A high global integration of axial lines in the street grid (R=n).
2. A high integration in the local angular analysis (R=3);
3. A high integration with a low metrical radius (R=3); and
4. A high integration with a high metrical radius (R=29).

Generally it can be stated that especially the local angular integration with a low metrical radius (R=3) is very important, as well as the global integration values. A higher integration in the local angular analysis indicates better pedestrian routes, which is important for retailers as the area is expected to attract over 200,000 visitors daily in 2020.

The analyses of the variants will therefore look at the local scale (local angular analysis R=3) to analyse the connection of the district to the surrounding neighbourhoods. In addition, only the global scale (global axial integration R=n) is analysed in order to determine whether the district is well accessible from the main roads.

1. First set of variants

By induction of the historic street pattern, the location of the former railway station at Hofplein – despite the newly built city centre and the new railway station – is clearly traceable in the Space Syntax maps. Apparently, the urban network is still largely pointed at the ever so important square and station of Hofplein, which provides a logical reason to investigate a number of street-connection in the
For this reason, the first analysis examines a set of variants that connects the RCD to the Couwenburg (in the east) and the Hofbogen-complex (in the northeast).

**Variant 1a:** A simple, curved variant of the ‘Luchtsingel’-connection from the (new) Schiestraat in the RCD, via the Schiekade (where a single staircase will be located), to the Heer Bokelweg (on the Hofbogen);

**Variant 1b:** The ‘Luchtsingel’-connection from the (new) Schiestraat, via the Schiekade (where a single staircase will be located), to the two-junction at the Couwenburg at which a route again veers towards the Heer Bokelweg and another route continues towards the Haagseveer;

**Variant 1c:** It is remarkable that the unattractive plinth at the south side of the Delftsestraat remains unchanged in the plans for the Schiekadeblok. For this reason this variant investigates the effect on the network if the Delftsestraat would be closed at both ends in combination with the new connections that were proposed in variant 1b.

---

Figure 65: map of the first set of variants
The changes in the integration values are given in percentages relative to the urban plan of Maxwan (the current situation). On the basis of this comparison, the variations can also be compared with each other, which is clarified in the table below using colour gradient.

From the percentages it appears that especially the expanded version of the ‘Luchtsingel’-connection leads to more than 11% increase of the integration values. Local integration values especially increase along the Delftseplein and the Nieuwe Delftsestraat, that both lie in the extension of this connection. Although global integration values barely increase (except for the Nieuwe Delftsestraat), closing down the Delftsestraat causes the largest increase. Closing down the Delftsestraat yet has little effect on the local integration values in comparison with the variants 1a and 1b.

### 2. Second and third set of variants

For the second analysis, two sets of variants are examined, with the first set examining the effect of a connection between the Provenierswijk (north) and the Lijnbaan (south). The variants 3a and 3b examine the effect of two compound variants. Again, the changes of the integration values are given as a percentage relative to the urban plan by Maxwan.

##### Variant 2a:
A simple connection between the Delftseplein (in the RCD) and the Molenvierweg as well as the Zuster Hennekeplein (both located in the Provenierswijk) through constructing a tunnel underneath the railway tracks;

##### Variant 2b:
An extended connection between the Provenierswijk, the RCD and the city centre through construction of an S-shaped bridge between...
the Van der Sluysstraat and the Molenwaterweg (crossing a canal), a tunnel underneath the railway tracks between the Molenwaterweg/Zuster Hennekeplein and the Delftseplein, and finally a better connection between the Poortstraat and the Weena-Zuid/Lijnbaan.

**Variant 3a:** A combination of variant 1b and 2b;

**Variant 3b:** A combination of variant 1c and 2b.

Figure 67: map of the second and third set of variants

Figure 68: proportionate changes of the integration values for the second and third set of variants in percentages.

<table>
<thead>
<tr>
<th>Global integration</th>
<th>Current situation</th>
<th>Variant 1a</th>
<th>Variant 1b</th>
<th>Variant 1c</th>
<th>Variant 2a</th>
<th>Variant 2b</th>
<th>Variant 3a</th>
<th>Variant 3b</th>
</tr>
</thead>
<tbody>
<tr>
<td> </td>
<td> </td>
<td>0.624903</td>
<td>0.625029</td>
<td>0.625085</td>
<td>0.625043</td>
<td>0.624999</td>
<td>0.626295</td>
<td>0.626473</td>
</tr>
<tr>
<td> </td>
<td>[%]</td>
<td>100.09%</td>
<td>100.02%</td>
<td>100.03%</td>
<td>100.02%</td>
<td>100.02%</td>
<td>100.03%</td>
<td>100.09%</td>
</tr>
<tr>
<td> </td>
<td> </td>
<td>0.628162</td>
<td>0.629239</td>
<td>0.629294</td>
<td>0.629349</td>
<td>0.628202</td>
<td>0.628432</td>
<td>0.628394</td>
</tr>
<tr>
<td> </td>
<td>[%]</td>
<td>100.09%</td>
<td>100.02%</td>
<td>100.03%</td>
<td>100.02%</td>
<td>98.43%</td>
<td>100.02%</td>
<td>100.04%</td>
</tr>
<tr>
<td> </td>
<td> </td>
<td>0.678183</td>
<td>0.679172</td>
<td>0.679197</td>
<td>0.679214</td>
<td>0.678184</td>
<td>0.678197</td>
<td>0.678212</td>
</tr>
<tr>
<td> </td>
<td>[%]</td>
<td>100.09%</td>
<td>100.02%</td>
<td>100.03%</td>
<td>100.02%</td>
<td>100.01%</td>
<td>100.02%</td>
<td>100.05%</td>
</tr>
<tr>
<td> </td>
<td> </td>
<td>0.65193</td>
<td>0.653066</td>
<td>0.653111</td>
<td>0.653166</td>
<td>0.651918</td>
<td>0.652066</td>
<td>0.652246</td>
</tr>
<tr>
<td> </td>
<td>[%]</td>
<td>100.09%</td>
<td>100.03%</td>
<td>100.02%</td>
<td>100.02%</td>
<td>100.01%</td>
<td>100.02%</td>
<td>100.05%</td>
</tr>
</tbody>
</table>

**Average increase in%:** 0.00% 0.23% 0.24% 0.26% 0.26% 0.06% 0.30% 0.30%

Source: personal calculation
Variant 2a shows that a tunnel under the railway to the Provenierswijk has less effect on the local integration values that the simplest version of the ‘Luchtsingel’. However, this changes if the variant would be expanded with a small bridge and a better connection to the Lijnbaan (variant 2b). The above figure clearly shows that a very good north-south route is created that way, virtually connecting the Lijnbaan through the RCD to the Provenierswijk. That way, especially the Delftsestraat is better integrated into the network and offers more potential to develop it into a shopping street.

The overall integration of the Delftsestraat is also improved significantly, although this on the one hand seems to be at the expense of the Proveniersplein (where another tunnel connection is situated) and other integration values remain stable on the other hand.

Finally the effect of a combination between 2b and variants 1b and 1c is examined, as these generate the greatest improvement to the network. For both variants this combination leads to the greatest increase in global integration values so far. Given the integration values, the Nieuwe Delftsestraat will get more of the character of a main street on a global scale.

Closing down the Delftsestraat in variant 3b leads to a lower average increase in local integration values compared to variant 3a. Nevertheless, the remaining local integration value is substantially equal (the difference in average values is mainly caused by the absence of the Delftsestraat in the set), hence variant 3b is considered as the most favourable variant. After all, variant 3b offers the opportunity to put the (almost) lifeless backsides of both Weenaflats out of sight through establishing new buildings at both ends of the street. This will generate additional land revenues and transforms the southern part of the Schiekadeblok to a so-called perimeter block (see section 4.2.1) with the ability to supply goods through the inner courtyard.

8.6.7 Concluding remarks

Given the low score of the city-centre of Rotterdam on the safety-index and the strong correlation between the MXI and the safety-domain as well as the significant correlation with the Leefbaarometer as a whole (see figure 53 in section 7.4.7), an increase of the MXI (by adding more dwellings) appears to offer a starting point to increase the liveability-score (safety has a 19%-weighting) as well as the score on the safety-index at the same time. The valuation of the public space appears not to be affected despite a positive correlation between a higher density and function mix to most LBM-domains. Spatial adjustments appear to be required in order to make more gains on this domain as well, for instance through extending the green and blue character of the Westersingel in the direction of the Delftseplein.

Despite the Vitality Web (Vitaliteitsweb) by Bureau Louter (2010) which indicates that there is no great pressure on the available space in Rotterdam in comparison with the other three cities of the G4, the net built surface in the RCD (relative to the inner boundary of the (gross) planning area) increases to a GSI of 0.46 (the compactness of an area) and an OSR of 0.14 (the openness of an area and the

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8 The combination with variant 2a has not been studied since the average local integration value would hardly increase despite a large investment in a tunnel underneath the railway tracks.
pressure on the non-built space) after realisation of the proposed plans. A GSI of 0.46 is according to Berghauser Pont and Haupt (2004) relatively high whereas an OSR of 0.14 is relatively low, yet both are considered normal for mid-rise block typologies in urban environments. They, however, suggest a maximum GSI of 0.58 as their comparative research on the one hand demonstrates that neighbourhoods with a higher GSI only exist in Barcelona and, on the other hand, this represents the extreme value of the threshold set by Jane Jacobs (1961). Nonetheless, the built area (GSI) in the RCD can slightly increase as a result of which the amount of public space will decrease. As a result, a budget will get through which can be used to provide for additional investments in the remaining public space (in order to achieve a higher domain score on the Leefbaarometer).

Nevertheless, the OSR should not fall below a 0.10 value as a lower OSR historically appears unprecedented in the Dutch context. Based on the Space Syntax analysis it is recommended to close the Delftsestraat at both ends, which leads to a closed perimeter block. This will increase the sense of urban density as it leads to more variety of individual street-walls that define the enclosure of the street.

As indicated, a final situation of 34 dwellings per hectare is considered undesirable. For this reason it is recommended to increase the number of dwellings on the east side of the area from 451 (foreseen) to at least 1430 dwellings (which is equivalent to about 2860 inhabitants). Nevertheless, it is not recommended to further densify the district as a final situation of over 1.000.000 m² of real estate in the RCD implies a sufficient threshold for urbanity. A larger built area (GSI) at an equal density implies lowering the heights of the planned buildings or decreasing the amount of floor surface currently allocated to offices. It is hence recommended to replace a number of planned offices by residential buildings as well as dealing economically with the available land in order to achieve an increase of the number of dwellings per hectare.

Besides a high urban and diverse character, the routes through the area should be strengthened in order for the RCD to actually be perceived as a part of the city-centre. The large number of expected travellers and visitors after all enables the RCD to function as a gateway to the city-centre in the future. For this purpose, logical (pedestrian) routes should be established through the RCD to destinations elsewhere in the city-centre, supported by an attractive and lively programme in the building plinths. Based on the Space Syntax analysis, a more extensive connection between the Provenierswijk, the RCD and the city-centre is recommended through the construction of an S-shaped bridge between the Van der Sluysstraat and the Molenwaterweg as well as a pedestrian tunnel underneath the railway tracks between the Molenwaterweg/Zuster Hennekeplein and the Delftseplein. The ending of the tunnel are in this situation located under the driveway of the Post CS building, where the route should then be extended via the Poortstraat to the Weena-Zuid/Lijnbaan through making the crossing of the busy Weena more attractive for pedestrians.
The translation of the quantitative theory to an urban plan is again shown in the final picture below.
8.7 COMBINING THE APPROACHES

As previous sections have shown, the (largely) theoretical study on the formation of agglomerations has led to a better understanding that has been translated to five final pictures. Nevertheless, individual inconsistencies between the final pictures can be detected as each of those final pictures is modelled according to a different point of view. In order to provide suggestions (for improving or complementing the current plan for the Rotterdam Central District) that correspond with each of the approaches, an overview of the spatial implications of each approach for the RCD is provided below.

8.7.1 Urban economics

1. Spatial proximity and density of firms:
   - low urban land values and affordable space through more intensive use of the available land;
2. Dense concentration of households and other downstream customers close to firms:
   - provide high density housing close to firms (and thereby labourers);
3. Urbanisation externalities (variety and (sectorial) diversity):
   - distinctive goods and services;
   - aesthetic charms;
   - provide consumptive provisions (restaurants, cafes e.g.);
4. Good accessibility through hard infrastructure:
   - sufficient qualitative infrastructure
   - firms should be located within a 500m radius from the railway station;
   - reopening of the Postal Tunnel;
5. Soft infrastructure:
   - education, libraries, hospitals, theatres, specialised collective goods such as universities or specialised schools, and other (semi- or quasi-) collective goods as such.

8.7.2 Location preferences of firms

- A critical mass of retail businesses (>50) mixed with other functions, companies, and activities within walking distance;
- Qualitative and pleasurable (green) public spaces;
- Good exterior appearance and visibility of buildings (altering building typologies);
- High density and proximity to consumers, clients, labourers;
- Good accessibility by car and sufficient room for parking in the district;
- Accessibility by public transport: 80% of the firms settles within 500m radius from an intercity station. Firms even prefer to be locate within a 250m radius of a public transport station;
- Options for considerable growth: available land and affordable space (low rents).
8.7.3 **Location preferences of households**

1. **Affordability:**
   - deal economically with the remaining available lands;
2. **Accessibility:**
   - increase the number of residents and jobs in the area;
3. **Space:**
   - provide better and more qualitative outdoor spaces (courtyards, (roof-) gardens, and balconies);
   - more small apartments for single-person households;
4. **Variety:**
   - urbanisation economies: diversity through a combination of different activities such as work, leisure and education;
   - mix of building typologies (both modern as well as retro);
   - no more residential towers;
5. **Amenities:**
   - more cultural facilities: music venue (2,000-5,000 m² LFA);
   - small-scale, high-quality and diverse supply of cafes and restaurants;
   - more owner-occupiers and less social housing;
6. **Shops:**
   - shops for daily groceries: local bakeries, butchers, small supermarkets, and a bank office;
   - luxury shops: literary amenities, refined provisions and high-culture;
   - sufficient parking within a 350m radius of the main shops;
7. **Nature:**
   - supply of well-maintained public parks and water over a distance of 500m;
   - densification in order to preserve the green hinterland;
8. **Private housing:**
   - no housing close to the railway tracks;
   - over 75% of owner occupiers and only small amounts of social housing;
   - rental apartments for starters;
9. **Human capital:**
   - more housing for students and graduates;
   - jobs do attract (highly educated) starters;
   - provide for vividness through diversity in functions and public meeting and recreational places;
   - densify the inner-city;
   - adjust the norms for parking downwards and provide bicycle sheds instead;
   - initiate alternative housing arrangements (such as CPO and community housing) through lowering the guard in planning policies.

8.4 **Implications from a market approach (only the spatial ones)**

- Add the Delftsestraat and the Schiekadeblok together, then split the plot and focus on smaller scale developments;
- Add retail and catering services to the backsides of the Delftse Poort and the Unilever Building. In this, the municipality can act as a facilitator and may limit the number of licenses;
- Focus on rapid development of the municipal lots that are located directly next to the station (called Delftseplein and Conradstraat). Provide a flexible
zoning plan (do not fix the size of the programme or the functions) and allow a multitude of actors.

8.7.5 Quantitative assumptions
- Extent the green and blue character of the Westersingel in the direction of the Delftseplein;
- Slightly increase the built surface (GSI) in the area;
- Replace some planned offices by residential buildings;
- Close the Delftsestraat down at both ends (creating a perimeter block);
- Establish a connection through the RCD, connecting the Provenierswijk and the Lijnbaan.

8.7.6 Analogies between the approaches
The goal is to increase the area’s attractiveness to all potential users in order to maximise the demand for real estate. Nevertheless, it is not advised to design a new urban plan in view of the very long process before the current plan was carried out. The existing plans should therefore be carried out as far as possible, only reinforced at some points.

The theories that have been discussed in this chapter led to five ‘final plans’ that differ from each other to a certain extent. Nonetheless, the figure below offers a comparison based on the possible presence of 10 aspects in order to evaluate which adjustments to the plan appear necessary according to most theories. The numbers used refer to the classification in section 8.7.

Figure 69: comparing the final figures

<table>
<thead>
<tr>
<th></th>
<th>8.7.1</th>
<th>8.7.2</th>
<th>8.7.3</th>
<th>8.7.4</th>
<th>8.7.5</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive use of the land</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Green public space</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>More housing</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>More shops</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+++</td>
</tr>
<tr>
<td>Parking (cars/ bicycles)</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Distinctive goods &amp; services</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Different zoning regulations</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Tunnel underneath the tracks</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Soft infrastructure</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>More offices</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: personal interpretation

This leads to the following general recommendations regarding the district based on the theories:
- deal more economically with the remaining land and use it more intense;
- Provide more publicly accessible (pocket-) parks in the public space of the RCD;
- More housing and shops are needed, whereas no final image points the need for more offices;
- A sufficient amount of parking places is valued by both residents as by firms, although not following from the other theories;
Abovementioned conclusions are, just like the call for distinctive goods and services, different zoning regulations, tunnelling the tracks and providing soft infrastructure, are incorporated in a final overview, specifically showing the adjustments that are recommended for the RCD.

Figure 70: final overview of the combined adjustments

Nevertheless, it should be considered that it is unlikely that many of these proposals will be implemented as the development process seems to be constrained, and probably will be for several years according to the prospects on the real estate market. Nonetheless, in section 9.4 it is recommended for further research to work these aspects out to a new development strategy for the Rotterdam Central District. Yet, this does not belong to the scope of this thesis, despite the fact that I would have liked to work such a strategy out.
CONCLUSION AND RECOMMENDATIONS

9.1 CONCLUSION

Initially it was assumed that urban area development could be stimulated by encouraging the process of agglomeration. Furthermore it was presumed that agglomeration would take place when the supply-end of the market could provide an answer to user preferences. However, urban area developments are more complex in nature and are not limited to the linkage between the supply and demand in the market. This chapter will elucidate this complexity, based on answers to the research question and subquestions. First the subquestions will be answered, thereafter the answer to the research question will be formulated.

9.1.1 Subquestion 1

*What are the well-established spatial and physical demands for firms and households to agglomerate in one particular area, such as Rotterdam Central District?*

In the first synthesis an overview was provided with the location factors that are important for firms and households. The table below summarizes point wise, the preferences of households and firms, that have been elucidated in the synthesis of Part II.

<table>
<thead>
<tr>
<th>Firms</th>
<th>Retail</th>
<th>Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>Accessibility</td>
<td>Affordability</td>
</tr>
<tr>
<td>Proximity</td>
<td>Availability</td>
<td>Accessibility</td>
</tr>
<tr>
<td>Appearance</td>
<td>Promotion</td>
<td>Space</td>
</tr>
<tr>
<td>Quality of life</td>
<td>Density</td>
<td>Variety</td>
</tr>
<tr>
<td>Labour market pooling</td>
<td>Economic base</td>
<td>Amenities</td>
</tr>
<tr>
<td>Information</td>
<td></td>
<td>Shops</td>
</tr>
<tr>
<td>Diversity</td>
<td></td>
<td>Nature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Private housing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human capital</td>
</tr>
</tbody>
</table>

Figure 71: overview of the most important preferences of households and firms.

From these points, which were extensively discussed in chapter 3, 4, and 5, a number of aspects showed to be conflicting. Although high (population) densities are important for firms in view of the larger opportunities of face-to-face contacts (Jacobs, 1961: human capital accumulation) and other economies of scale, the likelihood of diseconomies of scale thereby also increases. Diseconomies of scale are mainly experienced by households and may lead to a flight from the city. Most households nevertheless appear attracted to higher densities, especially because of the so-called urban attractions, and even prefer those over good accessibility: they accept a longer time to travel to live in an attractive city.

Firms consider the place of residence of their employees and believe this to be an important means by which to attract adequate and sufficient knowledge workers. Besides the consumption-end of a city, the diversity of the sectorial structure appears to be an determining factor in the success on the production-end of the city.

With respect to the development of the Rotterdam Central District, all theories appear to offer a different understanding of what the future situation should look like (which is apparent from the large lists that have been provided in chapter 8) in order to stimulate agglomeration. Although expecting that the market influence will be decisive, a total of eight spatial interventions seem to make sense, as well as the introduction of a more flexible zoning plan.

9.1.2 Subquestion 2

*Which adjustments may improve urban plans and development processes, when relating it to the literature on agglomeration of firms and households?*

Agglomeration is the result of an increasing demand, during a longer period, for real estate objects in which the supply in a certain location can continue to provide for in a sufficient extent. Even though this implies the real estate market should not exclude anyone, the importance to focus mainly on households has been demonstrated previously. The agglomeration of citizens is currently mainly hampered by the large mismatch between the demand and the qualitative and quantitative characteristics of the supply.

Qualitatively speaking, the supply does not capture the wishes of residents on a regular basis, which for one, leads to an increase in the real estate mutations. By allowing more development opportunities in the zoning, the momentum and possibilities of an area can be better utilized.

However, the crux lies in the quantitative mismatch: many promising population groups (young talented people: students, creative class, highly educated) consider the affordability of housing of main importance. High prices of land and construction programs in which insufficient (affordable) housing are provided for, lead to price pressure on the housing market.

Given that construction programs provide a certain degree of assurance and prevent opportunistic behaviour between parties, they are usually adopted in a master plan and zoning (the blueprint approach) in the preliminary phases of an urban area development by the municipality. In addition, the target groups and segmentation are
Understanding Agglomeration
a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District

predetermined in consents and agreements that are hardly flexible. The blueprint approach, however, provides a false form of assurance, as the knowledge on the expected demand is highly uncertain given the length of the urban area development process. Margins on the programmatic function mix, density and network requirements, as well as target-scores on the Leefbaarometer can be put forward as a tool to generate flexible master plans as such.

Densification and making more economically use of the (scarce) available land in the inner-city appears to be the most important recommendation towards urban plans in order to improve those. Besides, a balance should be sought between the total floor space occupied by offices compared to housing and amenities. At this point it is recommended to ensure that urban plans at least provide a mixed-use district according to the functional typologies as described by Van den Hoek (2009) in chapter 8.

9.1.3 Subquestion 3
Is it possible to prompt urban area developments with the knowledge gained or should a solution to do so be sought elsewhere?

Given the current economic climate, a large number of urban area developments currently in progress, have had to deal with reconsidering the goals, visions and content. Obviously, the demand for real estate will increase when the supply provides and answer for the demand, which has been explained in the previous subquestions. Nevertheless, it must be concluded that agglomeration theories provide an insufficient basis to stimulate the demand for real estate in an area.

Although, many of the planned supply will have to be adjusted in its content, the main issue is the way construction programs are initiated and realized, and are intertwined in the urban area development process. As indicated, greater flexibility has to be offered, by broadening the diversity of actors, integrating the chains (investors, developers, municipalities, and even end users) and allowing more development opportunities in the zoning.

9.1.4 Main research question
To what extent does the Rotterdam Central District provide bases for firms and households to agglomerate and thereby prompt the urban area development?

After various market players had acquired land possessions in the RCD, the municipality decided to set up a general plan for the urban area development. Both the process and spatial plans were formed before the crises and these unaltered plans and processes still form the basis for the development process. Although the municipality could reconsider the plans, given the municipality has bought back the land, the dependence on the leasehold-construction is more a risk than it is an opportunity.

In 2005/2006 unlimited opportunities to increase the density of the RCD were observed, which was endorsed by the agglomeration theories. This thesis has again discussed the preferences of the households and firms in the real estate market; to
offer guidance for the qualitative factors in which the various parties involved - on different scale-levels (the building level, the living environment, the socio-economic conditions of the city e.g.) of urban area development processes - have to provide for.

Given the current market conditions, it is advised to build more small-scale projects and not to exclude any potential tenant or buyer (increases the diversity of actors). In the current market it will prove difficult to focus on large real estate objects for highly profitable groups. Despite the poor housing market conditions, there are still very promising target groups for which can be build. Examples of this target group are the young potentials (students, creative class and highly educated starters), small retailers and office users, which may still be combined with some users from the upper segment. Although certain qualities in the plans for the RCD could be better utilized, a focus on that kind provides insufficient basis to stimulate the urban area development. The main opportunities to stimulate are hidden in another, more flexible approach to the process. The main recommendations made in respect to this ‘different’ approach of the process are:

- Integrate chains (municipality, developer, investor, end user) to spread (or settle) the financing cost and increase interdependencies;
- Adjust the zoning to give rise to the possibilities of development and the plots can be divided spatially into smaller plots, that can be realized in phases.
- Process management provides the opportunity to stretch and temporize the development process, in order to make efficient use of multiple economic cycles.
9.2 DISCUSSION

Agglomeration of users will occur, provided that the supply of real estate on a location is continuously available and that this supply, at all scale levels provides a (almost) seamless connection to the needs, preferences and requirements that are requested for at the demand side of the market. The size of the group of end users, however, is determined by what is realized by the developing parties, for which it is neither possible to be continuously available, nor link to all market demands.

In order to provide a linkage with the market demand, the following steps are often engaged in, in an early stage of the urban area development:

1. A few target groups are selected, on which the area and its buildings will focus;
2. A final image is proposed, serving as a joint level of ambition, based on which the zoning could be altered if necessary;
3. A round of selection is adopted, as to involve the various parties as early as possible in the process, to increase the realism and added value of the plans;
4. The financial feasibility of the plan is verified, which can indicate any necessary adjustments to be made in the plan.

The points mentioned above are important elements of the PPP-construction, however, at the same time they constitute the factors that can reduce the agglomeration in an area.

- If areas focus specifically on a limited number of target groups, they exclude the attractiveness to other target groups;
- The level at which the final image is developed (the blueprint approach) can constrain the input of creative ideas and inhibit the flexibility of the project;
- An early selection of parties with whom a collaboration is settled, reduces the possibilities of divesting such a partner in a later stage of the project and reduces the possibilities to involve new partners in the development process. However, it does not appear likely that the urban area development benefits when the PPP is actually a forced collaboration between parties;
- In the primary stage of the urban area development, the feasibility can play a decisive factor in long-term decisions, in which often too early outcomes are identified and considered. As a result, anticipation on changing market conditions is only possible to a limited degree.

Due to the dynamic context of urban area development (the volatility of the market, changing housing needs and trends, demographic changes, competitive real estate and unstable budgets), serving the optimization of these aspect, flexibility and alternative utilization should be assumed in an attempt to stay competitive.

First, this requires a better utilization of the changing functioning of the real estate market, both in the choice for target groups and the possibilities of financing, for projects which are deemed unprofitable in a first instance. In addition, this requires a more flexible framework from which decisions regarding the urban area development can be made, at various moments in time. Such a flexible framework should offer various developers the opportunity to make decisions, under fluctuating market conditions, without causing complete uncertainty about the quality and functionality of the final image for both the developers and end users.
Initiated by the involved authorities, a project organization can be established that can optimize the process by rethinking the internal vision and reconsider the flexible framework that follows from this. Before market players are involved in the urban area development, the project organization should maintain the overall vision. This in order to avoid coordination problems and to provide a certain assurance.
9.3 RECOMMENDATIONS
Concerning the spatial implications of agglomeration, the correlation between the function mix, the liveability, and the density were examined in section 7.3.3. Not all domains of the Leefbaarometer are correlated with density or function mix. The density strongly correlates with safety, public facilities and social cohesion. Moreover, safety appeared to be the only LBM-domain that strongly correlates with both the density and the function mix. Remarkably, safety is the only LBM-domain that is strongly correlated with the MXI, although 3 other domains (housing stock, composition of the population and social cohesion) show a slightly weaker correlation. Chapter 7 extensively discussed these relationships, however, it is expected that further research will be able to explain the relationships more accurately.

In addition, the understanding of the agglomeration theory is considered useful, however it is concluded that a better understanding will not prove to be decisive in the purpose of stimulating urban area development. It turned out that regarding the RCD, plans could have made a better utilization of certain qualities, however the main improvement would have been reached by an alternative design of the urban area development. Nevertheless, the aim of this thesis is not to review the urban area development of the RCD, but to investigate whether a better understanding of agglomeration theories could enhance the urban area development process. Although some general recommendations and conclusions regarding the RCD will be made, further research into the possibilities to implement the more flexible approach as proposed appears to be necessary as well.

Nevertheless, this study has led to the following general recommendations:

Recommendations to increase the support:
- In order to increase the support and demand a less permanent commitment from the actors, focus should be on more openness and broadening the diversity of actors (focus on a greater number of actors), open participation instead of solid parties.

Recommendations regarding the financial plan:
- Reduce the size and duration of funding needed by the developer, by lengthening the time the municipality owns the ground. A joint objective for value can be aimed at by involving the investors earlier in the process, this could lead to an extension of the depreciation periods of the real estate;
- Expand the number of options to realize the objective: divide the program financially, by splitting unprofitable parts from profitable parts, by phasing or modifying the project;
- Due to previous collaborations in the development process, the land exploitation, real estate exploitation and maintenance of real estate can be integrated in order to enable more ways to equalise costs capabilities. This leads to stretched revenue models, in which each party receives a return only when the value is actually present.
Recommendations regarding the spatial plan:

- Switch to a process management approach, which allows the use of multiple economic cycles by extending the timeframe of the development process and creating the opportunity to temporize.
- Controlling the content and quality of a project is important, however focus should be less on a methodical, rigid zoning to enable more types of developments.

The quantitative framework as ground for recommendations:

Based on the quantitative framework, increasing the functionality, liveability and accessibility was urged in chapter 7. This has led to the following recommendations:

- Functionality;
  Make sure that approximately 41% of the surface is used for housing relative to the other functions and dense into a FSI of at least 2.0 for a sufficient market. Joost van de Hoek (2009) did, however, indicate that “there is no such thing as an ideal mix, every location and every project has its own specific mix potential” (pp. 207).

- Liveability;
  Invest in the housing stock, the public space (emphasise on design, management and use, and avoid useless junkspace), the public facilities (increase in number as well as in variety/diversity), and the social cohesion;

- Accessibility;
  Explore, with Space Syntax the potential to increase the local and global integration values, on the basis of a variant study. A better embedded network can lead to the more effective utilization of the flow of by-passers, which is favourable for liveliness and the rentability/level of rents.

Besides the abovementioned recommendations regarding the development of the Rotterdam Central District, it is advised to also consider the following solutions, although implementation of these matters will require further research.

9.3.1 Focus on the process

Currently development of urban areas is often based on a project approach, where a process approach would be a better fit. Apart from the EIA-regulations (Plan-MER) and the protest from inhabitants, the land agreements between municipalities and the developers are a clear sign of external dynamics. Moreover, the scale of the programs have - given the poor market conditions and market development since the planning process – led to an increase of the complexity (internal dynamics). Klijn et al. (2006) indicate that in situations of that kind, the transition from a project management to a process management should be made. The municipality should adopt the organizational role of process manager more explicitly, to enable the exertion of direct influence on the (financial) land policy and the related procedures. In addition, from that role the municipality can determine the most urgent (rotten) areas, or clearly put the promising areas (hot spots) on the market. Triggers like these, that have the potential to help the area as a whole progress, could be utilized and the municipal revenues could be shoved forward (to get rid of the “bathtub”).
9.3.2 Focus on certainties
The development of the RCD constitutes an almost archetypical example of a public-private partnership, for which a blueprint of the Central Station and the surrounding area was initiated before the crisis, of which the realisation seems to barely come off the ground.

As the introduction of the RCD (chapter 2) showed, with the start of the OV terminal (a hub of public transportation such as railway, metro, tram and bus) late 2006, the preparations for the development of the area were initiated. The OV terminal was designated by the government as a National Key Project (NKP) and requires a total investment of approximately €650 million which is invested by the State, the Rotterdam Metropolitan Region and the municipality of Rotterdam. Even though the crisis has led to a situation in which many developments in the RCD have become uncertain, completion of the new terminal by the end of 2012 is fixed. This assurance should be seized by focusing the development on the Delftsestraat and the Conradstraat.

In order to promote the agglomeration, the projects that will be realized on these parcels (currently defined in the zoning as approximately 105,000m², of which 11.4% amenities and 88.6% offices), should be able to create a linkage to the changing market demand. This requires more flexibility within the zoning. Based on the offered theories and planning tools, the municipality could experiment with increasing the flexibility.

9.3.3 Turn back the leasehold
Finally, the Space Syntax analysis indicated that closing the Delftsestraat would be a good possibility to create a perimeter block, without harming the functionality of the network. This could provide additional land revenues, but moreover it could be used to initiate a primarily phase in the development of the Schiekadeblok. The municipality could propose LSI to transfer part of its land-/real estate positions, to bring the project back to a conveniently arrangeable size. The municipality would strengthen its role as process manager and LSI would be offered to capability to redeem or pay the leasehold rent (or other borrowings).

Further, there are many more smaller development locations in the area that the municipality could use to generate more dynamics, like the backside of Nationale Nederlanden, the back- and rearside of Unilever and eventually perhaps densing the area around the Albeda College.
9.3.4 Overview

Finally, the recommendations made with regard to the RCD, on different scales are summarized in the table below.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Product</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>Especially with regard to the Schiekadeblok, it is recommended to involve the Delftsestraat in the development and subsequently split the lot. In addition, existing buildings leave much to be desired. The backsides of the Delftse Poort and the Unilever Building could serve as a mean to transform the Delfseplein into a street with retail and restaurants.</td>
<td>Many of the intended developments were contemplated before the crisis, but prove too ambitious for the current market conditions. Based on the provided knowledge it is expected that the support-base for the developments can be increased by splitting lots and focusing on smaller scale developments (maintaining the FSI).</td>
</tr>
<tr>
<td>Meso</td>
<td>Based on the Space Syntax study it was recommended to close the entrance to the Delftsestraat and provide a good connection between the Lijnbaan and the Provenierswijk, and with the Couwenburg. Expected is, that the higher integration values, in practice, will translate into a larger stream of visitors, which enhances the chances for restaurants and retail.</td>
<td>The municipal lots (Delfseplein and Conradstraat) are essential for the success of the area as they are situated next to the station and thus form the entrance of the city. Developers, however, have bought two other plots (the Weenapoint and Schiekadeblok), this leads to a shift of the focus to two more remote areas that are not directly relevant for the area as a whole.</td>
</tr>
<tr>
<td>Macro</td>
<td>The liveability, density and function mix in the city-centre should be raised to create an attractive inner-city. Especially the number of residents should increase sharply, which could be realized within the RCD.</td>
<td></td>
</tr>
</tbody>
</table>
9.4 FURTHER RESEARCH

Based on the findings and recommendations that have emerged in this study, a new development strategy could be proposed for the Rotterdam Central District. Incorporation of the proposed amendments, could provide the opportunity to both change the urban area development process and the funding structure within the existing master plan, was it, only because it is proposed to include more actors in the process. A study of that kind, should be very practical in nature and could directly give rise to changes in the approach by the municipality of Rotterdam for the Rotterdam Central District.

Following the theoretical consideration of agglomeration, in which this research provides, research with a more quantitative nature could be performed. By compiling a database, in which various data regarding a variety of neighbourhoods over multiple years is included, relationships between the characteristics of the neighbourhoods and the in- and decrease of the number of citizens, households, jobs, firms and shops, can be explored. By means of such a research, possible quantitative explanations for agglomeration forming can be proved, which may provide new tools for the future policy regarding urban area developments.
9.5 PERSONAL REFLECTION

In this final section I will reflect on the process and product, hand my personal evaluation on both and identify what I might have done differently.

9.5.1 Process

The reason for this research was formed by the in number increasing, unsuccessful attempts to initiate large and important urban area development projects and the failure to realize (sometimes literally) towering ambitions in the Netherlands. The crisis has further pressured the enforceability of the projects, however in my opinion the need for many urban area developments has remained. Initially it was therefore my intention to formulate a development strategy for such large hampered urban area development projects.

As already mentioned in the Acknowledgements it is difficult to formulate a generic strategy for multiple projects of this kind, after which I have considered to limit my study to the Rotterdam Central District. Although I remained working with the RCD, it was soon clear that the scientific value and distinctiveness of the thesis, in case it developed as a typical development strategy, would be low. In my opinion a thesis of that kind would, moreover become less extensive since in that case a much larger number of (complex) factors had to be included. There, I personally was not convinced of the academic value of designing research I decided to focus on the fundamental aspects and approach the subject theoretically: agglomeration.

This had obviously not originated entirely out of thin air. During the writing of an essay for the course Corpopations and Cities by Herman Vande Putte, I was inspired by urban economic theories that were, according to Ottaviano and Thisse (2003) able to explain why agglomeration would occur at certain locations. Moreover they suggested to zoom in on a city, questioning how to steer agglomeration to a preferred location in order to prompt successful development of that particular area.

Nevertheless, urban economic theories were mainly related to business and I realized that within the segmented property market (DiPasquale and Wheaton, 1992) the various users would set different requirements with regard to their urban – working and living – environment. In the summer of 2011, however, I was inspired by the book “The Attractive City” by Gerald Marlet (2009), in which he analysed to which extend values of properties can be explained by the presence or absence of characteristics in the environment.

As I have not limited my research to a specific target group, I started by gaining more insight by plunging in an excess of literature. Even though this – especially in chapter 3 and 5 – has led to – my insights – an exceptional complete overview of the theories, it appeared that organizing this knowledge was very difficult and moreover appeared very time consuming. Furthermore, due to the mainly English literature concerning the urban economic theories I had decided to write my thesis in English, however, for almost all subsequent chapters it would have been a lot more practical to write the thesis in Dutch.

All in all I can conclude that this research offers an explanation for agglomeration based on many research fields. Although interesting, it would have likely been more practical
Understanding Agglomeration
a critical appraisal of agglomeration theories from the perspective of Rotterdam’s Central District

to further define the research more clearly, as the many possible viewpoints and explanations for agglomeration can simply not be captured and understood in a single study.
I can also conclude that I have used (too) much literature and research tools since I assumed from the beginning that I would be able to bring all this information back to the core. In the future I would nevertheless make a clearer choice for a single way to perform research in order to answer the main question.
Finally, I should have put more emphasis on the urban aspect of this thesis earlier in the graduation track through more frequently contacting my mentors from the Department of Urbanism. This would have probably made it easier to establish a logical coupling between the theoretical and the spatial aspects of this thesis. Especially the completion of this thesis has taken me a great deal of work as it appeared difficult to establish this linkage while finalising the report.

9.5.2 Product
The objective of this research was to provide an understanding of agglomeration as it was assumed that this phenomenon could be explained and brought back into a few simple factors, that could provide the urban area development a guidance to use these factors in order to increase the demand for real estate and stimulate the development process.
Although this thesis provides for a fairly complete understanding of agglomeration, it is, as pointed out in section 9.5.1, virtually impossible to get a complete understanding of the subject and to subsequently reduce this to a number of spatial factors that could put agglomeration into practice. Nevertheless, I believe that the five approaches I chose provide in an answer to the research question and furthermore, that it also – to some extent – was proven possible to translate these approaches to the planned development of an urban area and recommend some adaptations to the proposed plans.
As indicated, I got inspired by the clear manner in which Gerard Marlet (2009) statistically tested the accuracy of existing urban theories (of great theories like from Jane Jacobs, Richard Florida and Edward Glaeser) with regard to location preferences of households, in his hedonistic study. Although I have been able to include the statistics in my thesis, I believe that within the master education of the Faculty of Architecture more attention should be paid to both financial and statistical analyses by focussing more on Excel- and SPSS- education.
Using such knowledge, for example in quantitative research that could have been performed more extensively by more external benchmarking (for example by more comparisons between Rotterdam and other cities based on district data). In line with this, further research on the extent to which the city centre differs from the surrounding neighbourhoods (internal benchmarking) could have added to the value of the research.
In order to emphasize the generic aspect of this study it might have been more logical to test the theory on several case-studies, however this was not possible mainly due to time constraints. A generic method could, furthermore be accompanied by economies of scale (for example less depth) that are not practically applicable at a micro level. On
the other hand, a problem focused and context specific (not generic) method could be too dependent on assumptions made which, in turn, can lead to incorrect conclusions (Kauko, 2002). Partly for this reason, an attempt was made to apply a method that was generically applicable to a large extent – the area is representative for many of the urban area development within inner cities in the Netherlands – within the context of RCD.

In addition, I would have like to pay more attention to the financial side and the stakeholders within the process of development of the RCD. Following an interim presentation (P4) it was decided to put main focus on the spatial implications, as this was more in line with the urban planning discipline. Reflecting on the product could have verified the practical relevance and applicability of the research method.

Finally, hidden in the main research question was the assumption that strengthening of spatial factors could lead to more demand for real estate in (urban) areas, which could stimulate urban area development. From that perspective, it was disappointing that, despite the extensive research into reasons that could explain agglomeration, the market seems to be a dominant factor. However, in my opinion I succeeded to provide sufficient guidance for the parties involved on how to proceed the urban area development through setting it up in another way. The proposed approach to shape a more flexible process and product was technically not intended to elaborate on, yet this outcome could not be completely ignored.
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http://www.permeta.nl/
http://rotterdam.buurtmonitor.nl/
### APPENDIX 1: Building Characteristics of the RCD

| Building Name                  | Footprint old [m²] | Building old [m²] | Footprint new [m²] | Building new [m²] | Address | Tower | Parking | Year | Architect/Office
|-------------------------------|--------------------|------------------|--------------------|------------------|--------|-------|---------|------|------------------|
| Arboretum College             | 2,255              | 8,000            | 2,255              | 8,000            | Nirvana 750 | RBC Wealth Management | unknown | Krueger & Pfeffer Architects
| Central Park                  | 5,605              | 30,000           | 5,605              | 40,000           | Gallipoli 31 | 310 Water Street | 1955 | Krueger & Pfeffer Architects
| SoHo Hotel                    | 7,280              | 108,000          | 7,280              | 108,000          | Venezia 305 | Maltese & Associates | 1990 | Bottonia
| Riennerhof                   | 10,000             | 120,000          | 10,000             | 120,000          | Venezia 300 | Maltese & Associates | 1991 | Bottonia
| Kronbühlstrasse              | 2,340              | 5,057            | 2,340              | 5,057            | Venezia 700 | WestEast | 1996 | Bottonia
| Butterfield Central           | 20,000             | 36,000           | 20,000             | 36,000           | WestEast | 1996 | Bottonia
| Eastview                     | 3,900              | 35,000           | 3,900              | 35,000           | WestEast | 1996 | Bottonia
| Arrive                       | 4,500              | 17,340           | 4,500              | 17,340           | WestEast | 1996 | Bottonia
| Waterfront 1                | 2,140              | 24,000           | 2,140              | 24,000           | WestEast | 1996 | Bottonia
| Waterfront 2                 | 4,000              | 11,144           | 4,000              | 11,144           | WestEast | 1996 | Bottonia
| Waterfront                    | 2,140              | 14,000           | 2,140              | 14,000           | WestEast | 1996 | Bottonia
| Waterfront 1 (Herrenstrasse) | 7,755              | 32,350           | 7,755              | 32,350           | WestEast | 1996 | Bottonia
| Waterfront 3                 | 0                  | 0                | 0                  | 0                | WestEast | 1996 | Bottonia
| Waterfront 4                 | 5,700              | 43,000           | 5,700              | 43,000           | WestEast | 1996 | Bottonia
| Other smaller buildings       | 1,440              | 1,440            | 1,440              | 1,440            | WestEast | 1996 | Bottonia

**Building (new) | Old situation | New situation**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Existing [m²]</td>
<td>New [m²]</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Arbutus College</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Central Park</td>
<td>9,000</td>
<td>10,400</td>
</tr>
<tr>
<td>SoHo Hotel</td>
<td>106,000</td>
<td>119,000</td>
</tr>
<tr>
<td>Riennerhof</td>
<td>1,820,177</td>
<td>2,212,840</td>
</tr>
<tr>
<td>Kronbühlstrasse</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Butterfield Central</td>
<td>35,000</td>
<td>35,000</td>
</tr>
<tr>
<td>Eastview</td>
<td>31,000</td>
<td>31,000</td>
</tr>
<tr>
<td>Arrive</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Waterfront 1</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Waterfront 2</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Waterfront 3</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Waterfront 4</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Other smaller buildings</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Notes:**
- **New situation** includes living, working, and amenities
- **Old situation** includes existing space
- **New situation** includes new developments
- **Address** includes living, working, and amenities
- **Year** includes the year of construction
- **Architect/Office** includes the architectural firm responsible for the design

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**Building Characteristics:**
- **Building Name:** Various
- **Address:** Various
- **Year:** Various
- **Architect/Office:** Various
APPENDIX 2  importance that multinationals attach to the 4 domains

<table>
<thead>
<tr>
<th>Cushman &amp; Wakefield</th>
<th>Domain ¹</th>
<th>Value</th>
<th>Ernst &amp; Young</th>
<th>Domain</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy access to markets, customers or clients</td>
<td>EP</td>
<td>60%</td>
<td>Transport and logistics infrastructure</td>
<td>PE</td>
<td>63%</td>
</tr>
<tr>
<td>Availability of qualified staff</td>
<td>HC</td>
<td>53%</td>
<td>Telecommunications infrastructure</td>
<td>PE</td>
<td>62%</td>
</tr>
<tr>
<td>Quality of telecommunications</td>
<td>PE</td>
<td>52%</td>
<td>Transparency of political, legal and regulatory environment</td>
<td>EP</td>
<td>62%</td>
</tr>
<tr>
<td>Transport links with other cities and internationally</td>
<td>PE</td>
<td>42%</td>
<td>Potential productivity increase for their company</td>
<td>HC</td>
<td>57%</td>
</tr>
<tr>
<td>Value for money of office space</td>
<td>EP</td>
<td>33%</td>
<td>Social climate and environmental stability</td>
<td>QL</td>
<td>54%</td>
</tr>
<tr>
<td>Cost of staff</td>
<td>EP</td>
<td>32%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of office space</td>
<td>EP</td>
<td>25%</td>
<td>Local labour skills</td>
<td>HC</td>
<td>50%</td>
</tr>
<tr>
<td>Languages spoken</td>
<td>HC</td>
<td>21%</td>
<td>Labour costs</td>
<td>EP</td>
<td>50%</td>
</tr>
<tr>
<td>Business climate create by governments through tax policies/financial incentives</td>
<td>EP</td>
<td>20%</td>
<td>The country or region’s domestic market</td>
<td>HC/PE</td>
<td>48%</td>
</tr>
<tr>
<td>Ease of travelling around within the city</td>
<td>PE</td>
<td>20%</td>
<td>Corporate taxation</td>
<td>EP</td>
<td>46%</td>
</tr>
<tr>
<td>Quality of life for employees</td>
<td>QL</td>
<td>16%</td>
<td>Flexibility of labour legislation</td>
<td>EP</td>
<td>42%</td>
</tr>
<tr>
<td>Freedom from pollution</td>
<td>QL</td>
<td>16%</td>
<td></td>
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</tr>
</tbody>
</table>

| | Scalar | Normal. | Scalar | Normal. | Averages | outcomes |
| | Cushman & Wakefield | Cushman & Wakefield | Ernst & Young | Ernst & Young | | |
| Physical environment | 139% | 35,6% | 149% | 27,9% | 31,8% |
| Quality of life | 32% | 8,2% | 54% | 10,1% | 9,2% |
| Human capital | 74% | 19,0% | 131% | 24,5% | 21,8% |
| Economic profile | 145% | 37,2% | 200% | 37,5% | 37,3% |
| Totals | 390% | 100% | 534% | 100% | 100% |

Source: adapted after Cushman & Wakefield (2011) and Ernst and Young (2011)

¹ PE = physical environment, QL = quality of life, HC = human capital, and EP = economic profile.
## APPENDIX 3  
### domains and indicators of the Leefbaarometer

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dominantie vrijstaande woningen</td>
<td>Dimension Housing stock (19%)</td>
</tr>
<tr>
<td>2 Dominantie tweekappers</td>
<td></td>
</tr>
<tr>
<td>3 Dominantie flats met meer dan 4 verdiepingen</td>
<td></td>
</tr>
<tr>
<td>4 Dominantie etagewoningen</td>
<td></td>
</tr>
<tr>
<td>5 Dominantie boerderijen en tuinderijen</td>
<td></td>
</tr>
<tr>
<td>6 Dominantie stedelijke statuswoningen</td>
<td></td>
</tr>
<tr>
<td>7 Dominantie suburbane statuswoningen</td>
<td></td>
</tr>
<tr>
<td>8 Dominantie boerderijen en tuinderijen</td>
<td></td>
</tr>
<tr>
<td>9 Dominantie vroeg-naorlogs (1945-1960)</td>
<td></td>
</tr>
<tr>
<td>10 Dominantie vooroorlogse bouw (tot 1940)</td>
<td></td>
</tr>
<tr>
<td>11 Waarde verkochte huurwoningen</td>
<td>Dimension Public space (12%)</td>
</tr>
<tr>
<td>12 Aandeel sloop</td>
<td></td>
</tr>
<tr>
<td>13 Geluidsbelasting railverkeer</td>
<td></td>
</tr>
<tr>
<td>14 Geluidsbelasting totaal</td>
<td></td>
</tr>
<tr>
<td>15 Nabijheid groot water</td>
<td></td>
</tr>
<tr>
<td>16 Groene ruimte tussen vroeg-naorlogse bouw</td>
<td></td>
</tr>
<tr>
<td>17 Nabijheid grote water</td>
<td></td>
</tr>
<tr>
<td>18 Nabijheid groot water</td>
<td></td>
</tr>
<tr>
<td>19 Nabijheid grote water</td>
<td></td>
</tr>
<tr>
<td>20 Nabijheid grote water</td>
<td></td>
</tr>
<tr>
<td>21 Nabijheid grote water</td>
<td></td>
</tr>
<tr>
<td>22 Nabijheid supermarkt</td>
<td>Dimension Public facilities (4%)</td>
</tr>
<tr>
<td>23 Nabijheid bankfiliaal</td>
<td></td>
</tr>
<tr>
<td>24 Nabijheid groot winkelcentrum</td>
<td></td>
</tr>
<tr>
<td>25 Nabijheid niet-werkende werkzoekenden</td>
<td>Dimension Composition of the population (36%)</td>
</tr>
<tr>
<td>26 Dominantie inkomens tot 2x modaal</td>
<td></td>
</tr>
<tr>
<td>27 Dominantie minimuminkomens</td>
<td></td>
</tr>
<tr>
<td>28 Dominantie inkomens meer dan 2x modaal</td>
<td></td>
</tr>
<tr>
<td>29 Aandeel niet-westerse allochtonen</td>
<td></td>
</tr>
<tr>
<td>30 Aandeel niet-westerse allochtonen</td>
<td></td>
</tr>
<tr>
<td>31 Dominantie middelbare paren zonder kinderen</td>
<td>Dimension Social cohesion (10%)</td>
</tr>
<tr>
<td>32 Dominantie jonge paren zonder kinderen</td>
<td></td>
</tr>
<tr>
<td>33 Dominantie oudere paren zonder kinderen</td>
<td></td>
</tr>
<tr>
<td>34 Dominantie jong alleenstaand</td>
<td></td>
</tr>
<tr>
<td>35 Dominantie middelbaar alleenstaand</td>
<td></td>
</tr>
<tr>
<td>36 Aandeel ouderen</td>
<td></td>
</tr>
<tr>
<td>37 Aandeel gezinnen met kinderen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Homogeniteit gezinnen met oudere kinderen</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>38</td>
<td>Homogeniteit gezinnen met jonge kinderen</td>
</tr>
<tr>
<td>39</td>
<td>Dominantie eigenaar bewoners</td>
</tr>
<tr>
<td>40</td>
<td>Verhuizingen (mutatiegraad)</td>
</tr>
<tr>
<td>41</td>
<td>Vernielingen</td>
</tr>
<tr>
<td>42</td>
<td>Verstoring openbare orde</td>
</tr>
<tr>
<td>43</td>
<td>Geweldsmisdrijven</td>
</tr>
<tr>
<td>44</td>
<td>Diefstal uit de auto</td>
</tr>
<tr>
<td>45</td>
<td>Overlast</td>
</tr>
<tr>
<td>46</td>
<td>Nabijheid natuurgebied</td>
</tr>
<tr>
<td>47</td>
<td>Nabijheid bos</td>
</tr>
<tr>
<td>48</td>
<td>Nabijheid kust</td>
</tr>
<tr>
<td>49</td>
<td>Not belonging to a domain</td>
</tr>
</tbody>
</table>

Dimension Safety (19%)