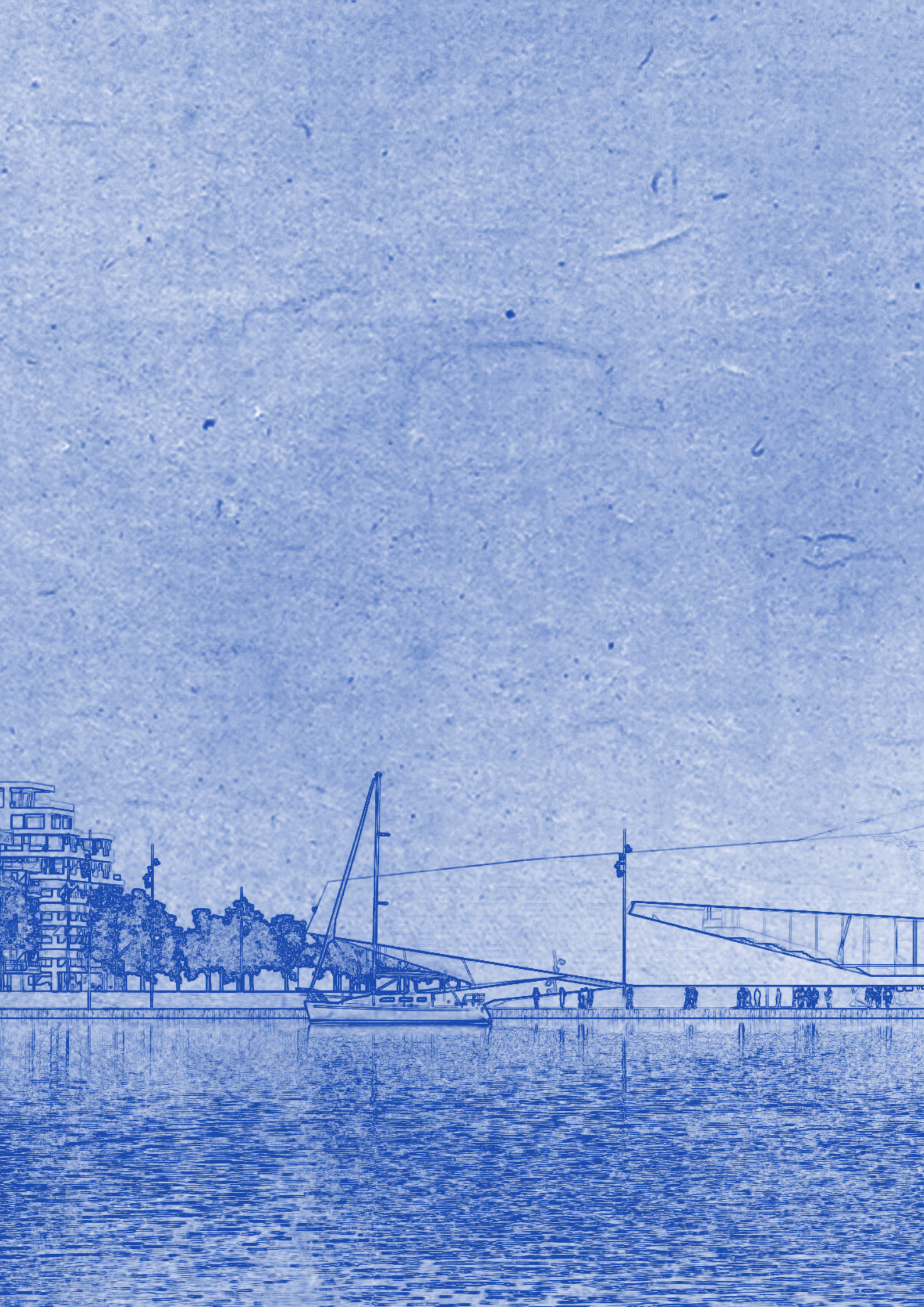
BLUEPRINT FOR INTERVENTION

A Decision Support Model for transformation of Vacant Office Buildings in Amsterdam



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A Decision Support Model for transformation of Vacant Office Buildings in Amsterdam

Title: Blueprint for Transformation
Research project: A decision support model for transformation of vacant office buildings in Amsterdam.

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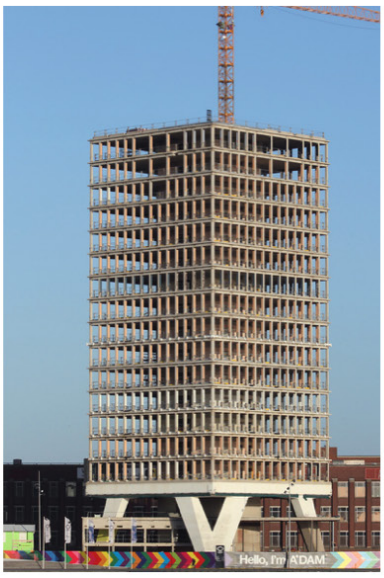

The Transformation of Overhoeks Tower to A'DAM, Amsterdam

PREFACE

This report is part of my graduation research at the department of Real Estate & Housing within the Faculty of Architecture at Delft University of the Technical in the Netherlands. The graduation research of Real Estate & Housing is divided into different themes and this is conducted within the Adaptive Re-use theme of Real Estate Management.
My research is towards a decision support model (DSM) for different intervention strategies for vacant office buildings in Amsterdam. This decision support model should help to determine the potential of different intervention strategies. Because of the many aspects involved, this determination process is often seen as complex. The existing models concerning this process are primarily focussed on some of the aspects involved. This model should determine the most critical aspects involved. When possible this aspects could be quantified and linked into one comprehensive model. This model should ease the decision-making process in the initial phase. The accessibility model should encourage actors to actively counteract to their vacancy problem.

Besides Real Estate and Housing I am in the track of the Master of Architecture. My interest lies in the development of real estate from the point of view of the developer. With my architectural background and this interest I always try to find ways to enrich the world from the real estate perspective. These possibilities can be found in vacant office buildings waiting to be reused. The challenge within my research is to map simplify the decision making process in order to create a decision support model based on financial, social and sustainable solutions.

I would like to thank everyone who has contributed to this report. Special thanks to Hilde Remøy, Peter de Jong and Theo van der Voordt for their supervision during this part of my research.

I hope this report is informative and useful for you, enjoy reading it!

Mischa Moritz | Delft | October 2016

MANAGEMENT SUMMARY

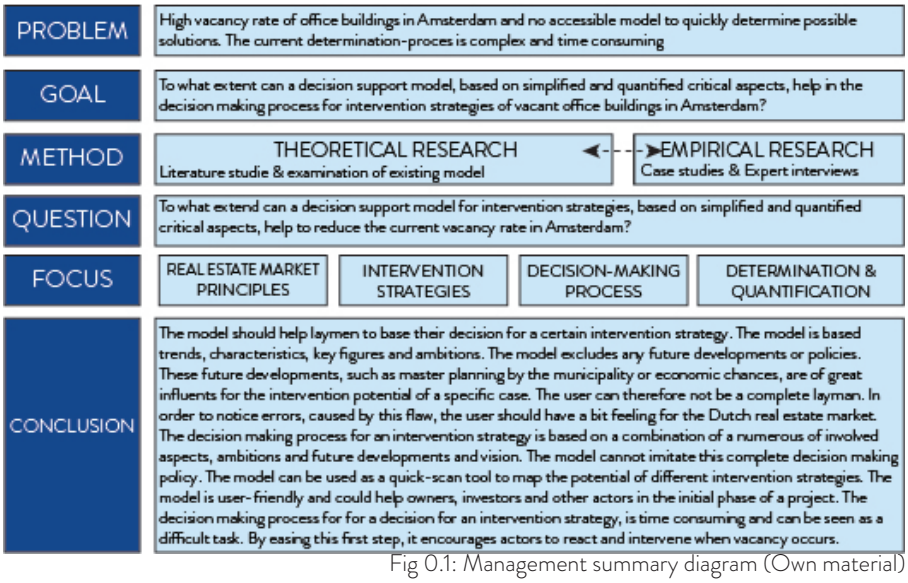

Fig 0.1: Management summary diagram (Own material)

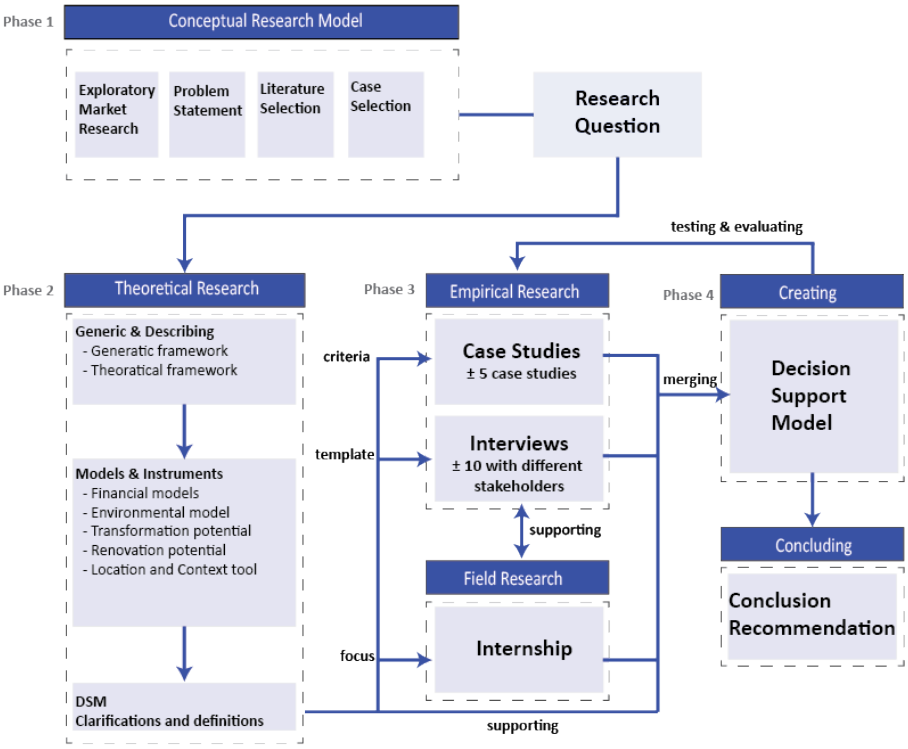

Fig 0.2: Methodology research model (Own material)

1 | INTRODUCTION

The decision-making process to determine the right intervention strategy is a complex process and is based on a lot of unique values. Some developers claim that they base their decisions on their gut feeling. This gut feeling should be a combination of knowledge and experience. It can be assumed that a developer with a portfolio of primarily transformation projects would be more likely to choose a transformational related intervention strategy. Each and every case is a combination of several aspects and can therefore be seen as unique. A standard solution for vacancy is therefore unrealistic. A quick-scan decision support model that would help to map possible solutions for every unique situation could help to justify their decision in the initial phase of a project.
This research helps to determine the critical aspects involved in the decision-making process for certain intervention strategies. These aspects are quantified and linked into a comprehensive quick-scan decision support model for the determination of the potential of certain interventions.

RELEVANCE

Scientific - The goal of the research is to quantify the critical aspects involved in the decision-making process during the initial phase of a project. The decision for a certain intervention is based on a combination of different forces and ambitions. The research should result in a simplified, but usable and accurate approach for a complex decision-making process of determination of an intervention strategy. This simplified method could quickly determine the potential of a vacant office building. This would encourage actors to intervene when vacancy occurs.

Social - The aimed model should simplify the decision-making process in the initial phase of a project. The current decision-making process is sometimes seen as complicated and time consuming. Resulting in rushed decisions based on previous methods. The desired decision support model should ease the decision-making process for an intervention strategy. The model should help to quickly determine possible intervention strategies. When possible and feasible, the model should preferably suggest a re-use related intervention. This DSM would be most interesting for owners and investors.

Commercial – Current models related to the decision-making process of intervention strategies are complex and time consuming. The

aimed Decision Support Model is a quick scan method based on all interrelated aspects and the users ambitions. The model should be user-friendly, thus easy and quick to use. The model should be consistent in its output and be based on reliable value

SCOPE

One Comprehensive model - There is a need for one comprehensive decision support model (DSM) that compares different intervention strategies and focuses on the different option of the transformation intervention strategy. Each and every vacant office building is unique, making it very hard to design one comprehensive DSM. Existing models are focused on specific aspects of an intervention strategy and are ignoring other aspects. These models are therefore not usable for a realistic situation, where all aspects should be involved. The aimed DSM should combine all aspects concerning intervention strategies for a vacant office building. The DSM should combine these aspects with the users' ambition to conclude in the best possible solution.

User-friendly -Lots of existing models are not user-friendly and are therefore barely used by involved actors. The DSM should therefore be easy to handle by a layman without too much technical information.

there is not one comprehensive decision support model that supports the decision for the right intervention strategy. Because of the complexity, the decision for one of the intervention strategies is often hard for non-developers. The role of the project developer is crucial with a redevelopment. The size of the project and the range of financial, planning, legal and regulatory consequences are often so complex that a layman cannot do without the expertise of a developer (Harmsen, 2008). The aimed model should simplify the decision-making process in the initial phase of a project. The current decision-making process is sometimes seen as complicated and time consuming, resulting in rushed decisions based on previous methods. With the desired decision support model it would be much easier to make quick decisions. Firstly between different intervention strategies focusing on transforming, and secondly which transformation fits best.

RESEARCH QUESTION

To what extent can a decision support model, based on simplified and quantified critical aspects, help in the decision making process for intervention strategies of vacant office buildings in Amsterdam?

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TARGET GROUP

The aimed model should help investors or building owners to determine possible intervention strategies as a solution for a vacancy problem. This model could also be interesting for other actors such as architects or developers.

2 | RESEARCH DESIGN

PROBLEM FIELD

The current vacancy level in office buildings in the region Amsterdam is alarming (Amsterdam, 2013) A healthy market could have a maximum vacancy rate of 5%. The current vacancy rate in Amsterdam is 18,4% (DTZ-Zadelhoff, 2015). This vacancy rate leads to the impoverishment of certain areas of Amsterdam and has a negative effect on the economic development and may decrease the social and financial values for owners, users and the surroundings. Contemporaneous vacancy is a waste of the scarce building space in Amsterdam; a responsible use of space is essential (VNG, 2012). According to Keeris en Koppels (2006, p. 7) the current structural vacancy was not a problem in the past.

PROBLEM STATEMENT

With an alarming vacancy rate of 18,4% within the Amsterdam office market it is obvious that some interventions should take place. Contradicting the high vacancy rate of the office building in Amsterdam is the shortage of housing (Huikenshoven, 2016a). In the new vision of the municipality of Amsterdam, vacant offices should be transformed to other functions or be demolished.

There are several models that support different objectives but

RESEARCH APPROACH

A qualitative and quantitative comparative design strategy will be used for this research, where the empiric researches cross test the theoretic findings. This research may be divided in three different parts.

1. **Theoretical research**: A comprehensive literature study, this theoretical knowledge will form the foundation of my research.
2. **Empirical research**: The empirical research evaluates the theoretical framework. This will determine, according to practice, the most critical aspects involved. The empirical research is a combination of case studies and expert interviews.
3. **Creating**: A decision support model (DSM) will be created.

3 | THEORETICAL & EMPIRICAL RESEARCH

GENERIC FRAMEWORK

Defining adaptive re-use -The Department of Environment and Heritage (2004) defines adaptive re-use as "a process that changes a disused or ineffective item into a new item that can be used for a different purpose".

Adaptation and sustainability - The adaptation process gains benefits of the embraced energy and authenticity of the building in a sustainable manner (Bullen & Love, 2011). This can be achieved by expanding a building's life through re-uses. They see sustainability as a changing process with particular actions to strengthen system, infrastructure and innovation attributes to this cycle. For conversions to be made during the adaptation process, an environment has to be created that is receptive to innovations.

MANAGEMENT SUMMARY

Decision making aspect	Determination process and main question	Type of criteria
Market	Quick market analysis	Gradual
Technical	Building physics – technical possibilities *What are the technical possibilities of a building?*	Gradual
Functional	Building physics – technical restrictions *Are there building characteristics, which exclude possible functions?* Location factors – favourable aspects *What are favourable location aspects?*	Veto Gradual
Cultural	Building Context – determination of soft values Is there any cultural, emotional or cultural value in current design? Social and political aspects – The present of a strategic vision *Are there any social or political restrictions?*	Gradual Veto
Financial	Quick-scan – financial feasibility analysis *What are the costs and benefits?*	Gradual
Legal	Analysis of involved legalisations *Are intervention excluded by law?*	Veto
Environmental	Analysis of environmental consequences of interventions *What re environmental consequences of interventions?*	Gradual / Veto

Table 0.1 : Aspect & Themes (Own material)

Motives, critical aspects, drivers and barriers for adaptation – Re-use of buildings is one of the possibilities to decrease the vacancy rate. Transformation or renovation help to balance an imbalanced real estate market. Re-use of building materials could lead to a reduction of new building material resulting in less pollution. Critical aspects for the determination of the potential of a transformational intervention are physical attributes and age of the building, the location and market involved, the legislation and the involved occupants and owners.
Bullen and Love (2011) reveal that the most important drivers for adaptation are lifecycle issues, changing perceptions of buildings and governmental encouragement.
Barriers to adaptation involved are increased maintenance costs, building regulations, development criteria and the constitutional risks and uncertainties that are associated with older buildings. Adaptive re-use can lead to a greater degree of uncertainty , difficulty in implementing modern standards within the existing structures and the lack of experienced labor.
Intervention strategies - When structural vacancy occur, an owner or investor could choose for a certain intervention strategy.
- Consolidation: Just wait for better times or try to find a temporary solution.
- Sell the building: Sell the building for the best price possible.
- Renovate the building: When the buildings do not meet the current requirements for an office function, the owner may choose to renovate to meet these demands.
- Transform the building: A change of function would result in a transformation intervention.
- Demolish & build: When the market and location analysis propose a function that could not be housed in the current building, the owner may choose to demolish it and build a new building.

Transformation strategies - Brooker & Stone (2004) defined three strategies that can be applied by developers while transforming existing office buildings: intervention, insertion and installation. With the 'intervention strategy', they mean the activation of the potential or repressed meaning of the building by interprets, clarify or uncover. With the 'insertion strategy', they mean the establishment of an intense relationship between the existing building and the adaptation, yet allowing the character of both to exist independently. With the 'installation strategy', Brooker and Stone (2004) mean the heightening of awareness of an existing building and the combination of the old and new – without intruding each other.

THEORETICAL FRAMEWORK

The real estate market - The real estate space market consists of land and building. The real estate asset market reflects the cash-flow rights. A developer can develop a building in the space market and sell this with lease contracts to an investor as an asset. The total real estate market is a combination of the space and asset markets.

The four quadrant model of DiPasquale & Wheation - The four quadrant model of DiPasquale & Wheation shows the relationship between the real estate space and asset markets and the implications of market mechanisms on the total real estate market (Bonner, 2009, pp. 13-16). The four parts of the model are four equations. An imbalanced market would result in an over- or undersupply.

Highest and best use Approach - Geltners' highest and best use (HBU) theory (Geltner et al., 2007) the best use approach is based on the urban form, the physical spatial characteristics of a city. This contains the patterns of the locations of different land uses, such as residential, commercial and industrial within the city. Land value plays a key role in determining the shape of the long-run supply function and this governs the trend in rents and is therefore the most fundamental defining characteristic of real estate.

The market cycle - The office market can be seen as a cycle or wave. History has shown that the real estate market is a continuous cycle, where recession, recovery, expansion and contraction are alternating.

Types of vacancy - There are different types of vacancy and not every type is harmful to the current office market. According to Keerins and Koppels (2006) vacancy can be divided in four different types of vacancy: initial-, friction-, conjuncture-, and structural vacancy. Another and more contemporary type of vacancy is the hidden/shadow vacancy (Hersier, 2010). The first three vacancy types are normal vacancy in the market mechanism; the last two can be seen as harmful for the market mechanism

Decision support model - Uncertainty has to be communicated in the science engineering and policy-management interface. Walter (2003) has attempted to propose a tool for identifying and characterizing the potential uncertainty in model-based decision support, suggesting that uncertainty is a three dimensional concept defined by: the location in the analysis, the level of uncertainty, and the nature of the uncertainty. In order to create a DSM concerning the real estate market, the model should include a combination of different analyses.

MODELS AND INSTRUMENTS USED

The aimed DSM should map all different aspects concerning the transformation potential of a vacant office. Several existing models and instruments based on these aspects are examined. The combination of these models and aspects should conduct in one comprehensive model. The model should include (1) renovation of the office function, (2) transformation to another function, demolish and build the same or other functions. All the possible scenarios should be compared by function possibility, financial profitability, environmental sustainability and architectural & cultural value.

Vacancy risk meter - The vacancy risk meter (in Dutch leegstandrisicometer) (Geraedts & Voordt, 2007a). This tool was developed to measure the risk and potential of offices in Rotterdam. The tool is based on the opinion of 50 involved real estate experts. The tool can give a verdict about future potential of an office building. This model is a quick scan applicable for vacant office buildings and the potential to maintain the office function. This model is in fact a quick scan for a renovation intervention. When vacancy occurs, but the market situation is very favorable for an office function the building or the location needs an upgrade.

Transformation potential meter - The transformation potential meter (Geraedts & Voordt, 2007c) is a quick scan method to determine the potential to transform the vacant office into dwellings. A lot of the aspects are overlapping but make use of other criteria. These models could easily be combined to one comprehensive model to determine a renovation or transformation intervention

Life cycle costing model - The Life cycle costing (LCC) Model of Jelle de Groot (2014) is one of the methods to swiftly calculate the best financial intervention strategy for a vacant office building. This model focuses on the operating costs and the time factor of the costs and benefits of each strategy. The outcome of this model should be the best financial option for a transformation project. The model needs a comprehensive set of financial input, thus making the model user-unfriendly, and unsuitable for a quick scan. A simplification of the model would be sufficient for a quicker approach but make it less reliable.

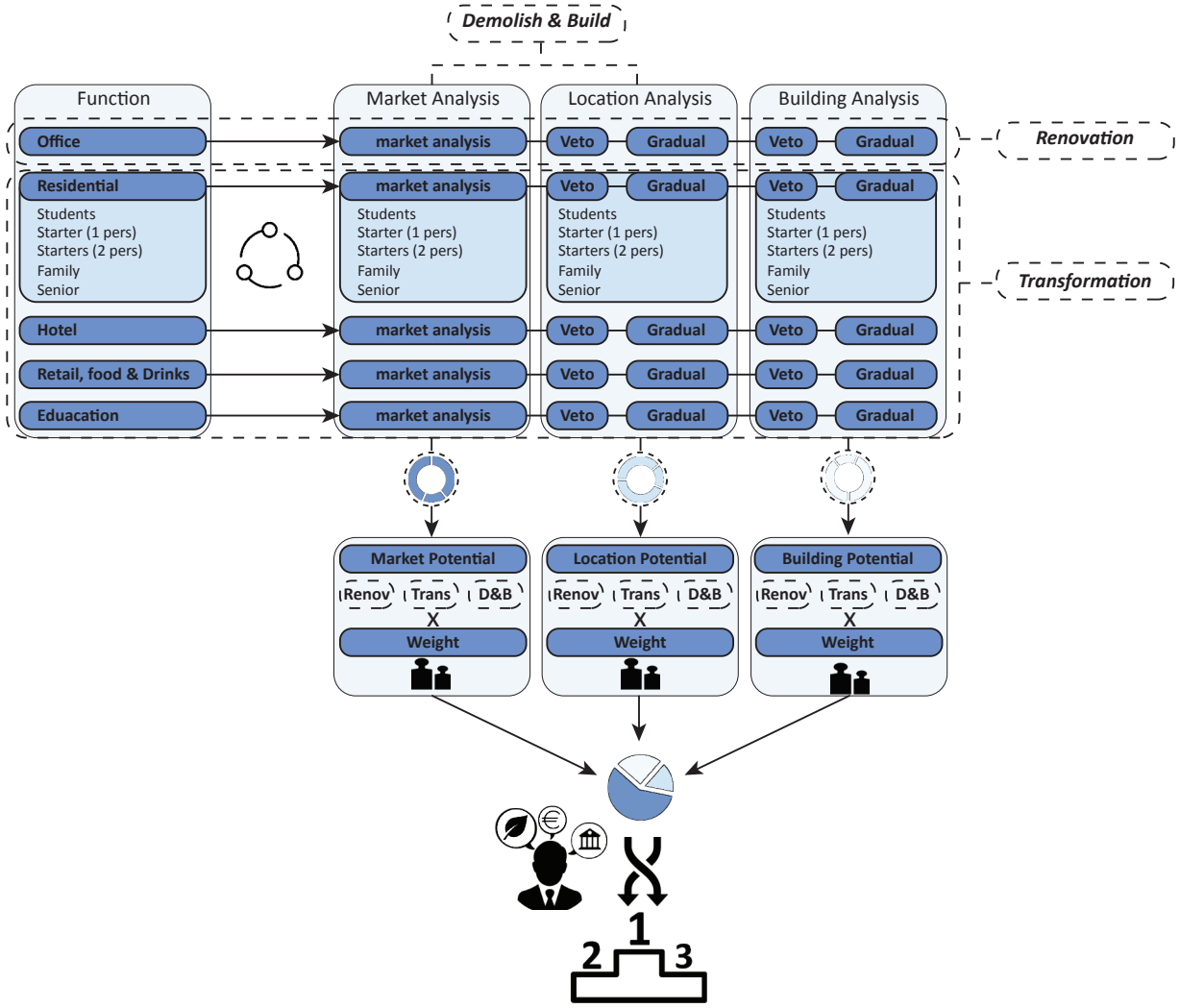
The lifespan accounting model - Van Dobbelsteen (2004) uses a method that calculates the remaining environmental load in an existing building. The lifespan accounting model is a method to assign values to the environmental values of an intervention of a building. This model could easily be implemented in a model to evaluate the environmental sustainability of an intervention strategy

The S3-model - Jansz' (2012) bases the S3-model on the lifespan accounting approach of van Dobbelsteen (2004) and Greencalc+.. The model bases the best intervention strategy on environmental values and leaves financial or architectural & cultural values out of consideration.

The Location of structural vacant offices - The location of structurally vacant offices model of van Wingerden (2013) is a model focusing on factors and criteria related to the vacancy rate of offices. The model focuses on the city of Utrecht. Van Wingerden (2013) researched the interrelation of these aspects and possible intervention strategies.
Potential critical aspects in the decision-making process
In table 0.1 The aspects and themes are shown.

Decision-making policy
The combination of function and a specific intervention, with the highest potential has the best chance to succeed. Nevertheless,

MANAGEMENT SUMMARY



0) Vacant office building
1) Involved functions
2) Market Potential - The market potential is a quick scan of the current demand in the neighbourhood.
3) Location potential
    a. Exclusion - based on a set of veto criteria, when a veto occurs the function is excluded.
    b. Gradual – based on a set of gradual criteria that can be positive or negative for a function.
4) Building potential
    a. Exclusion - based on a set of veto criteria, when a veto occurs the function is excluded.
    b. Gradual – based on a set of gradual criteria that can be positive or negative for a function.
5) Weigh factor
    a. A weigh factor is implemented that makes a distinction in importance between the three analyses.
    b. A weigh factor is implemented that makes a distinction in importance all criteria.
6) Ambition of user
    a. Financial profitability
    b. Sustainable contributions
    c. Architectural and cultural value
7) Recommendation for a certain intervention including
    a. Function
    b. Intervention
    c. Specific intervention
    d. Ambitions

the owner, investor or developer may choose for another combination, because it is more fitting for their business strategy. This strategy is a combination of three main ambitions: the financial profitability, the environmental sustainability and the architectural & cultural value of a development.
- Financial profitability: The financial profitability is quantified by the IRR of each scenario. The IRR depends on the initial investment, net income, inflation and operational time.
- Environmental sustainability: An indicator for the environmental sustainability is the environmental load, which can be divided in the annual and initial environmental load. The annual environmental load depends on the annual energy consumption of a building, while the initial environmental load reflects the load caused by the use of building materials. The environmental sustainability of the - Demolishment and newly built intervention strategy - can be higher when a vacant building cannot be redeveloped to result a higher energy label. In theory, every building transformation could lead to a high-energy sufficiency. The initial load is quantified by a construction intervention index, the annual load by the energy label.
- Architectural & cultural value: The architectural and cultural value of a building is a combination of the user, the future and cultural values. The essence of architectural and cultural value cannot be expressed in a currency but it can be expressed in the willingness to pay when necessary. The essence of a good design - a higher architectural and cultural value - lays in user experience, building appearance, and future value. The architectural & cultural value is quantified by a list of values given as input by the user.

3 | THE MODEL

A general quick scan that helps to determine potential solutions for a vacant office building.
The model is based on the most critical aspects involved in this process. These critical aspects are quantified and linked into a quick-scan decision support model resulting in a quick and simplified version of this decision-making process. Nine different functions, six specific interventions and three ambitions are implemented in the decision support model.
Fifty-four scenarios reflect the combinations of functions and specific interventions.
The model is based on the combination of function related markets, locations and building analyses.

Validation of the model - According to the result of the tests cases, the model can be assumed to be realistic. Most of the results are more or less similar to the actual intervention. The final result of the model consists of a top 3 combination of a function and an intervention. The user can consider deferring from this result by choosing other combinations from the preliminary results. The difference in potentials are given in percentages, the deviation between different potential can be used to defer from the result.
The preliminary results of the model give an impression of the potential of different functions or interventions. The model can be assumed to be quite accurate but it is still a simplified version of a decision making process. The model gives several options based on pre-set values and criteria.

4 | CONCLUSION & RECOMMENDATIONS

CONCLUSION

The underlying research question of this research is:

To what extent can a decision support model, based on simplified and quantified critical aspects, help in the decision making process for intervention strategies of vacant office buildings in Amsterdam?

The goal of a certain model is to help owners of vacant office buildings to find a solution for their vacancy problem and thereby reduce the total vacancy rate. The solution for this vacancy problem would result in a certain intervention strategy. The decision for an intervention strategy is a consideration between the intervention potential of a building and the business strategy of the involved company. This decision-making in this initial phase of a project is unique and very case specific. In order to give a perfectly accurate result, this determination is depending on a lot of specific input. This perfectly accurate solution is not relevant for the decision in the initial phase.

The goal of the model is to basically compare different intervention strategies and match this to the users ambition. In order to compare different intervention strategies, each intervention potential has to be determined. This is done by a quick simplified analysis based on the most critical aspect involved in the decision making process. In order to simplify this decision-making process the critical aspects involved need to be determined and quantified. The users strategy is reflected in the combination of three ambitions. The model is a based indicator related to these ambitions.

The model will not provide a perfectly accurate result; nevertheless the result of the model will be accurate enough to be decisive for the choice of any further investigation. The user-friendliness of the model eases the decision-making process in the initial phase. Investors and owners of vacant office buildings could now easily compare different intervention strategies and determine the best solution for their vacancy problem.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. The specification of the research - Due to the limited amount of time, the model is specified on vacant office buildings in the region of Amsterdam. The model can in fact be elaborated to other regions and building types. In order to include more regions and building types, more research is needed.
2. The amount of models and factors implemented – The decision-making process for a certain intervention strategy depends on a lot of aspects. In order to create a useful tool, a balance has to be found between the preciseness and user-friendliness. In order to get a more accurate model, more models with the same specialization need to be compared and specializations need to be added.
3. The amount of cases and interviews implemented - The empirical research is based on five case studies and eleven expert interviews. The research would be more accurate if more cases and interviews were implemented.
4. The amount of scenarios & mixed use - Nine different functions and six specific interventions are implemented in the deci-

MANAGEMENT SUMMARY

sion support model. Fifty-four scenarios reflect the combinations of functions and specific intervention. An increase of both functions and specific interventions would result in a more realistic usable model.

5. Temporary use - Temporary use can be used as a tool to influence market or location forces. More research is needed to the quantification of these values.

6. Soft & Future values – The values of soft ambitions. Such as architectural and cultural values, are very hard to quantify. Architectural value in this model is based on the personal reflection of this value. The architectural value can always be upgraded and the willingness to pay for this upgrade is reflected in this ambition. Area-develop policies are the most determining aspects within the decision-making process and should be implemented as veto or extreme gradual criteria.

7. More possibilities to specify - The model is based on a certain amount of pre-set values as a result of assumptions and average values. The user can adjust some influential and critical values. The possibility to adjust all these values would result in a more useable model. The user may choose to specify where needed, when needed.

RECOMMENDATIONS FOR PRACTISE

1. The usability and goal of an analysis or model - This simplified version is usable because it meets the goal. This process is unusable for anything besides the aimed purpose. Simplifying a determination process, by assumptions and average values, is acceptable when this does not devalue the result of the process. Therefore the usability of a simplified model is related to the purpose of the model. The user should realize that every model is a simplified version of reality.

2. One integrated process - Investors and building owners should realize that the success of (re)development projects depends on several aspects. The success of one of these aspects is related to the success of all the other involved aspects. Transparency and early involvement of the aimed target group will contribute to a successful result.

3. The real estate market mechanism - The supply and demand in the real estate market is related to the market equilibrium. A higher demand will lead to a higher price. Most actors will base their decision - for a certain function - on the mechanism, resulting in an extreme expansion of this function. At the moment of a balanced market, an oversupply could occur as a result of the relatively long construction time. Actors should therefore not base their decision on this market mechanism.

4. Decrease of risk - A multi-tenant building would require more effort in the initial phase of a project but will result in a less risk full asset. A combination of a multi-tenant and a mix-function will reduce the risk of an asset and will amplify the livability within the building.

5. Establishing future value - When actors are trying to find a solution to a problem, the problem already exists. Actors should anticipate a potential problem by constantly determining the future value of a healthy asset. The lack of a quick response will result in financial losses.

6. Acceptance of losses - Investors and owners should accept a potential decrease in value of their asset. By accepting this relatively small decrease of value, bigger losses can be avoided.

READING GUIDE

This report is structured in different parts distributed in six chapters. The first chapter is the introduction.

2 | Research Design

The report starts with a description of the aimed research. The first part of this chapter elaborates on the research proposal consisting the problem statement, the research questions, the main objectives and the aimed result. The second part of the research is the research approach. This chapter elaborates on the research methods and the research methodology.

3 | Theoretical Research

The theoretical research will form the base of the entire research. The research design can be divided in three different parts with their own contribution to the aimed goal.

- Theoretical framework: This part of the literature study consists of general information needed to understand the topic and the research. The aimed model should be very user-friendly and usable for a layman. This part should clarify terms and definitions.
- Literature study: This part of the research is directly related to the aimed result of this research. The literature study will result in the base of the model. The real estate market forces are examined, and the added value of a certain model that can address to the aimed goal.
- Models used: Existing models are examined to test their usefulness for a potential decision support model.

4 | Empirical Research

The goal of the empiric research is to test the theory values with practical values. The Empiric research can be divided into several parts that addresses to this goal.

- Case studies: The aimed result of the case studies is a summary of different transformations of vacant office buildings in Amsterdam. Besides the options in transformation, the research is about the motives, its aimed success, the opportunities, the involved risks and the context of the building. Where literature is the theoretic approach, case studies will research the project in practice. The practical approach may deviate from theory. What were the drivers and decisive factors behind the transformation? The case studies should provide more practical information of a transformation project.
- Interviews: The interview is a combination of a case related interview and an expert interview. When a stakeholder is not case related, only the expert interview is kept. It is important to interview different stakeholders with different interests. A combined summary of all the interviews given, the persons and companies behind different opinions will stay anonymous. The interviewees were asked to give their personal opinion and this may differ with the companies' policy.

5 | The model

The theoretical and empirical research should result in a consistent list of involved aspects and related criteria. The research should conclude in one comprehensive and usable model. The scientific contribution of this research can be tested with this model.

- The approach of the model: The model should be clearly structured. The critical steps in a decision making process and the related aspects are elaborated. How can function potential and in-

tervention potential be determined and matched? The value and consequences of the quantification of a company's ambitions are explained.
- **The procedure of the model**: Where the approach reflects the theoretical approach, the procedure elaborates on the actual practical procedure of the model. This part clarifies the steps within the model that lead to the procured results.
- **Sheets within the model**: A summary of sheets used in the procedure of the model.
- **Validation of the model and cases**: The model is tested on the case studies. The main goal is to validate the result given by the model. The cause of a differ is examined when the result and the actual intervention mismatch.

6 | Conclusion
This chapter concludes the research. This conclusion elaborates on the critical steps according to the theoretical and empirical research. This conclusion contains the steps within the model, related analysis and aspects within the model. The second part of the conclusion consists of recommendations for both further research and practical use of the results. The final part of the conclusion is a reflection on the used research methods and scientific and social relevance.

ABSTRACT

GOAL – The goal of this research is to examine the possibility of a decision support model concerning intervention strategies of vacant office buildings in Amsterdam. This quick scan results in the best future function and intervention for a specific vacant office building. This DSM is based on the market, the location and the building analyses and involves the users' or companies' ambition. The ambitions involved are financial profitability, environmental sustainability and architectural & cultural value. The focus of the existing models is limited to the certain aspects of an intervention strategy.

METHODOLOGY – This research consists of a theoretical and imperial study. The theoretical study includes a general part, a literature study, and a study of existing models. The imperial study consists of five case studies and 11 expert interviews.

ADDED VALUE – The decision for a certain intervention strategy is based on a number of factors and criteria, unique for each project. This DSM combines involved theory and existing models into one, integrated model. The DSM should give a comprehensive verdict, based on several factors and ambitions, for a possible solution.

KEYWORDS - transformation, intervention, vacant, office building, Amsterdam, Decision support model, blueprint, Decision tree, Adaptive Re-use, Intervention Strategy

LIST OF ABBREVIATIONS

CBS	Central Office for Statistics - Central Centraal Bureau voor Statistiek
DCF	Discounted Cash Flow
DSM	Decision Support Model
EPC	Energy Performance Coefficient
ESL	Estimated Service Life
GFA	Ground Floor AREA
GIY	Gross Initial Yield
HBU	Highest and Best Use
IRR	Internal Rate of Return
LCC	Life Cycle Costing
NEN	Dutch Normalisation Norm- Nederlands Normalisatie-Instituut
RevPAR	Revenue Per Available Room
SQM	Square Meters
TPM	Transformation Potential Meter
UFA	Usable Floor Area
VRK	Vacancy Risk Meter

The Transformation the GAK-gebouw to the Studio, Amsterdam.

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INTRODUCTION | 1

1.1 INTRODUCTION

The concept of project development has changed drastically over the past few years. For decades new offices and dwellings continued to being developed. When a vacancy appeared the most common solution was to simply demolish the building and develop a new one. Buildings that were once built for an operational time of fifty years, could count on a life expectancy of maximum twenty-five years (Gruis, Visscher, & Kleinhands, 2006).
In times of crises, when financial resources diminish and changing demands occur, the developers are forced to overthink their strategy. They could develop new flexible building with a higher future or make use of the current building stock. There is an imbalanced situation in the current real estate market of Amsterdam. An oversupply of offices has increase the current vacancy rates, while there is a screaming demand for housing. Adapted reuse of vacant office buildings could have a balancing effect. With minimal effort existing buildings could match the current demand(Geraedts & Voordt, 2008). The construction costs are the biggest cost of a development. Reducing the construction costs may result in a more profitable and accessible development.
Transformation may be a solution for this imbalanced market. This concept is not as innovative as we think. In Amsterdam canal houses changed to offices, warehouses became dwellings and fortifications transformed to accommodate trading activities.
Developers may try to find a balance between costs and benefits (Jowsey, 2015). When is this balance established, and is transformation applicable in every situation? Adaptations in the facade, climate design, construction, routing or new floor plans, may be solutions to dysfunctional buildings. The current functional, technical, economical and symbolic or social situation makes each building unique, which makes it very hard to come up with a standard solution to the mismatch in the real estate portfolio of various countries.

The decision-making process for determination of the right intervention strategy is a complex process and is based on a lot of unique values. Some developers claim that they just base their decisions on their gut feeling. This gut feeling should be a combination of knowledge and experience. It can be assumed that a developer with a portfolio of primarily transformation project would be more likely to choose a transformational related intervention strategy.
Each and every case is a combination of several aspects and can therefore be seen as unique. A standard solution for vacancy is therefore unrealistic. A quick-scan decision support model that would help to map possible solution for every unique situation could help to justify their decision in the initial phase of a project.

This research helps to determine the critical aspects involved in the decision-making process for certain intervention strategies. These aspects are quantified and linked into a comprehensive quick-scan decision support model for the determination of the potential of certain interventions strategies. The result of the model should help the user to map possible solutions for a current or future vacancy problem.

The theoretical research will form the foundation for this research. The literature review will summarise and discuss the existing knowledge concerning this topic. The generic part of the literature study will include a clear definition of the research.
The empirical research focuses on criteria and factors influencing the decision for a certain intervention strategy. This part of the research will test the finding of the theoretical research to practise. Both studies will conduct in a summary of criteria and factors concerning intervention strategies.

Delay
My graduation was postponed half a year because of a shoulder injury. During the time the economic situation changed drastically. The market situation improved and the ongoing economic crises ended. During this half year I started working at G&S Vastgoed, one of the leading real estate developers of the Netherlands situated in Amsterdam. During this period, I gained a lot of information concerning my graduation topic. I added a chapter to my thesis where I reflect my hypothesis, with the knowledge I gain during this period.

"Architecture should have little to do with problem solving - rather it should create desirable conditions and opportunities hitherto thought impossible." - *Cedric Price*

1.2 PROFILE & AMBITION

1.2.1 PERSONAL MOTIVATION

During my bachelor's, my passion for designing and developing grew. I did not understand the strict division between developing and designing. After several national and international work experiences I have come to the conclusion: developing and designing are too interconnected to separate these two disciplines A developer should always feel the need to develop something beautiful in a certain way. For years developers just built office buildings with little charisma knowing that, they would sell anyway. Architects should always design buildings are financial feasible.
I concluded that the country and its location with all its aspects create opportunities for a developer. This conclusion may also apply to the current economic crises in Europe. It forces us to rethink our current way of developing. The imbalance real estate market in Amsterdam increased vacancy rate of office buildings.
The vacancy rate is seen as a problem, but it also creates possibilities. Reusing building comments, may lead to cost reduction. By reducing the costs the risks of a project diminish, making project more accessible.
During a meeting in 'Pakhuis de Zwijger' hosted by the BNA, the Dutch Architectural Bond, several Architects and developers argued about the applicable intervention strategy for a certain vacant office building. Both parties agreed that transformation would fit best. The architects argued that redesigning the façade, interior and indoor climate, would lead to increase in value. However the developers, focussing on the financial aspects of the development, argued that a new indoor climate would be sufficient. Both parties have their own reflection about added value. In my opinion, the best intervention chosen would be a combination several aspects, in this case an increase of both architectural and financial value.
This was when I started thinking about a decisions support model for vacant buildings. Due to limited time u , I will focus on vacant office buildings in Amsterdam. I hope that this research will be continued so a DSM can be produced for vacant building in general, regardless of their primarily function or location.

1.2.2 PERSONAL VISION

The vacancy rate of office buildings in Amsterdam is one of the highest in the Netherlands and it is still increasing (Amsterdam, 2013). Adaptive reuse is a possible method for dealing with obsolete or structurally vacant buildings.
Other intervention strategies are consolidation, renovation, demolish & build or just sell the building (Wilkinson et al., 2014). In order to diminish the high vacancy rate in Amsterdam some intervention strategies are more implacable then others. The decision-making process of intervention strategies is complex and time consuming. Therefor most involved actors primarily base their decision on personal knowledge and experience and simplified models. After the decision for an intervention strategy the calculations become more elaborated. The use of simplified methods, concerning the most critical aspect in this process, is justified in the phase of the project. A simplified version of this decision-making process could be quantified and linked in a model. This DSM could help involved actors to quickly determine in applicable intervention strategies. By easing this determination process, involved actors are triggered to rethink possible intervention scenarios. When a potential feasible intervention is determined an actor may be more likely to intervene, resulting in a decreasement of the vacancy rate.
This research focuses on the possibility to simplify a certain decision-making process. This simplification is done by determination of the most critical aspects during this process. After determination of these aspects, the possibility to quantify these values and link them into a one comprehensive model is examined. This model should be assessable and user-friendly.
The research determines the critical decision-making aspects, making a simplification possible. There are several specialized models but lack of one comprehensive model that helps to determine potential intervention strategies. This research will help students understand this decision-making process. Decision making actors may justify their decisions, based on the result of the model.

1.2.3 DESIRED PROFESSIONAL PROFILE

I am really interested in the complete lifecycle of commercial real estate, from initiative phase to exploitation of a development project.
In order to gain the best result, I am convinced, that real estate developers and designers should intergrade their motivation and knowledge.
This result of this research clarify the decision making process in the initial phase of a project. The research should determine the critical aspects involved in this process. The model is a quantification of the causes and results of certain aspects. I will gain knowledge about this decision-making process and the possibility of simplification and quantification of the process.

1.3 RELEVANCE

1.3.1 SOCIAL AND ENVIRONMENTAL RELEVANCE

Structural vacant office buildings result in an impoverishment of it surroundings. The attractiveness of the site as a location for office-based organisations is negatively influenced and thereby the 'willingness-to-pay' in that area decreases making the building and its surroundings less valuable. When a neighbourhood becomes impoverished, criminality may rise and people will feel unsafe. (Koppels, Remoy, & Messlaki, 2011).

It is socially-economically irresponsible to demolish vacant office buildings after 20 years while they were once built for a technical lifespan of a minimum of 50 years. Firstly, because the initial investment of the building was calculated on the basis of a minimum lifespan of 50 years. Secondly, the building industry is the number one polluting and energy consuming industry (Bijleveld, Bergsma, Krutwagen, & Afman, 2014). By retaining as much as possible of the existing building, this can be minimized.

The aimed model should simplify the decision-making process in the initial phase of a project. The current decision-making process is sometimes seen as complicated and time consuming. Resulting in rushed decision based on previous methods. With the desired decision support model, it would be much easier to make quick decisions firstly between different intervention strategies focussing on transforming, and secondly which transformation fits best. This DSM would be most interesting for owners and investors.

1.3.2 SCIENTIFIC RELEVANCE

There is a need for one comprehensive decision support model that eases the decision-making process of different intervention strategies. The available models are to specify and only focused on some of the many aspects involved. The research should determine the most critical aspects involved. The effects of these aspects on the potential intervention strategies are examined. This should result in a simplified but useful model for the quick determination of potential solutions for a vacancy problem. The result of this research should indicate if simplification of a complex process is usable for this purpose.

The goal of the research was to quantify the critical aspects involved in the decision-making process during the initial phase of a project. The decision for a certain intervention is based on a combination of different aspects and ambitions. The research should result in a simplified, but usable and accurate, approach for a complex decision-making process of determination of an intervention strategy. This simplified method could quickly determine the potential of a vacant office building. This would encourage actors to intervene when vacancy occurs.

The aimed DSM will help students to understand the decision-making procedure concerning different intervention strategies and the possible solutions of transformation and will help building owners, and investors ground their decisions.

1.3.3 COMMERCIAL RELEVANCE

Models or Instruments that helps to determine the future function or a certain intervention strategy already exist. The problem with these models is that they are focussed on particular aspects within such a decision or are not user-friendly. The too focussed models, base their decision on specific values and neglecting other values. The decision for a certain function and/or intervention is a based on a cohesion of aspects. The aimed Decision Support Model is a quick scan method bases on all interrelated aspects and the users' ambitions. The model should be user-friendly, thus easy and quick to use. The model should be consistent in its output and be based on reliable values. The output of the model should be a summary of all interrelated aspects.

1.4 RESEARCH RESULT & SCOPE

1.4.1 SCOPE

One Comprehensive model - There is a need for one comprehensive decision support model (DSM) that compares different intervention strategies. This DSM should help owners and investors of vacant office buildings to decide if their vacant office building has transformation potential. If so, what transformation fits best and if not, what intervention strategy fits best.

This DSM compares the costs, benefits and risks of different interventions and it success while focussing on transformation intervention of vacant buildings in Amsterdam. Within this decision support model, the lifecycle cost and the environmental impact of various transformation are taken into account. The DSM will combine several models with knowledge gained from both theoretical and empirical research.

Each and every vacant office building is unique, making it very hard to design one comprehensive DSM. Existing models are focused on specific aspects of an intervention strategy and are ignoring other aspects. These models are therefore not usable for a realistic situation where all aspects should be involved. The aimed DSM should combine all aspects concerning intervention strategies for a vacant office building. The best solution is a combination of a potential and the ambitions of the decision-maker. The DSM should take the ambition of the user into account.

User-friendly - Lots of existing models are not user-friendly and are therefore barely used by involved actors. The DSM should therefore be easy to handle by layman without too much technical information. The aimed DSM should combine all aspects concerning intervention strategies for a vacant office building. The users ambition should be implemented in the model in order to conduct in a personal solution.

1.4.2 TARGET GROUP

The aimed model should help investors or building owners to determine possible intervention strategies as a solution for a vacancy problem. This model could also be interesting for other actors such as architects or developers.

The Transformation of the Bull tower to the Arena Tower, Amsterdam.

RESEARCH DESIGN | 2

2.1 RESEARCH PROPOSAL

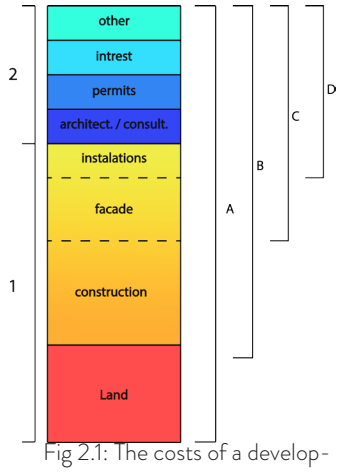


Fig 2.1: The costs of a development.(own material)

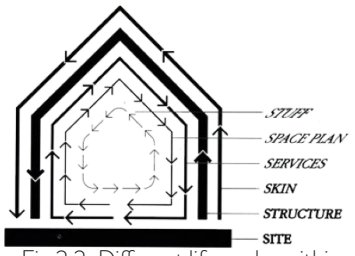


Fig 2.2: Different life cycles within a building (Brand, 1995)

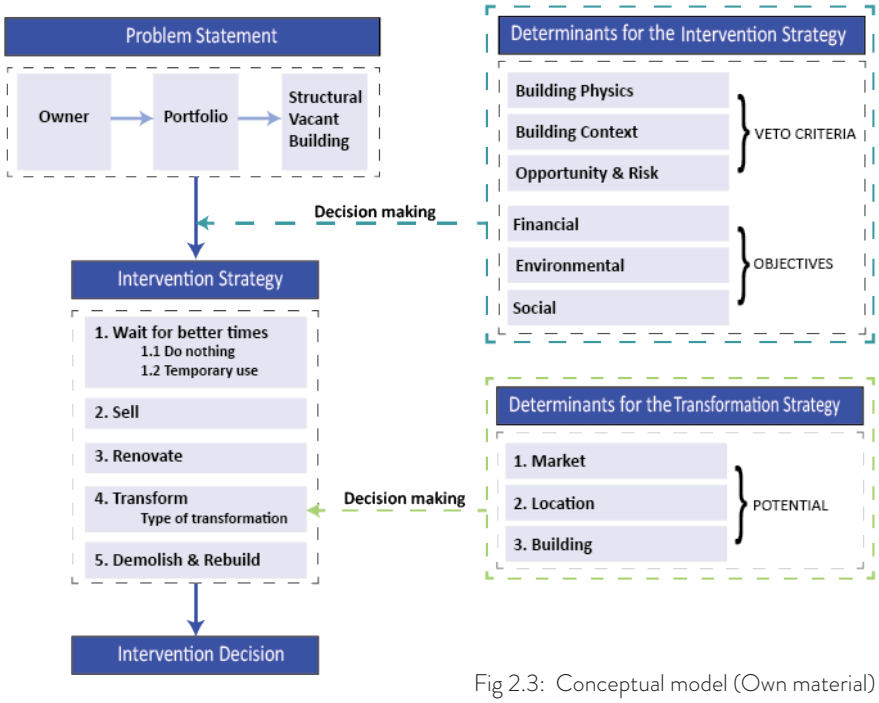


Fig 2.3: Conceptual model (Own material)

2.1.1 INTRODUCTION

The current vacancy rate of office buildings in the region Amsterdam is alarming (Amsterdam, 2013) A healthy market could have a maximum vacancy rate of 5%. The current vacancy rate in Amsterdam is 18,4% (DTZ-Zadelhoff, 2015). With a vacancy rate of 18,4% you can seriously doubt if the current office market is still healthy.

This vacancy rate leads to the impoverishment of certain areas of Amsterdam and has a negative effect on the economic development and may decrease the social and financial values for owners, users and its surroundings.

Additional to that this vacancy rate may have a negative effect on the image of these (sub-) municipalities. Aspects like the safety, public environment and the attractiveness of a neighbourhood can be influenced. Contemporaneous vacancy is a waste of scare building space in Amsterdam; a responsible use of space is essential (VNG, 2012). According to Keeris en Koppels (2006, p. 7) the current structural vacancy was not a problem in the past.

Causes of the current vacancy

According to Remoy (Duurzamer & Rakt, 2010) there are a few causes for vacancy:

- Firstly, the construction of new offices exceed of the number of the office demand.
- Secondly tenants would rather stay in new buildings with new office equipment and facilities. Companies are concerned about their location, image and charisma. This makes new office buildings more attractive to investors. The problem amplifies because lots of investors don't want to keep their assets up-to-date when tenants are still willing to pay (Koppels & Keeris, 2006). Municipality, that should prevent vacancy, may profit from this movement by selling and leasing land.
- Thirdly there is a new movement called "the new way of working". This way of working promotes flex working: there is no bounded office space, which saves office space.
- The final cause is, of course, the economic crises. Through the economic crises there are almost no new companies and the Dutch working population is still diminishing.

Different scales of problems (Remoy & Voordt, 2007, p. 1)

Economically: Vacancy has a direct financial impact on the owner of a building. A vacant building will hardly generate income and will therefore always cost money.

Socially: Vacancy brings problems of insecurity and social uncertainty and may give rise to

criminality; ranging from vandalism and graffiti to break-ins and illegal occupancy, which will lead to downgrading of the area.

Why should vacant offices be transformed and reused?
Every negative side has its positive side: it is plausible that by preserving parts of the building developers can save lots of costs and thereby diminish risk of a development. With the right adaption a building could fulfil the current market demands. The costs of a development can be roughly split up in: 1. Land, purchase of lease. 2. Construction, the main construction of a building. 3. The façade. 4. Installations of the indoor climate etc. 5. Architectural and consultant costs. 6. Permits. 7. Interest. 8. Other. These costs can be divides in 2 main groups: 1: 1-4 and 2: 5-8, where group 2 is depending on the costs of group 1. Without the purchase of land and the construction of the main structure, the two biggest costs are left out, making a development less expansive and risk full. There are examples where because of the condition of the building or other physical aspects, demolition is a cheaper option.
Transformation is a possible intervention when a building is structurally vacant and is assessed to be functionally obsolete while its technical lifespan is not ended. As a result of functional obsolescence, the building does not yield any financial benefits to its owner and is therefore also considered financially obsolete (Remoy, 2010).

What makes transformation a good option for dealing with vacancy?
A transformation is only one of the possible ways to deal with vacancy. The owner of a vacant office building can also choose for other intervention strategies: have it demolished, renovated, sold or he could wait for better times (Remoy & Voordt, 2007). As stated above, there is an oversupply of office buildings at the moment. By decreasing the oversupply of offices and thereby increasing for instance the housing market the buildings can be reused.

What influence the transformation potential of office building?
Market: The longer the time a building is vacant, the more likely its owner would like to transform it. In the beginning of vacancy the owner will probably wait until new leasers apply.
Location: The location is leading the buildings potential. What are the specific demands on that location?
Building: Just like the location, the structure of a building can bring opportunities or exclusions for certain building programmes. A developer should always look for the opportunities in a case not the defects.
In the appendix 1 a table for the transformation potential can be found (Geraedts & Voordt, 2002).

2.1.2 PROBLEM STATEMENT

The current vacancy rate in the office market is alarming. This vacancy rate in Amsterdam has reached a maximum of 18,4%. Contradicting to the high vacancy rate of the office building in Amsterdam is the a shortage of (Huikenshoven, 2016a). The municipality of Amsterdam wrote a commandment in order to diminish the structural vacancy and to condole with the rising demand for housing. This commandment obliges real Estate owners to report structural vacancy. In order to diminish the vacancy rate, the municipality of Amsterdam strives to transform of demolish all vacant office buildings.
Because of the complexity, the right decision for one of the intervention strategies is often too hard for non-developers. There are several models that support different objectives but there is not one comprehensive decision support model that supports the decision for the right intervention strategy. The size of the project and the range of financial, planning, legal and regulatory consequences are often so complex that a layman cannot do without the expertise of a developer (Harmsen, 2008).
The current decision-making process is often seen as complicated and time consuming. This results in rushed decisions, based on previous experience. There is currently no quick-scan model that could clarify the best solutions for a vacant office building. Such a model should simplify the decision-making process in the initial phase of a project. A quick scan decision support model it would be much easier to make quick decisions firstly between different intervention strategies focussing on transforming, and secondly which transformation fits best.

2.1.3 RESEARCH QUESTIONS

Research Question – To what extent can a decision support model, based on simplified and quantified critical aspects, help in the decision making process for intervention strategies of vacant office buildings in Amsterdam?

The aimed result of the research is a comprehensive list of critical aspects involved in the decision-making process for certain intervention strategies. The common decision-making process is depending on an extensively number of aspects. A simplified approach, using only the most critical aspect, would result in a quick determination of potential of different intervention for vacant offices in Amsterdam
These critical aspects are quantified and when possible linked into a quick-scan decision support model resulting in a quick and simplified version of this decision-making process. The determine potential of possible interventions in the initial phase of a project.

Sub-questions
The sub-questions are divided in related themes.

Generic & Describing – General information clarifying the basics of this research
- What are the main principles of the Dutch Real Estate market?
- What types of vacancy are harmful for the Dutch real estate market?
- To what extend could a decision support model result in a solution?

Determination of intervention strategies
- What are the types of intervention strategies?
- What are the conventional specific interventions?
- What aspect influences the potential for an intervention strategy?
- What aspects should be included in a decision support model?
- What are the drivers of a business-strategy?
- Are the involved actors quantifiable?

2.2 RESEARCH APPROACH

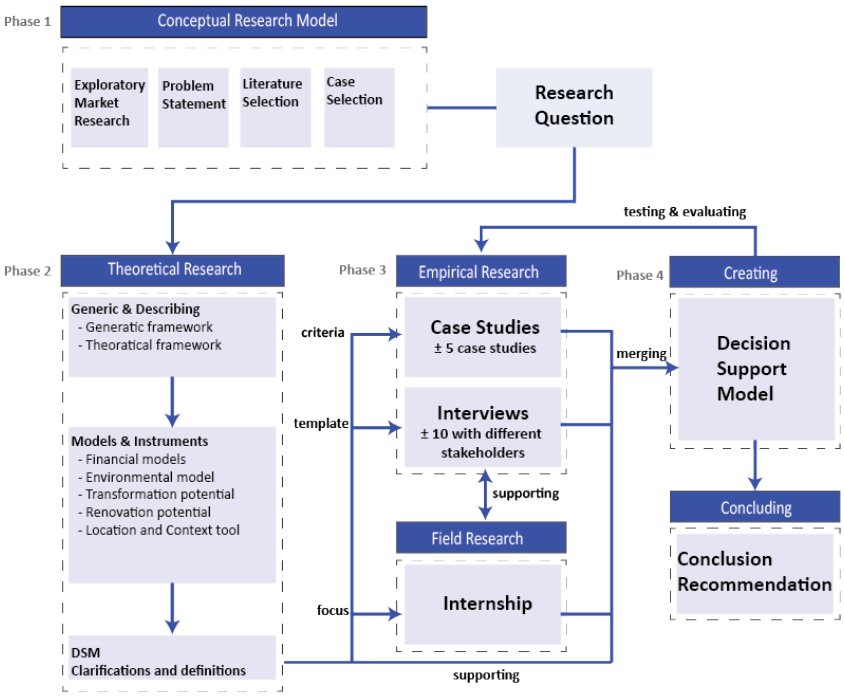


Fig 2.4: Methodology research model (Own material)

2.2.1 CONCEPTUAL MODEL

The first part of the conceptual model is the problem statement: An owner has a structural vacant building in his portfolio. Structural vacant buildings are a problem for the building owner; vacant buildings cost money.
Intervention is needed: The owner of a vacant office building could wait for better times (consolidation), sell it, renovated it, transform it or demolish and built a new building (Remoy & Voordt, 2007).
The decision for these intervention strategies is depending on decision-making aspects. These aspects could be quantified to function related criteria. These criteria could help to determine a function potential or exclude a function by veto. The chosen decision for a certain intervention is a combination of function potential and the companies' ambition.

First step is to determine the potential of different intervention strategies. The goals of certain interventions strategies are:
- Consolidation: Just wait for better times or try to find a temporary solution.
- Sell the building: Sell the building for the best price.
- Renovate the building: If the buildings physics do not meet the current demands but the market is still positive the owner may choose for a renovation.
- Transform the building: The decision for a certain transformation is depending on the current market, the buildings' location and the buildings physics.
- Demolish & newly build: If none of the above strategies is applicable on the building, the owner may choose to demolish and rebuild it.
The previous step will support the building owners' decision for an intervention strategy. If the decision for a certain intervention is made, new aspects should support the decision for a specific intervention. The model should address to the reduction of the vacancy rate. Selling the building would solve the users problem, but would not address to the decrease of the vacancy rate. Nevertheless, the model could help to determine the future value and thereby the price of a vacant building. Consolidation would neither reduce the vacancy rate. Therefor selling the building or consolidation is left out of consideration.

What critical aspects address to the success of an intervention strategy?
The aimed decision support model should examine relevant existing models. Different aspects should be considered before considering a certain intervention strategy.

The intervention potential is depending on the following aspects:
- Veto criteria: criteria which could lead to exclusion of a certain function or intervention strategy.
- The objectives of the owner: What are the preferred objectives of the owner?

If there is potential for a transformation, a decision for a certain transformation should be made:
- Market: What are the current market demands?
- Location: What are the demands and characteristics of the buildings' context?
- Building: What are the specific building characteristics and qualities.

2.2.2 METHODOLOGY

A qualitative and quantitative comparative design strategy will be used for this research, where a practise research cross test theory. This research may be divided in three different parts:

1. Theoretical research: A comprehensive literature study, this theoretically knowledge will form the foundation for my research. The goal of this theoretical research is to determine involved aspects during the decision-making process of intervention strategies. This theoretic research concludes in a theoretical framework.

2. Empirical research: The empirical research evaluates the theoretical framework. This will determine, according to practice, the most critical aspects involved. The empirical research is combination of cases studies and expert interviews.

3. Creating: A Decision support model (DSM) will be created. This DSM will support the decision for certain intervention strategies.

This first goal of the research is to determine the critical aspects involved in the decision-making process for certain intervention strategies. After determination of these most critical aspects, the possibility to simplify this process is examined. When possible, these aspects are quantified and linked into a comprehensive quick-scan decision support model for the determination of the potential of certain interventions strategies. The result of the model should help the user to map possible solutions for a current or future vacancy problem.

2.2.3 METHODOLOGY RESEARCH MODEL

The methodology research model can be found in figure #.

EXPLANATION OF THE METHODOLOGY RESEARCH MODEL

Phase 1: A brief exploratory market research is done. This research concludes in a problem statement followed by a literature selection for the theoretical research and some case selection criteria. The conceptual research conducts with a main research question.

Phase 2: A theoretical framework is made. This framework consists out of a generic and a research specified part. The goal of the generic part of the literature is to form a base for the research. Knowledge of general principles is essential for further research. The aimed comprehensive decision support model should include all critical aspects. The literature study should conclude in a comprehensive list of possible aspects. These aspects should relate to: Financial, social, environmental, risk, opportunity, and the building context. Several existing models related to this decision-making process are examined. The theoretical research should form the basis for further research, help to focus on the right subject during the internship, create a template for the expert interviews and establish case selection criteria.

Phase 3: The empirical research determines if the theory and practice match. If so, where and how, if not why does it deviate? In the case studies are focuses on three main themes: market, location and building.

Phase 4: The determined critical aspects are quantified and linked into a quick-scan decision support model. This DSM is validated by the case studies; the model is assumed useful when the results given are realistic

2.2 RESEARCH APPROACH

2.2.4 INTERVIEWS

The interviews are the main source of information for the empirical research. This chapter can be divided in two examinations. The first examination focusses on transformed project and the second on decision making aspects in general according to experts. The interview is kept as a combination of case related interviews and expert interviews. When a stakeholder is not case related, only the expert interview is kept. The interviews are kept semi-structured to leave some undivided space for answering.

The case related interviews should clarify the decision making process and focusses on the critical factors involved within a particular case. The interview is kept to gain the most relevant case related information as possible.

The expert interviews focus on transformation in general and should give more information about the motives behind transformations. This part also includes a list of criteria. This list is used in the DSM for an extra weigh factor. The interviewees where asked to give an opinion about the importance of a certain aspects of a transformation project. A list of the interviewees and a short introduction can be found in appendix 1.

A combined summary of all the interviews given, the persons and companies behind different opinions will stay anonymous. The interviewees where asked to give their personal opinion and this may differ for the company's policy.
An interview template is created to list different opportunities of different types of stakeholders. This template is used as guidance for the interview but will not take a leading role. The template can be found in appendix 8.
The interview consists out of different parts with different interview methods.

1. Introduction of the survey
A brief introduction about the interviewer, the topic of the interview and the structure of survey. This part consists out of a set of personal questions about the interviewee.
2. The general part
Open questions about transformation in general. The goal was to inventory the opinion about the general aspects of a transformation.
- The cause of the rising transformation intervention strategy.
- Factors and criteria involved in a transformation.
- The relation between sustainability and transformation
- Financial aspects
- The position of the government towards transformation
- The process of a transformation project
- Different types of transformations
- The potential success of a transformation

3. Criteria and factors
The interviewee is asked to assess the aspects of degree of importance.
A five-point-scale is used with 5= very important and 1= unimportant
4. Case related questions
This part consists out of a set of case related open questions in order to substantiate the case studies.
5. Decision Support Model related questions

2.2.5 RESEARCH PLANNING

Due to my shoulder injury, my planning got delayed. The original planning is shown in figure #

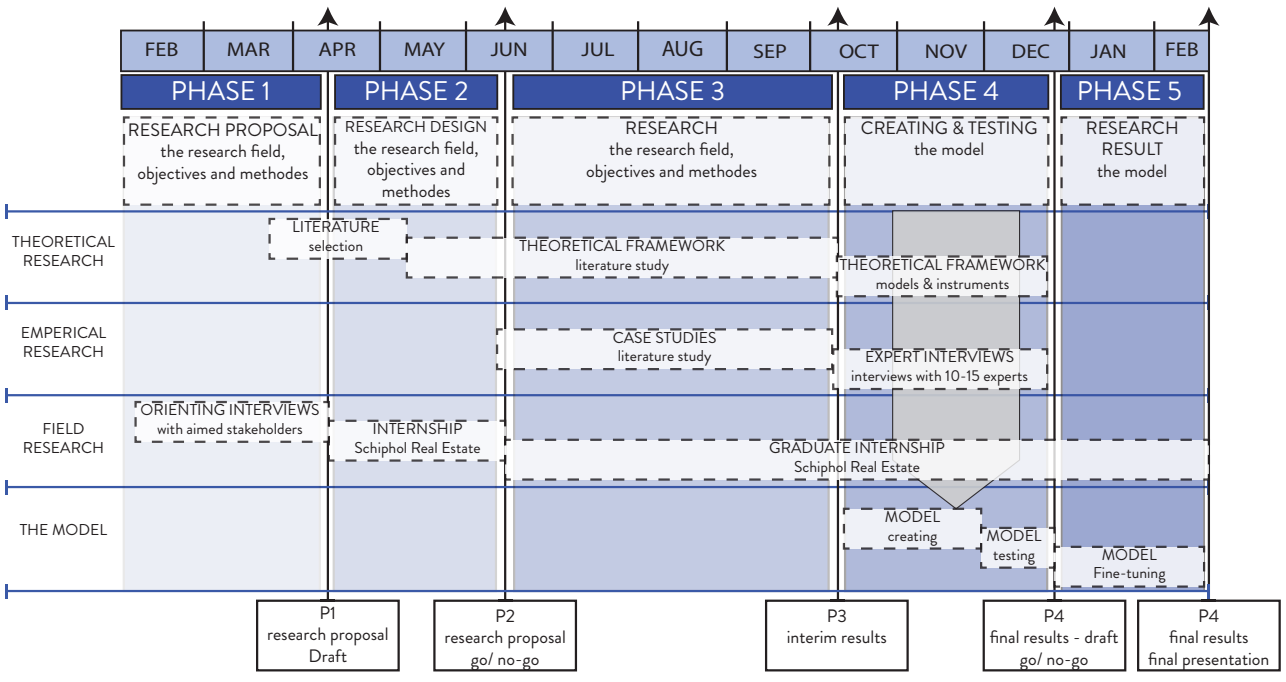


Fig 2.5: research planning (Own material)

The Transformation of the Molenwerf, Amsterdam.

THEORETICAL RESEARCH | 3

3.1 GENERIC FRAMEWORK

DEFINING ADAPTIVE RE-USE / TRANSFORMATION

Adaptive re-use has become an essential strategy to alleviate the financial, environmental and social performance of buildings (Wilkinson et al., 2014)The Department of Environment and Heritage (2004) defines adaptive re-use as "a process that changes a disused or ineffective item into a new item that can be used for a different purpose".

ADAPTATION AND SUSTAINABILITY

The re-use and adaptation of office buildings has become a trend within the built industry (Bullen & Love, 2011). Today, adaptation and upgrading building accounts for between 50 and 70 per cent of the building work (Cramer & Breitling, 2007) and because of economic and environmental requests, adaptation has gained great importance.

It is a process that gains benefits of the manifested energy and quality of the authentic building in a sustainable way (Bullen & Love, 2011). Increasing a buildings life through re-use might lower material, transport and energy expenditure; thus it is an addition to the sustainability (Bullen & Love, 2011). Also, there exists a growing perception that the conversion of old buildings to new uses is cheaper than demolishing and rebuilding them. Shah and Kumar (Bullen & Love, 2011) state that – in the case of significant public buildings – the buildings' life could extend in surplus of 80 years, where adaptive re-use will play an important role in meeting modern requirements. Still, initiatives that focus on the sustainability of office buildings tend to prefer new construction projects instead of existing buildings, because old buildings are seen as "products with a limited useful life that have to be outmoded and destroyed eventually" (Bullen & Love, 2011). But most of the existing buildings will be in use for another hundred years and able – through adaptation and conversion – to suit new conditions.

The adaptation process gains benefits of the embraced energy and authenticity of the building in a sustainable manner (Bullen & Love, 2011). This can be achieved by expanding of the building its life through re-use. They see sustainability as a change process with particular actions to strengthen system infrastructure and innovation attributes that is on-going and cyclical. For conversions to be made during the adaptation process, an environment has to be created that is receptive to innovations. Shediac-Rizkhallah and Bone (1998) describe capacity-building as a determinant of sustainability, more than an outcome. Green and Plsek (2002) and Hall and Ford (2001) state that systems have a culture that may be resistant to change. When this is the case, capacity-building actions must be adapted. Johnson et al. (2004) believe that a sustainable innovation should also benefit to the stakeholder(s) prior to adoption and after the implementation.

MOTIVES FOR TRANSFORMATION

The motives to convert office buildings to other uses – like housing - are social, economic and environmental. Beauregard (2005) and Heath (2001) state that one of the social motives is the revived appeal for city centre living. Adaptation benefits urban intensification, has embodied energy and boosts the use of public transport. Building adaptation is a crucial part of sustainable development, where a glance of the past is allowed. A Hong Kong study states that adaption can expand value. The influence of renovation on high-density residential property demonstrates a 9.8 per cent increase in value when compared to identical un-renovated property (Chau et al., 2003). Whilst in Amsterdam, older buildings are left empty for new buildings and the vacancy is fixated where the obsolescence arises. Chandler (1991), Ball (2002) and Remøy (2010) state that older properties remain vacant and occupy rare ground.

CRITICAL ASPECTS FOR ADAPTATION

Remøy and Wilkinson (2011) researched the viable transformation of office market to residential use. Their research analysed the transformation, the capacity of sustainable retrofit and a number of important aspects in adaptation. The starting point for their study was to use adaptation aspects identified as critical decision-making factors (Remøy and Van der Voordt, 2007; Wilkinson and Reed, 2011). In Amsterdam, five case studies were initiated and eventually revealed these aspects that clarify the viability of the transformation.

First of all, the physical attributes: all five buildings contained a wide frontage and shallow depth, findings that occurred in other studies as well (Remøy and Van der Voordt, 2007b). The building depth is found important for transformation potential. Deep plan buildings do require an internal corridor entrance and have a problem concerning sufficient daylight admittance – direct sunlight is an important requirement for housing in Northern Europe. Besides building depth, a high level of flexibility (a structural frame comprising beams and columns), a high level of accessibility (makes construction easier to manage) and a main entrance located centrally (with emergency exits at each end of the building) were found as important results.

Location is the second – and most – critical decision-making factor. The buildings are all centrally located: near public transportation, facilities (commercial and social) and located in mixed-use areas. According to the developers, location was the most important benchmark in the determination to convert. The uniqueness of the building is the main reason why a lot of developers embrace adaptation. "Location, location, location" is always the first and most important consideration for each development plan (Yeung Yee Mei, 2011). The right location and protected historical aspects are success factors of adaptation.

The legal and social aspects also contribute to the decision-making process. The buildings are all post-war office buildings, classified as characteristic urban sceneries. They had contributed to the history of Amsterdam's urban development. Three out of the five cases were classic 1970's office buildings with long horizontal sliding windows and concrete façade elements – perceived as unattractive and associated with high vacancy rates (Remøy, 2010). These façades were altered and upgraded to fit modern requirements like energy use, and made the apartments appealing to the target buyer group.

The buildings have a lot in common when it comes to the age facet; all five buildings were constructed during the early 1970's. Most office buildings were advanced in small-scale office areas or mixed districts and were more than thirty years old when the transformation started. To continue the use of the offices, the physically out-of-date buildings needed transformation.

The last criterion, occupants and owners, shows that large banks or public agencies – not built as investments but for the owners' use, owned the buildings. This has found to be an important facet, as (owner-)occupants do not expect high returns on outdated buildings (Remøy, 2010; Van der Voordt et al., 2007). According to the developers, three transformations have made the buildings fit for

transformation: standard measurements, high floor-plan flexibility and replaceable facades.

DRIVERS AND BARRIERS OF ADAPTATION

Whilst Remøy and Wilkinson (2011) state that physical attributes, location, legal and social aspects, age, occupants and owners are critical for adaptation, Bullen and Love (2011) reveal that the most important drivers for adaptation are lifecycle issues, changing perceptions of buildings and governmental encouragement. Furthermore, they explain that the barriers to adaptation, on the other hand, involve increased maintenance costs, building regulations, development criteria and the constitutional risk and uncertainty that are associated with older buildings. Shipley et al. (2006) also identified barriers that included: a greater degree of uncertainty (unexpected costs), difficulty in implementing modern standards with the existing structures and the lack of experienced labour. Heath (2001) adds that dealing properly with the physical legacy of the past is a challenge, but that the transformation of existing buildings opens up opportunities for entrepreneurs. Entrepreneurs can utilize obsolete buildings to fit the needs and desires of the present. Jacobs (1961) identified that "time makes the high building costs of one generation the bargains of a next generation" and that "time makes particular structures out-of-date for some businesses, so they turn available to others".

INTERVENTION STRATEGIES

When structural vacancy occur a owner or investor could chose for a certain intervention strategy. The decision-making actor could choose to wait for better times (consolidation), sell it, renovated it, transform it or demolish and built a new building (Remoy & Voordt, 2007).

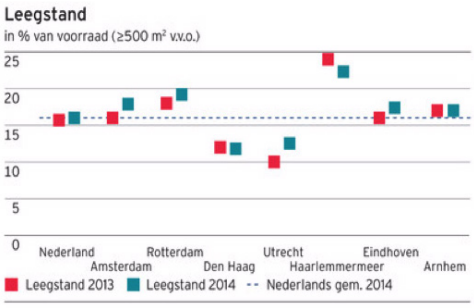
- **Consolidation**: Just wait for better times or try to find a temporary solution. The owner decides not to invest in an intervention strategy and hopes to lease it in the current situation. The attraction a new leasing party is not very likely, since cause of vacancy is still present.
- **Sell the building**: Sell the building for the best price possible. This intervention strategy may be a result of a changing real estate strategy or a quick way to generate money.
- Renovate the building: When the buildings physics or confines do not meet the current demands for an office function, the owner may choose to renovate to meet these demands.
- **Transform the building**: The decision for a certain transformation is depending on the current market, the buildings' location and the buildings physics. A change of function would result in a transformation intervention.
- **Demolish & newly build**: When the market and location analysis propose a function that could not be housed in the current building, the owner may choose to demolish it and built a new building.

TRANSFORMATION STRATEGIES

There is a nonstop tension between interventions to make sure that the future use of the building and the preservation of the historic structure are guaranteed (Plevoets & Van Cleempoel, 2011), especially when it comes to buildings that cannot be used anymore for their initial function and have to be used for a different function. When a new function is introduced to a historic building, the awareness of the values attributing to the building is fundamental in order not to damage the authenticity of the building (Plevoets & Van Cleempoel, 2011).

Brooker & Stone (2004) defined three strategies that can be applied by developers while transforming existing office buildings: intervention, insertion and installation. With the 'intervention strategy', they mean the activation of the potential or repressed meaning of the building by interprets, clarify or uncover. With the intervention strategy, the old and new are completely twisted and are not able to exist independently from each other. With the 'insertion strategy', they mean the establishment of an intense relationship between the existing building and the adaptation, yet allowing the character of each two to exist independently. With the 'installation strategy', Brooker and Stone (2004) mean the heightening of awareness of an existing building and the combination of the old and new – without intruding each other. Brooker (2009) ads that, in case of adaptation, the new cannot exist without the 'old' (the original building), but the strategy can be applied to emphasize or suppress the place its history.

3.2 THEORATICAL FRAMEWORK



(DTZ-Zadelhoff, 2015)

Fig. 3.12 Space market Categories (Floyd & Allen, 2002)

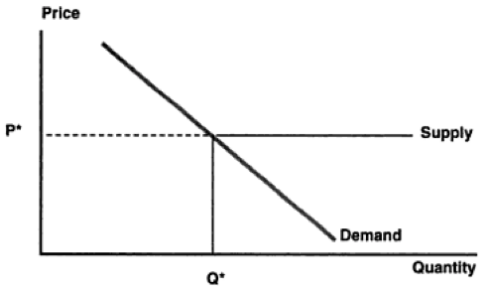


Fig. 3.13 Supply and Demand curve of a homogenous market (Floyd & Allen, 2002)

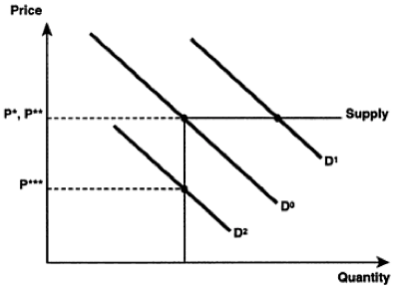


Fig. 3.14 Impact of demand changes in a real estate market (Floyd & Allen, 2002)

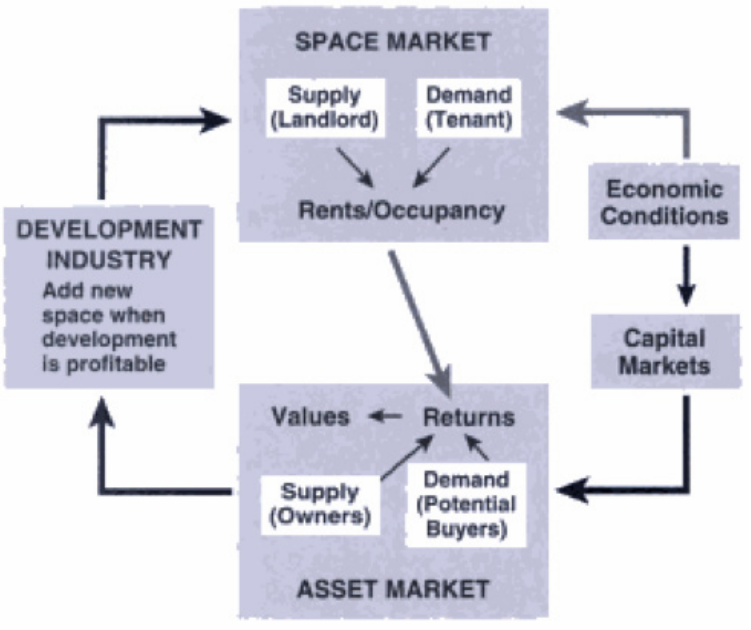


Fig. 3.15 The Real Estate Mechanism as whole. (Floyd & Allen, 2002)

3.2.1 THE REAL ESTATE MARKET

This chapter elaborates on the basics of the Dutch real estate market and focussing on the office market mechanism.
By definition, a market is the mechanism or arrangements through which goods and services are traded between market participants. Applying this concept to land and buildings, we can classify real estate transactions into real estate space markets or real estate asset markets. (Floyd & Allen, 2002)

REAL ESTATE SPACE MARKETS

The product of the real estate space market consists of land and buildings. On the supply side of this market there are stakeholders who own land or buildings and are willing to sell or rent these. This space can be consumed or be used for production proposes by the demand side. The demand side consist of people firms or other entities that are willing to pay for space. The prices for the use in the space market called rent. Different users may have different demands and requirements of the type of space and location. Because of these requirements on the demand side the real estate space markets are highly segmented and make the market regional and not national or international. For instant within the office in the Netherlands two regions geographically close can have totally different market situations. Figure 3.11 the vacancy rate of the office market in 2014 is shown. The area of Haarlemmermeer and Amsterdam are geographically close but the markets are not alike.
Real estate space markets can be categorized by property usage and by geographic boundaries. Floyd & Allen (2002) are dividing Real estate market into major segments which are then categorized. The office market is divided four categories as shown in figure 3.12;
Class A, B, C & D.
- Class A: Highest rents per square meter due to their high-quality and/or superior location.
- Class B: Desirable buildings but lacking on certain attributes.
- Class C: Acceptable both physically and in amenities because of the cost-effective space to tenants who are not particularly image-conscious.
- Class D: Very few amenities and poor locations and/or physical conditions.

THE REAL ESTATE SPACE MARKET

The real estate space markets can be explained by the supply and demand curve or the price elastic. With less demand, the prices will drop and the other way around as shown in Figure 3.13. This curve only applies on a homogenous

market. Within this diagram different segments cannot be distinguished.
In figure 5.14 the same curve with a changing demand is shown. At T0 the price is P* and the demand is D0. While de demand (D1) increases developers will react and produce new offices and the price (P**) will stagnate. If the demand decreases (D2) the price will decrease. A normal reaction of building owners is to "tear down their buildings" in order to keep the price high.
This is a direct quote given by Floyd & Allen (2002) in a book used for study material for the Master Real Estate at different universities. This regulation of market prices causes a price bubble on the real estate market. Besides demolition there are more social-economical responsible options to decrease the office supply.

THE REAL ESTATE ASSET MARKETS

The real estate asset market reflects the cash-flows rights to real estate (Floyd & Allen, 2002). The asset of this market is the claim of the cash flows that the real estate space market, buildings and land, may create in the future. The value of these buildings can be sold in parts or as a whole on the asset market. Companies or private investors can buy bonds that represent values on the real estate space markets. For instant investors can buy private people's mortgage for a price equal to the depth of this mortgage without the interest that this depth should gain. Essential for this trading is that 1: the value of this mortgage is representable for the value of the asset and 2: the private person is able to pay for this mortgage with interest (Floyd & Allen, 2002).

THE REAL ESTATE MARKET MECHANISM

In figure 3.15 the real estate market mechanism as a whole is illustrated. In order to understand the real estate market it is important to see both the space and asset market as one mechanism. The space market, the asset market and the development industry is interrelated and should react on each other.

A REAL ESTATE MARKET ANALYSIS AS A TOOL TO PREDICT FUTURE DEMANDS

A market analysis is an examination of the supply and demand sides of a real estate space market segment and the equilibrium of those two. A goal of an analyst is to assist in making the best real estate decision (Floyd & Allen, 2002). I the scope of my research such an analyst can be used to answer de following question; to what type of function should this vacant office transform? The next question will be " what requirement suit this function?" Followed by "what transformation fits best to accommodate this function in this vacant building?"
According to Geltner (2007) a real estate market analysis focuses on a set of variables that would characterize the supply and demand sides of the market segment and the equilibrium between those two. The most important variable in this research is the vacancy rate.

$$\text{vacancy rate} = \frac{\text{vacant space GFA (m2)}}{\text{total office space GFA (m2)}}$$

The vacancy rate is described by Geltner (2007) as the measure of the amount of unoccupied space as a percentage of the total amount of space in the market.
Others are:
2. Rent or price level
3. Quantity of new construction starred
4. Quantity of new construction completed and
5. Absorption of new space.
Combining those five different variables will resolve in the following formula:

$$\text{Months Supply} = \frac{\text{vacant space + space in construction}}{\text{net absorption per moth}}$$

3.2 THEORATICAL FRAMEWORK

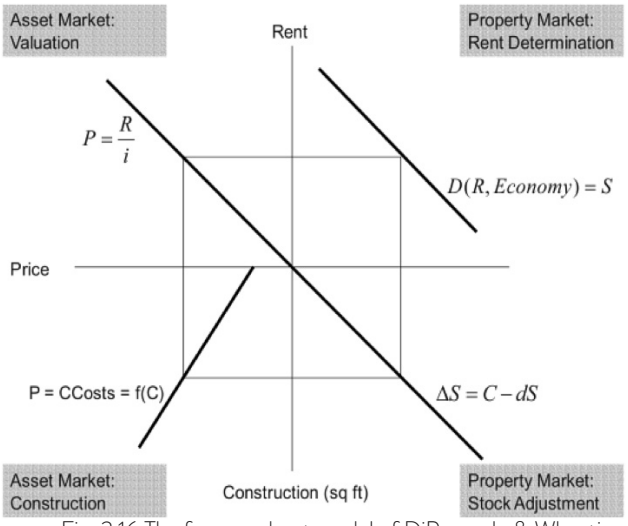


Fig. 3.16 The four quadrant model of DiPasquale & Wheation (Bonner, 2009)

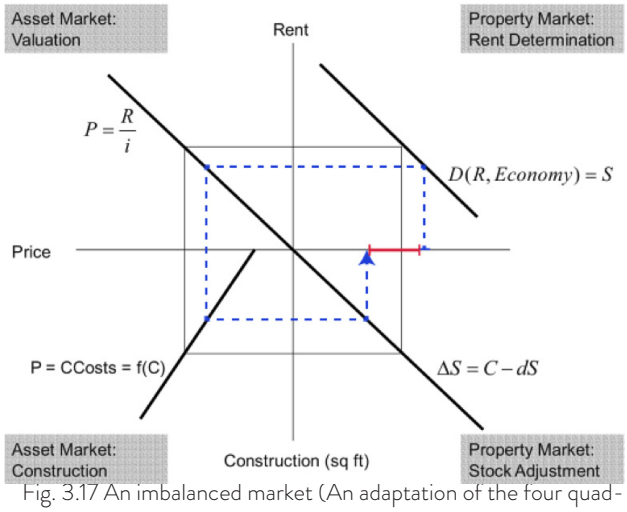


Fig. 3.17 An imbalanced market (An adaptation of the four quadrant model (Bonner, 2009)

Test	Determined by
Economic demand	Market analysis
Physically possibility	Building analysis
Legally permissible	Building & Location analysis
Financial feasibility	Scenario analysis
Maximal productivity	Combination of all above

Table 3.1: Conditions for an optimal HBU (Own material)

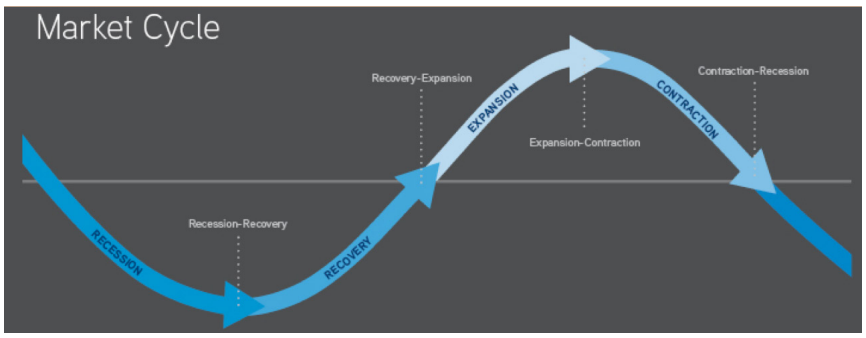


Fig. 3.18 The Market Cycle (www.coydavidson.com)

3.2.2 THE FOUR QUADRANT MODEL OF DIPASQUALE & WHEATION

Another more integral model is the model of DiPasquale & Wheation. The four quadrant model of DiPasquale & Wheation shows the relationship between the real estate space and asset markets and the implications of market mechanisms on the total real estate market (Bonner, 2009, pp. 13-16). The property market on the right part of the model are representing the space market, the left part is representing the asset market. The four parts of the model are four equations, starting with 1 right above and moving counter clockwise.

Equation 1: D(R,Economy) = S (Rent and stock of space)
Where in equilibrium, the demand of space, D, is equal to the stock of space, S. The rent (R) must be determined in a way that demand is the stock. So D is a function of R. The rents are determined in the short run and thus the demand for space.
Equation 2: P = R / I (the rent to price ratio)
The capitalizations rate for real estate asset market. This rate presents the current yield that investors require to invest in real estate assets. This rate is determined by four influences: the long-term interest rate in the economy, the expected growth in rents, the risks associated with that rental income stream, and the treatment of real estate in the respective federal tax code.
Equation 3: P = CCosts = f(C) (construction of new assets)
F(C) is the asset market curve and the CCost the replacement costs of real estate. The price and constructions cost must be equal since both are a function of the construction level C.
Equation 4: ΔS = C – dS (the construction and stock of the real estate space market)
The new constructed stock form equation 3 is transformed into the long-run stock of real estate space. ΔS = 0 and S = C/d.

In figure 5.16 there is an equilibrium between the real estate space and asset market. In equilibrium, the price of the real estate will be valued at replacements costs (Hendershott, 1994). When replacements cost exceeds the value again the construction will increase. Until the value is equal to the building costs.

With no equilibrium this model there will be an imbalanced market. An imbalanced market would result in an oversupply; with an undersupply the market will react on the construction side of the model (equation 3). When an oversupply accurse this will result in a decrease

of the rent price (equation 1) followed by a decrease in price (equation 2), a decrease of the construction of new stock (equation 3). With a decrease of the construction the market should get back in equilibrium because of the stock adjustment (equation 4). According to Floyd & Allen (2002) an faster method to reach a equation is to demolish the overstock

3.2.3 HIGHEST AND BEST USE APPROACH

Geltners' highest and best use (HBU) theory (Geltner et al., 2007) is based on the urban Form; The physical spatial characteristics of a city. This contains the patterns of the locations of different land uses, such as residential commercial and industrial within the city. Land value plays the key role in determining the shape of the long-run supply function and this governs the trend in rent. Land value is therefore the most fundamental defining characteristic of real estate.

DEFINITION OF HIGHEST AND BEST USE

The highest and best use generally is the optimum use to which land or improved property can legally put. It is also that available use or most probable use alternative that results in the highest present land value.

Test	Determined by
Economic demand	Market analysis
Physically possibility	Building analysis
Legally permissible	Building & Location analysis
Financial feasibility	Scenario analysis
Maximal productivity	Combination of all above

The HBU conclusion must be logical, and there must be economic demand for this use (Carr, Lawson, & Schultz, 2003, p. 114).

The HBU is (1), physically possible, (2) Legally permissible, (3) Financially feasible, (4) Maximally productive (Carr et al., 2003, p. 114). Analysis can determine these actors. Table shows the aspects and the interrelated analyses.

LOCATIONS AND THE RESIDUAL NATURE OF LAND VALUE

In contrast to other goods obtaining land is a necessary input or factor of production. Land is necessary for any building construction and the location for the type of production. Geltner makes a distinction between mobile factors and land. Geltner (2007, p. 62) gives a simplified example of the residual theory of land value. The type of product and the revenue of the production process will determine the location. The location of the land is depending on the mobile factors of its production. The mobile factors are the factors that will move away if some other company gives a better price. In other words you cannot save on this costs. Geltner (2007, p. 61) uses as an example the production process of clothes. Mobile factors in this example are the costs of labour, energy and raw material, the leftover is for the budget for the location.

COMPETITION, EQUILIBRIUM, AND HIGHEST AND BEST USE

Economics (Geltner et al., 2007, p. 62) note that residual theory of land is a bit simplified and leaves out factors like competition of both land and mobile factors. Land is considered to be unique but different plots will have similarities. Location or buildings are not flexibility on short term but can still be flexible over the long run.
The tendency of markets tends to move toward equilibrium between supply and demand. Equilibrium is defined by Geltner (2007, p. 62) as the condition in which the market does not need to adjust the level of output any further. In this equilibrium all the customers and producers are satisfied with the level of consumption and production. The demand and supply curve are in balance and this resolve in equilibrium prices. One condition to this equilibrium is that each factor of production will be paid an equilibrium price equal to its marginal product, that is, equal to the marginal value of what it contributes to the production process (Geltner et al., 2007, p. 62). This theory is known as the "Euler's Theorem". To keep this equilibrium, it is not possible for one side of this market to gain more profit without diminishing the other parties' profit. This second condition is known as the Pareto optimality. In the case of a landowner this will result in receiving the highest price willing to pay by an user. Another condition in this case is that the user prefers this location above another location with the same price.
The Highest and Best use principle result in that each site used in a way that it is most productive for that location. The productivity is represented by the net difference between the value of what is produced on the site and the costs of the mobile factors of production, that is, the land residual as Geltner (2007, p. 64)describes it.

3.2.4 THE MARKET CYCLE

The office market can be seen as a cycle or wave. History has shown that the real estate market is a continuous cycle, were recession, recovery, expansion and contraction are alternating (Nicolais, 2014). This cycle can predict the next downfall. "The next major bust, 18 years after the 1990 downturn, will be around 2008, if there is no major interruption such as a global war."Fred Foldvary (1997)

3.2.5 TYPES OF VACANCY

There are different types of vacancy and not every type is harmful for the current office market. According to Keerins and Koppels (2006) vacancy can be divided in four different types of vacancy: initial-, friction-, conjuncture-, and structural vacancy. Another and more contemporary type of vacancy is the hidden/shadow vacancy (Hersier, 2010). The first three vacancy types are normal vacancy in the market mechanism; the last two can be seen as harmful for the market mechanism. In figure 3.19 the market mechanism of the Amsterdam office market between 1987-2010 is shown.

Initial vacancy - This is the vacancy that accurse when a construction of new office is complete. The initial vacancy is a normal phenomenon and is mostly around the 1 – 2% of the total office stock.
Friction vacancy - The friction vacancy is necessary for the market to allow movements of tenants. The friction vacancy is called "healthy" with a vacancy rate of 4 – 5%. During an unhealthy market this 4-5% should be added on top of the structural vacancy.
Conjuncture vacancy - The conjuncture vacancy is normal and is a result of the change in demand and supply curves. Within a healthy market the demand and supply will always fluctuate.
Structural vacancy - We speak of structural vacancy if the office is ready and vacant for more then three years. In this report structural "vacancy" will mean structural vacancy.
Hidden/shadow vacancy - Hidden vacancy is a result of expiring

3.2 THEORATICAL FRAMEWORK

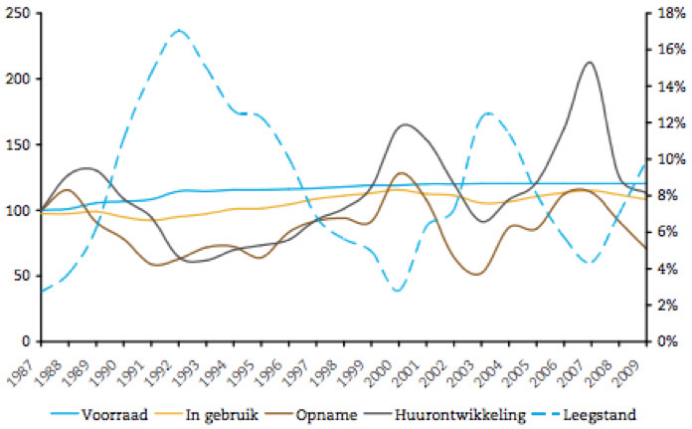


Fig. 3.19 The office market in Amsterdam 1987-2010 (Zuidema & Elp, 2010)

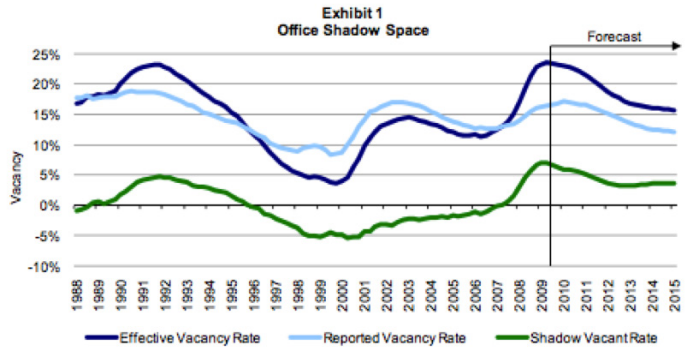


Fig. 3.20 Effective vacancy (Hersier, 2010)

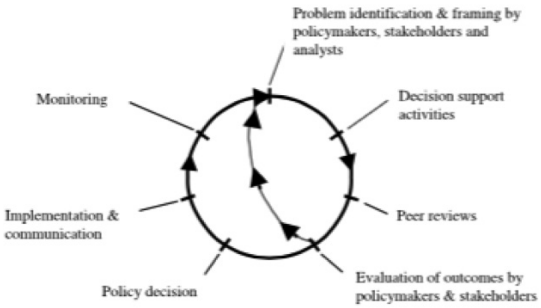


Figure 3.21: Policy making process (WALKER et al., 2003, p. 2)

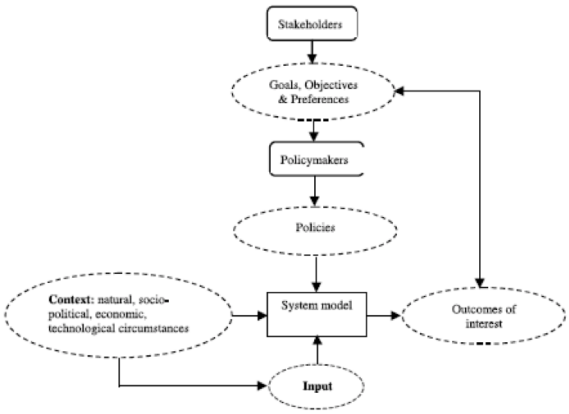


Figure 3.22: The system model (WALKER et al., 2003, p. 2)

lease contracts and accepted vacancy by its owners. This hidden vacancy is hard to find and should be added with the structural vacancy rate.

Effective vacancy - The structural is the product of structural and hidden vacancy as shown in figure 5.20.

3.2.6 A DECISION SUPPORT MODEL

WHAT IS A DECISION SUPPORT MODEL?

W.E. Walker (2003) created a conceptual framework to systematically handle the uncertainty in the decision-making process. Walker (2003) defines uncertainty as "any deviation from the unachievable ideal of completely deterministic knowledge of the relevant system" and feels that a good decision support model has to provide the necessary (scientific) assistance.

WHY DEVELOP A TYPOLOGY OF UNCERTAINTIES?

There are multiple reasons for the development of a typology of uncertainties. First of all, consistency among used terms might improve the communication among policy analysts. Furthermore, it improves the communication among policy analysts, policymakers and stakeholders: a better insight in dimensions of uncertainty for policy choices might lead to more confidence in the scientists' provision of decision support. Also, developing a typology of uncertainties stimulates the identification of effective research and development actions for decision support.

THE POLICY MAKING PROCESS

The policy making process can be streamlined and idealized to the diagram shown below (figure 3.21). It contains several crucial elements of interplays between policy analysts and the policymaking process, what makes it an adequate conceptual model base.

1) Problem identification & framing

The problem identification and framing stage contains communication among policymakers, stakeholders and scientists. During this stage, the structure of the system model is decided and the outcomes of interest are labelled.

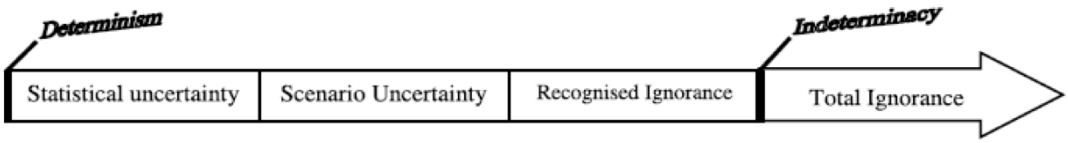


Figure 3.23: Policy making process (WALKER et al., 2003, p. 8)

2) Decision support activities
During this stage, policy analysts evaluate the accessible information for the knowledge production, according to the involved uncertainty. The guidance of a quality control stage (a peer review, for example) might boost the confidence in the acquired results.
3) Evaluation of outcomes by policymakers and stakeholders
The evaluation is done by the policymakers and stakeholders. When the accessible information does not fit the needs that are decided in the first stage, the process will go back to the first stage. When the information does fit the needs, the perspectives will be developed by the policymakers and stakeholders – depending on their own interests.
4) Implementation and communication
The ultimate stages of the process include the policy choosing, implementation and communication. Also, the monitoring of the policy impact might be included in this stage for the observation of goal achievement.

THE SYSTEM MODEL

Decision support activities repeatedly analyse the effect of alternate policies under diverse scenarios and review the trade-offs among various policies. This research demands to be structured and simplified to a model, due to its complexity. The model is shown on the next page (figure 3.22).

The System Model is a simplification of the system of interest and has been accustomed to fit the different terrains of risk evaluation. It represents the relationship between the cause and effect of the system. These relationships are articulated as functions.

UNCERTAINTY

This concept is described as a situation of inadequate information, which can be of three kinds: inexactness, unreliability and border with ignorance (Walter, 2003). These three kinds make the distinction between uncertainty caused by the absence of knowledge and uncertainty caused by instability inherent to the system.

Another important distinction can be made between the modellers' view of uncertainty and the decision makers' view of uncertainty. The modellers' view aims attention at the models' outcomes and conclusions of support performance.
The policymakers' view contains the valuation of the outcomes, in view of goals and potential conflicting interests.

There are three dimensions of uncertainty:
1) Location of uncertainty
2) Level of uncertainty
3) Nature of uncertainty

1. Location of uncertainty
This is the description of the manifestation of uncertainty within the model. Regarding context uncertainty, it includes conditions and circumstances that determine the system's boundaries, and the framing and defining of issues that come along with those boundaries.
Context uncertainty involves uncertainty about environmental, political, social and technological situations that form the checked problem's context. Regarding model uncertainty, it includes model structure uncertainty and model technical uncertainty.
Model structure uncertainty is caused by the absence of system understanding (containing the system's behaviour and elements interrelationships).
Also, input uncertainty and parameter uncertainty are involved. Input uncertainty is associated with the data that characterize the reference system and external driving forces that have an effect. Parameters are the model's constants, probably equal to the chosen context and scenario.
Last but not least, the model outcome uncertainty is discussed. This uncertainty is generated by all the mentioned uncertainties (context, model, input, parameter) and might be labelled as the prediction error, because it is the difference between the true and model's predicted outcome.

2. Levels of uncertainty (from "know" to "no-know")
The greatest goal of decision making, concerning uncertainty, should be the reduction of unwanted impacts. The levels of uncertainty are as follows: statistical uncertainty, scenario uncertainty, recognised ignorance, total ignorance (shown in figure 3.23).

3. Statistical uncertainty
Statistical uncertainty is uncertainty that can be described decently in statistical terms and can be applied to any location in the model. The most common example is the measurement uncertainty that is connected to all data. Measurements cannot exactly represent the authentic value of what is measured, due to sampling errors or imprecision.
Scenario uncertainty comes along with policy analyses that are associated with the external environment of a system and its effects. Scenarios are not able to predict what is going to happen in the future – they bring an indication of plausible futures. These assumptions are often not verifiable, which relates scenarios to uncertainty at a higher level than statistical uncertainty.
Recognized ignorance is the essential uncertainty about the examined systems and relationships. The functional relationships and the statistical properties are unknown and the scientific ground for scenario development is weak.
Total ignorance indicates an extended level of uncertainty, where the examiners do not even know what they do not know.

4. Nature of uncertainty
To explain the nature of uncertainty, it is important to make the differentiation between two extremes: epistemic uncertainty and variability uncertainty.
Epistemic uncertainty is caused by the inadequacy of our understanding and might be decreased by doing more research and observational attempts. This shape of uncertainty involves limited and inaccurate data, measurement error, incomplete knowledge, limited understanding, ambiguities and subjective judgement.
Variability uncertainty is caused by its integral instability, relevant for human and natural systems – regarding economic, social and technological developments. This shape of uncertainty can be separated into four sources: randomness of nature (unpredictable and chaotic), human behaviour (non-rational, cognitive dissonance), social, economic and cultural dynamics (societal variability) and technological surprise (unexpected consequences, side-effects).

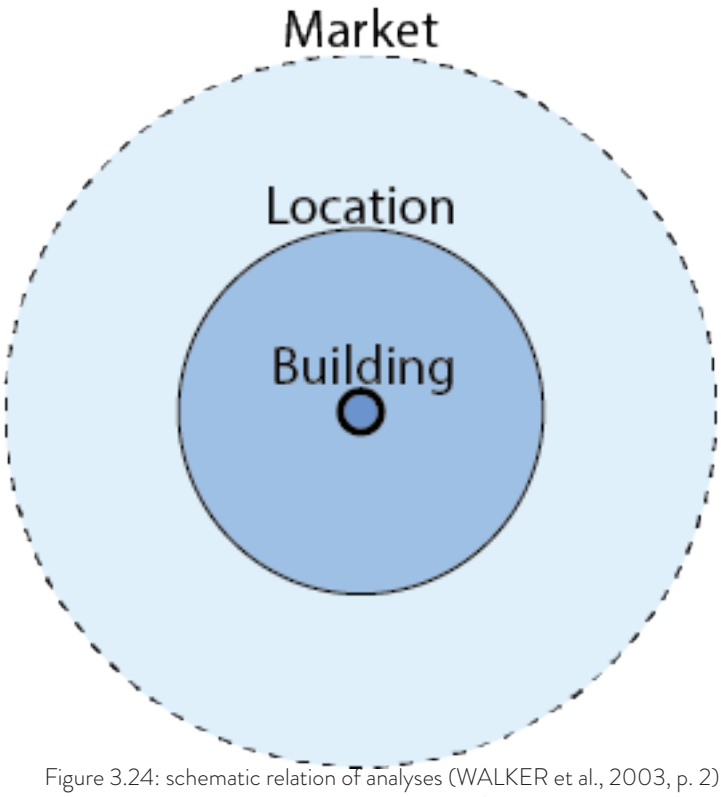


Figure 3.24: schematic relation of analyses (WALKER et al., 2003, p. 2)
(Figure 3.24: schematic relation of analyses (WALKER et al., 2003, p. 2) own material)

3.2.7 CONCLUSION OF THE THEORATICAL FRAMEWORK

The real estate space market consists of land and building. The real estate asset market reflects the cash-flow rights. A developer can develop a building in the space market and sell this with lease contracts as an asset to an investor as an asset. The total real estate market is a combination of the space and asset market. When an equation is met between those markets, the market price is equal to the replacement price. This equation is hard to realize and therefore the market is imbalanced.

Vacancy is one of the results of an imbalanced market. Not all types of vacancy are signs for a bad market situation. The effective vacancy is a combination of structural and hidden/shadow vacancy.
Structural vacancy is when a building is vacant for over three years. Shadow vacancy is occurs when owner or investors accept structural vacancy and therefor wont counteract nor report.
The price in the real estate market is elastic and depending on the supply, demand side and the location. The real estate market analysis can determine the current supply and demand on a location and therefore predict future demands.
The real estate market can be seen as a continuous cycle, where recessions, recovery, expansion and contraction alternate.

Highest and best use is based on the idea of maximum productivity. According to this theory, the market value of a building in depending on the function in it. The highest value of a building is depending on best use of it. Thus the value of a building in Amsterdam is depending on the function. The best fit or the best function chosen is depending on the market, the location of the building and the building characteristics. The HBU is (1), physically possible, (2) Legally permissible, (3) Financially feasible, (4) Maximally productive (Carr et al., 2003, p. 114).

Uncertainty has to be communicated in the science engineering and policy-management interface. Walter (2003) has attempted to propose a tool for identifying and characterizing the potential uncertainty in model-based decision support, suggesting that uncertainty is a three dimensional concept defined by: the location in the analysis, the level of uncertainty, and the nature of the uncertainty.

Test	**Determined by**
Economic demand	Market analysis
Physically possibility	Building analysis
Legally permissible	Building & Location analysis
Financial feasibility	Scenario analysis
Maximal productivity	Combination of all above

In order to create a DSM concerning the real estate market the model should include a combination of different analyses.

3.3 MODELS AND INSTRUMENTS USED

Intervention	Function	Vacancy Risk Meter	Transformation potential meter	LCC model	Lifespan accounting	S3-model
Renovation	Office	X		X		X
Transformation	Residential		X	X		X
	Other functions					
Demolish & Build	Office			X		
	Residential			X		
	Other functions					
	Financial			X		
	Sustainability				X	X
	Architectural & Cultural	X	X		X	X

Table 3.3.1.1: Selection criteria models (Own material)

Step	Action	Level	Result
Step 1	Evaluation market supply with veto criteria	Location, Building	Quick selection of future perspective
Step 2	Evaluation market supply with gradual criteria	Location, Building	Gradual judgement of the vacancy risk
Step 3	Determine the vacancy risk	Location, Building	Vacancy risk of the building
--	Recommendation	--	--
Step 4	Detailed scan with REN-norm, Trafometer or HBWZ	Location Building	Office function or other function

Table 3.3.1.2: Steps within model (Own material)

Vacancy risk score	Vacancy risk class
Location + Building = 0 - 136	1= very suitable for an office function
Location + Building = 137 - 272	2= suitable for an office function
Location + Building = 273 - 408	3= limited suitable for an office function
Location + Building = 409 - 544	4= barely suitable for an office function
Location + Building = 545 - 678	5= not suitable for an office function

Table 3.5: Determination potential (Own material)

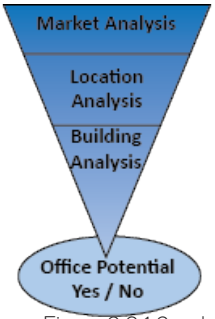


Figure 3.3.1.3: schematic diagram of the model (Own material)

INTRODUCTION

Developers may have their own solutions and methods for developing vacant offices, but for owners or investors it may be more difficult. The aimed DSM should map all different aspects concerning the transformation potential of a vacant office. The conceptual model shown in chapter 3.3 shows the determinants for decision making aspects for an intervention strategy. Several existing models and instruments based on these aspects are examined. The combination of these models and aspects should conduct in one comprehensive model. The model should include (1) renovation of the office function, (2) transformation to another function, demolish and Build to an office and another function. All the possible scenarios should be compared by function possibility, financial profitability, environmental sustainability and architectural & cultural value.

Office function and residential are the only functions in current models. The possibility to determine other functions needs to be added. The expert interviews should determine which functions should be implemented in the DSM. The analyses of existing models should clarify how to determine the potential of those functions.

3.3.1 VACANCY RISK METER

The vacancy risk meter (in Dutch leegstandrisicometer) (Geraedts & Voordt, 2007a). This tool was developed to measure to risk and potential of offices in Rotterdam. The tool is based on the opinion of 50 involved real estate experts. The tool can give a verdict about future potential of an office building.

DESCRIPTION

In order to predict the potential for an office function, the model uses a set of veto criteria; criteria that lead to exclusion of an office function. When a criterion is answered with yes, and there is no room for improvement, the criterion is a veto.

The second step is a set of gradual criteria; criteria that are seen as positive or negative for a future office function. When answered with a yes, the criteria give a positive result.

The third step is to predict the building potential for an office function.

The first list of gradual criteria applies on building level, the second list applies on building level.

The veto and gradual criteria are listed in appendix 2. In order to make a distinction between location and building level, a weigh factor is applied. The amount of “yes” answers are multiplied by 5 (location) or 3 (building). The result should help to determine the vacancy risk

ANALYSES

In order to gain a quick result, the model funnels the different analyses. The model addresses market, location and building level. The building criteria are mainly focussed on the technical aspects. The sustainable, architectural and cultural values are subservient. The technical values are hard values, obtained out of technical information of the building. The architectural and cultural criteria are based on the opinion of the user.

The target group are investors or building owners and initiators who are interested in future potential of the building. The model focuses purely on an office function.

CONCLUSION

This model is a quick scan model applicable for vacant office buildings and the potential to maintain the office function. This model is in fact a quick scan for a renovation intervention. When vacancy occurs, but the building is very suitable for an office function the building or the location needs an upgrade.

3.3 MODELS AND INSTRUMENTS USED

Step	Action	Level	Result
Step 0	Analysis of the market supply of vacant office buildings	Supply	Insight in the location of vacant office buildings
Step 1	Quick scan. First exploration of the building with veto criteria	Location, Building	Quick selection of suitability further investigation (go/no go)
Step 2	Quick scan. Feasibility scan. Gradual criteria of the building	Location, Building	Transformation potential of the building
Step 3	Quick scan. Judgement transformation class.	Location, Building	Transformation class of office building/transformation potential of the building (go/no go)
--	Recommendation	--	--
Step 4	Financial feasibility scan	Building	Judgement of financial/economical feasibility. (go/no go)
Step 5	Checklist of risks	Location, Building	Transformation plan (go/ no go)

Table 3.3.2.1: Steps within model (Own material)

Vacancy risk score	Vacancy risk class
Location + Building = 0 - 40	1= very suitable for transformation
Location + Building = 137 - 272	2= suitable for transformation
Location + Building = 273 - 408	3= limited suitable for transformation
Location + Building = 409 - 544	4= barely suitable for transformation
Location + Building = 545 - 678	5= not suitable for transformation

Table 3.3.2.2: Determination potential (Own material)

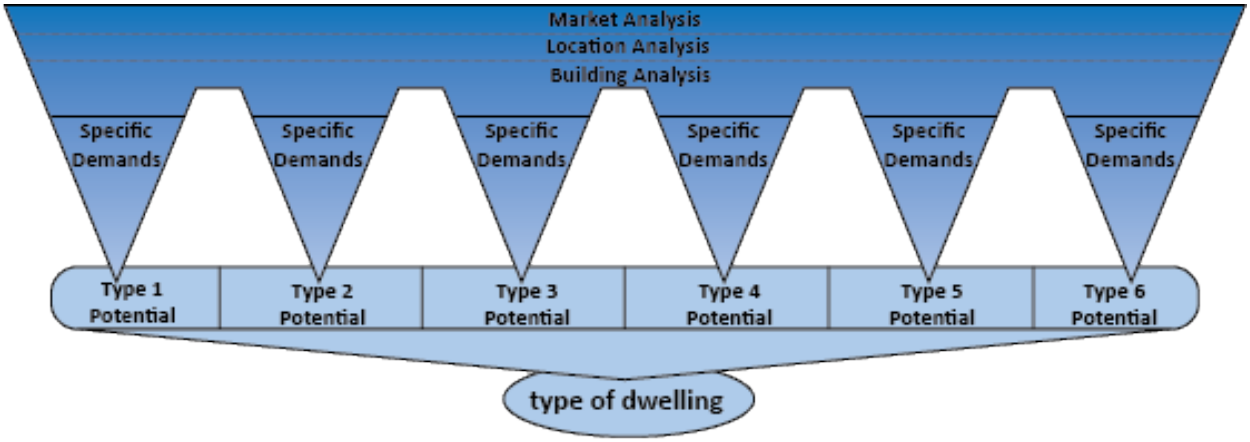


Figure 3.3.2.3: schematic diagram of the model (Own material)

3.3.2 TRANSFORMATION POTENTIAL METER

The transformation potential meter (Geraedts & Voordt, 2007c) can be seen as a follow-up of the vacancy risk meter (Geraedts & Voordt, 2007a). Where the transformation potential meter focuses on maintaining an office function, focuses this model on the transformation to a residential function. This is a tool to measure the opportunities and risks of converting empty offices into dwellings.

DESCRIPTION

The transformation potential meter is a more comprehensively approach then the vacancy risk meter.
According Geraedts and van der Voordt (2007b) experts in the field of real estate, the transformational potential of vacant offices buildings depend primarily on three factors:
1. Duration of vacancy. An owner is more willingly to think about an intervention strategy if the building is vacant for a long time.
2. Reason for vacancy: market, location or building. If vacancy occur because of market factors, transformation would be less interesting for a owner if he has the capital to wait for better times. If the location does not meet the standard for office buildings, transformation would be a good intervention option. The transformation potential is highly depended on physical restrictions. Buildings characteristics may take a leading role in the decision for an intervention strategy. These characteristics, which restrict the options of intervention, are called veto criteria.
3. Municipal policy. The zoning plan made by the municipality may also become an veto criteria. The municipality may decide to change a zoning plan, this can be a opportunity or a restriction.

The model uses a set of 9 veto criteria followed by gradual criteria on location and building level. The model uses the same weigh principle as in the vacancy risk meter. The model uses the demands of a set of five target groups to make a distinction in the type of dwellings. Geraedts and van der Voordt (2007b) are focusing on high rise office buildings. Not everyone wants to live in a high rise complex, some target groups are more interesting in other situations. The main target groups are: Young Urban Professionals, workers in the creative class, Empty Nesters and Senior citizens. A mix of different target groups may increase the lifelines of the dwelling complex, but different target groups will have different preferences. According to Geraedts and van der Voordt (2007b) different factors are important for the demand of housing. The type and size of the housing, an attractive, safe residential environment and affordability are important criteria for all target groups. The main differences between various target groups concern such matters as price and quality level, preference for a family house or a flat, and the desire to live in a lively environment with plenty of facilities or in a more peaceful environment.
The amount of “yes” answers are multiplied by 5 (location) or 3 (building). The result should help to determine the transformation potential. A complete list of criteria can be found in appendix 5.

ANALYSES

The model is less depending on technical input by the user. This makes the model user-friendlier and makes it usable for laymen but less reliable because of the ungrounded opinion of the user. The model only uses five different target groups to make a distinction in different dwellings types. Geraedts and van der Voordt (2007b) claim that families are unwilling to life in a high-rise. The models should include this target group.
The target group are investors or building owners and initiators who are interested in future potential of the building. The model focuses purely on an office function.

CONCLUSION

This model is a follow-up of the vacancy risk meter (Geraedts & Voordt, 2007a) and is a quick scan method to determine the potential to transform the vacant office into dwellings. A lot of the aspects are overlapping but make use of other criteria. These models could easily be combined to one comprehensive model to determine a renovation or transformation intervention

3.3 MODELS AND INSTRUMENTS USED

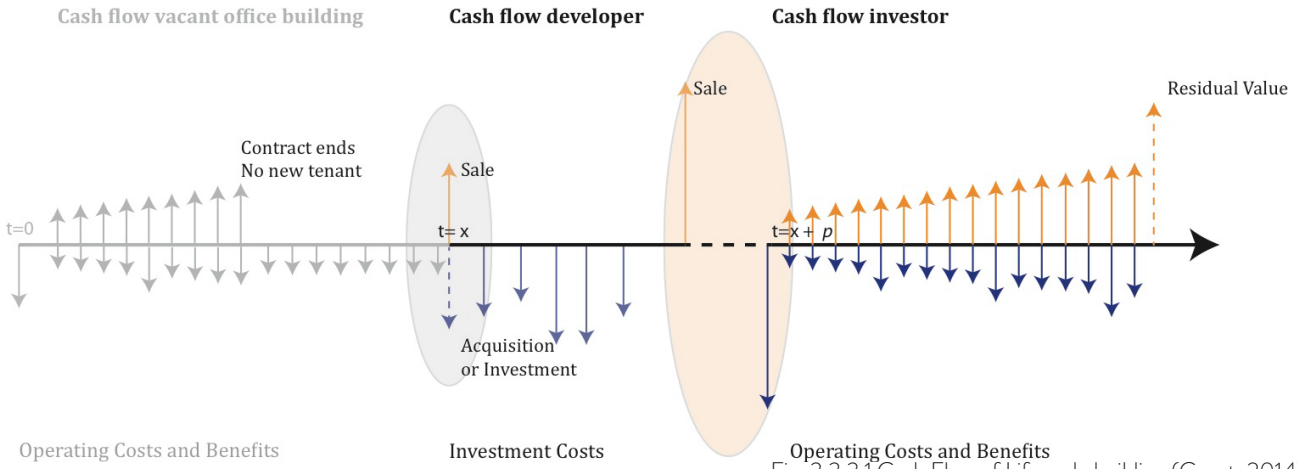


Fig. 3.3.3.1 Cash Flow of Lifecycle building (Groot, 2014)

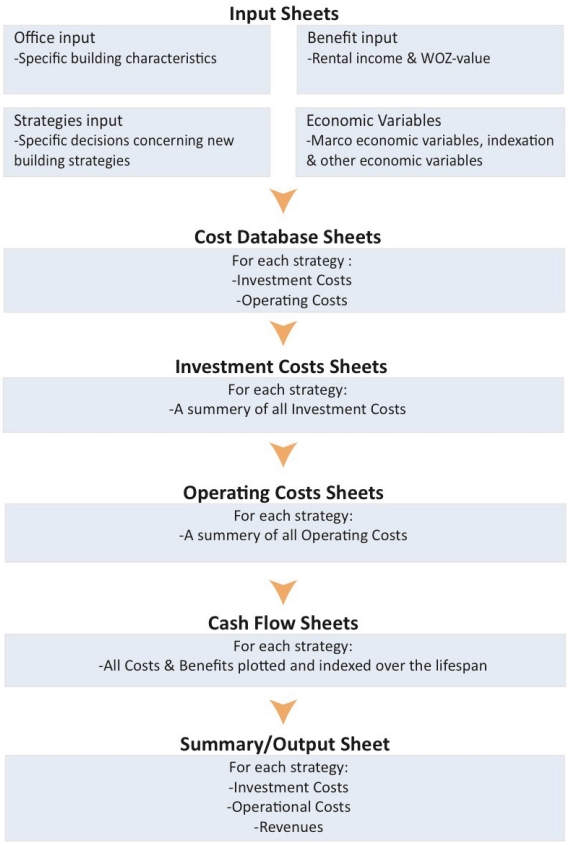


Fig. 3.3.3.2 Sheets of the LCC Model (Groot, 2014)

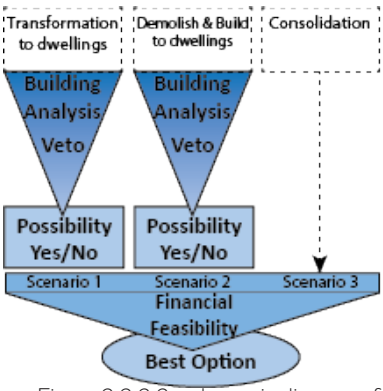


Figure 3.3.3.3: schematic diagram of the model (Own material)

3.3.3 LIFE CYCLE COSTING MODEL

The Life cycle costing (LCC) Model of Jelle de Groot (2014) is one of the methods to swiftly calculate the best financial intervention strategy for a vacant office building. This model focuses on the operating costs and the time factor of the costs and benefits of each strategy. The outcome of this model should be the best financial option for a transformation project.

DESCRIPTION

The model uses the NEN2699 norm and combines a developer's model with an investor's model. Each and every case is unique and therefor the model can only give a general outcome. In order to retrieve a specific answer this model should be used with other methods such as the Monte Carlo Simulation. The LCC model is a way to make a quick estimation of the costs and benefits of different transformational options. Within this model different assumptions and rough estimations are made and therefore the model cannot be used as a leading method to define the precise costs and benefits.
The model combines both cash flows of the investment and operation phases. The investment cost of the investor are in fact a compensation for the cost and risk the developer had to make. During the development the developer will only invest, only after completion he will gain profit. This is a short a straightforward cash flow. After completion the building will be sold to an investor and it would turn into an asset. The cash flow of this asset is a long-term cash flow. During this period the investor still has to invest to gain profit but the result, the residual value, should be positive. If not, the asset was a bad investment. If the tenant contracts ends and no new tenant's accurse because of demand change the asset is costing money instead of producing it. One of the options besides, demolishing and consolidation, an investor has is to sell it to a developer who will transform it and resell it to an investor. This cycle is illustrated in figure 3.33.

Investors and developers will use different methods to calculate their costs and benefits during both cash flows. The LCC model will combine all the different costs and benefits in the complete cycle combing both cash flows. In contradiction to existing models the LCC model will take the factor of time into account. In theory the initial investment of a transformation project will be less. Mostly the construction period will be shorter then with a new construction project and therefor the rental income will start sooner in this process.

The model processes in three different stages, the input -, processing- and result stage.
Input
The input of the model consists out of four different excel sheets:
1. Information about the current, vacant, building
2.Information about the three different intervention strategies
- Transformation (transform the physical or functional conditions)
- Demolition & build (demolish the current building and build a new building)
- Consolidation (do nothing)
3. Information of the benefits of rental income of these strategies.
4.Economic variables

Processing
These models are separated but linked to a cost data sheet (5) in order to estimate the two different cost and benefits sheets:
6. The investment costs (development cost)
7. The operating costs (cost and benefits for the investor)
Result
These two sheets are plotted in the cash flow sheet (8) and the results of are summarized in the summary sheet (9).
The results are depending on the input (1-4) and the cost data sheet (5) which all can be manually changed.

A complete overview of the sheets can be found in appendix 3.

ANALYSES

De Groot (2014) compares three different intervention strategies for vacant office buildings on base of the NPV or the IRR rate. The model gives three results and the user may choose which fits best for their strategy. The first input of the life cycle costing model (LLC-model) of De Groot (2014) are some veto criteria. Some physical aspects of the building may lead to legal exclusion. The LCC-model can be used to estimate the project cost of an intervention. The aimed decision support model should give a complete advice for all the different intervention strategies.

CONCLUSION

The model uses a comprehensively set of financial information and leaves other factors out. De Groot (2014) uses some veto criteria of the transformation potential meter (Geraedts & Voordt, 2007c) and the vacancy risk meter (Geraedts & Voordt, 2007a) in his first step. The LCC uses a financial approach to determine the best intervention strategy. The evaluated consolidation, transformation and demolish & build.
The model needs a comprehensively set of financial input, making the model user-unfriendly, and unsuitable for a quick scan. A simplification of the model would be sufficient for a quicker approach.

3.3 MODELS AND INSTRUMENTS USED

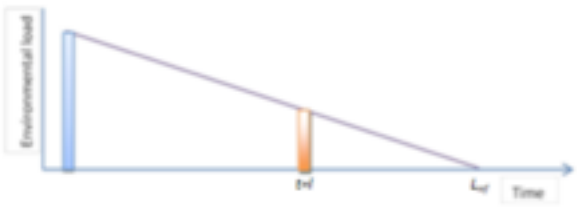


Figure 3.3.4.1: The remaining environmental load at the year t=L before the aimed lifespan(Dobbelsteen, 2004)

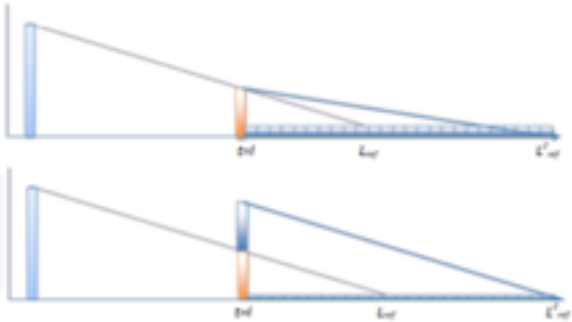


Figure 3.3.4.2: Comparison of reuse versus demolish & build (Dobbelsteen, 2004)

Figure 3.3.4.3 Cumulated environmental load of different interventions (Dobbelsteen, 2004)

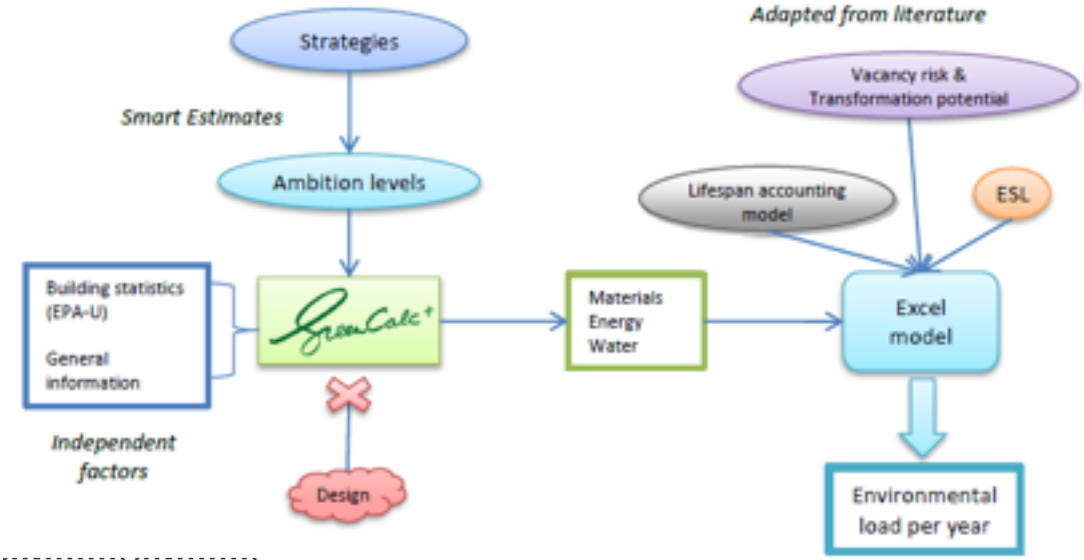


Figure 3.3.4.4 Cumulated environmental load of different interventions (Dobbelsteen, 2004)

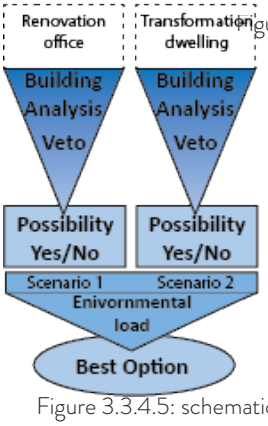


Figure 3.3.4.5: schematic diagram of the model (Own material)

3.3.4 THE LIFESPAN ACCOUNTING MODEL

Every intervention strategy have different environmental load. The remaining load and estimated service life are interrelated. Van Dobbelsteen (2004) uses a method that calculate the remaining environmental load of an existing building.

DESCRIPTION

The remaining environmental load is depending on the once calculated lifespan the building was designed for. When a renovation, transformation or demolish and build intervention is chosen before the aimed lifespan of the building, an additional environmental load is created. This additional load has to be added to the remaining environmental load of the building. A renovation has a smaller additional load then transformation or demolish and build. The environmental load will pay off in the years the building exists. This load is called the initial load.
A project is more environmental sustainable if the environmental load is smaller and the lifespan longer. The environmental load created can be calculated using the lifespan accounting model.
The environmental load is not only depending on the building materials but also on the energy used in this lifespan. This energy used in the lifespan of the building is called the annual load.
The balance between the input of new materials and the annual load of the building will result in the complete environmental load of an intervention. Van Den Dobbelsteen (2004) explains that a new building can be more suistabalvle if the annual load is smaller even if the initial load caused by construction will be higher. In figure 3.3.4.2 the cumlated environmenal load of different intervention strategues are illustrated. The tangent of the life represent the annaul load. At some point the different lines will cross. From that point on the certain intervention payed of and is the investment lucrative.

ANALYSIS

When a building is transformed or renoveded, the lifespan is prelonged. The added transformed innitial load has to be taken into account. Another option is to design a building with a much shorter lifespan en less innitial environmental load.
In order to reduce the total load, caused by materials per year, two interventions are possible
1) Prolong the lifespan of a building.
2) Reduce the initial environmental load.

A building is a composition of different components with their own environmental load. A concrete structure of a building may have a life cycle of over 150 years, however an installation may have of 15 years.

CONCLUSION

The lifespan accounting model is a method to assign values to the environmental values of a intervention and the building. This model could easily be implemented in a model to evaluate the environmental sustainability of an intervention strategy.

3.3.5 S3-MODEL

The goal of Sacha Jansz' (2012) research was to develop a model that compares the sustainability of possible strategies when dealing with a vacant office building. The strategies include: consolidation, renovation, transformation and demolition & new-build, and may be performed in two ways: traditionally (submitting the rules and regulations in the building industry) and sustainable (creating a building with an A++ label or excellent BREEAM certificate).

DESCRIPTION

The framework of Jansz' S3-model has based the coming limitations: eliminating – besides sustainability of materials, water and energy, all real life factors (like social or financial), eliminating the architectural design and including the ESL. The ESL stands for the Estimated Service Life. Jansz' S3-model calculates the effect of the ESL on the sustainability of vacancy strategies.
Jansz' research is strictly a simplification of real life situations; financial and social values are not taken into account. The architectural design is left out to prevent a bias in the results; the model uses "ambition levels" to determine important differences between strategies that influence their sustainability. The ESL is often not included within models, which gives the S3-model an advantage

ANALYSIS

Jansz' (2012) uses Greencalc+ to evaluate the existing building. Greencalc+ uses a pre-set database with environmental load values. The variation between the sustainability of the strategies has to be calculated, which requires a building specific input that contains the materials used during construction and energy use during the user phase. Greencalc+ was found to be the only suitable available sustainability model to serve as ground for the S3-model, because it generates a monetized output. Greencalc+ is a very comprehensively method and is barely used in practise.

CONCLUSION

Jansz' (2012) bases het S3-model on the lifespan accounting approach of Dobbelsteen (2004) and Greencalc+. The model uses veto criteria of the transformation potential meter (Geraedts & Voordt, 2007c) and the vacancy risk meter (Geraedts & Voordt, 2007a) to determine the intervention strategy potential. The model bases the best intervention strategy on environmental values and leaves financial or architectural & cultural values out of consideration. In order to determine the best environmental option both models make environmental load.

3.3 MODELS AND INSTRUMENTS USED

Accessibility	The accessibility of an area can be important for the current or future function. The accessibility subdivided by Van Wingerden (2013) in eight sub-categories, six options in transformation and two additional options in measurement. A distinction between these categories is the operating level or reaches the type of transformation accessibility. Three distinctions are made (1) international, (2) inter-urban and (3) intra-urban
Facilities	Van Wingerden (2013) summarized eight different facility factors but only uses three. He argues this decision because these three factors are being measured by more than half.
Public space	Is according to Van Wingerden (2013) an important factor for the success of an office building. A distinction is made between three factors contributing to the liveability of an area.
Functionality	In order to define the functionality of an area Van Wingerden (2013) uses four factors. Housing Employment Mix of functions
Environmental	The only environmental factor used by Van Wingerden (2013) is noise. Other factors are not used sufficient by all the authors.
Building characteristics	Van Wingerden (2013) is not investigating the influences of building characteristics due the time limitations. Remoy (2010) states that building characteristics are of influence to the obsolescence of a building.

Table 3.8: Aspects Themes ((Wingerden, 2013))

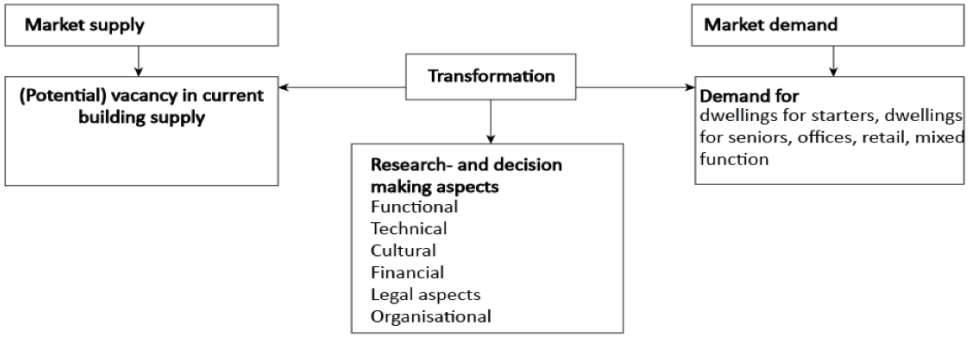
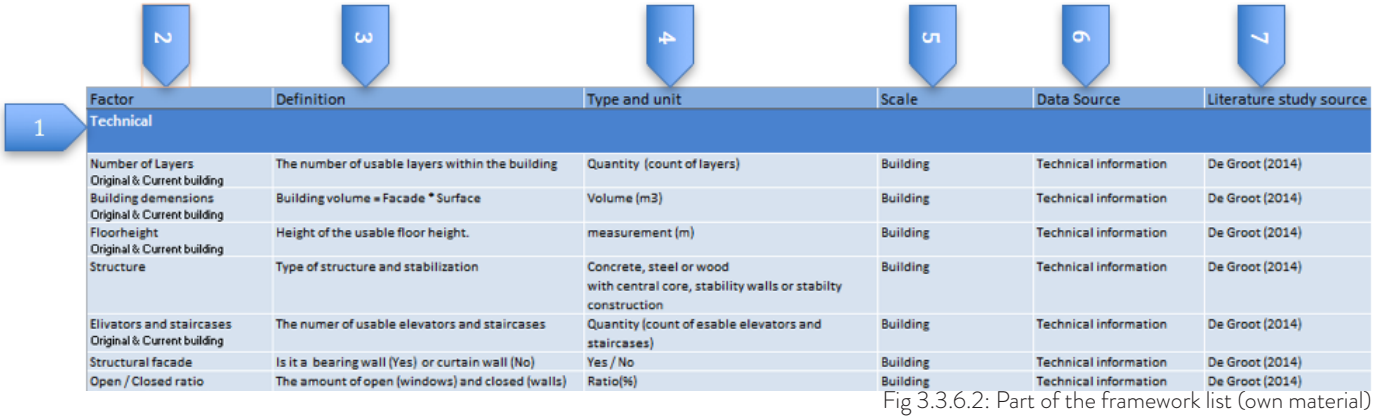


Figure 3.3.6.1 : Themes of transformation (Translation of diagram given in Voordt et al (2007) p.18)

Decision making aspect	Determination process and main question	Type of criteria
Market	Quick market analysis	Gradual
Technical	Building physics – technical possibilities *What are the technical possibilities of a building?*	Gradual
Functional	Building physics – technical restrictions *Are there building characteristics, which exclude possible functions?*	Veto
	Location factors – favourable aspects *What are favourable location aspects?*	Gradual
Cultural	Building Context – determination of soft values Is there any cultural, emotional or cultural value in current design?	Gradual
	Social and political aspects – The present of a strategic vision *Are there any social or political restrictions?*	Veto
Financial	Quick-scan – financial feasibility analysis *What are the costs and benefits?*	Gradual
Legal	Analysis of involved legalisations *Are intervention excluded by law?*	Veto

Table 3.9: Themes of Intervention (own material)



1	2 Factor	3 Definition	4 Type and unit	5 Scale	6 Data Source	7 Literature study source
	Technical					
	Number of Layers Original & Current building	The number of usable layers within the building	Quantity (count of layers)	Building	Technical information	De Groot (2014)
	Building demensions Original & Current building	Building volume = Facade * Surface	Volume (m3)	Building	Technical information	De Groot (2014)
	Floorheight Original & Current building	Height of the usable floor height.	measurement (m)	Building	Technical information	De Groot (2014)
	Structure	Type of structure and stabilization	Concrete, steel or wood with central core, stability walls or stabilty construction	Building	Technical information	De Groot (2014)
	Elivators and staircases Original & Current building	The numer of usable elevators and staircases	Quantity (count of esable elevators and staircases)	Building	Technical information	De Groot (2014)
	Structural facade	Is it a bearing wall (Yes) or curtain wall (No)	Yes / No	Building	Technical information	De Groot (2014)
	Open / Closed ratio	The amount of open (windows) and closed (walls)	Ratio(%)	Building	Technical information	De Groot (2014)

Fig 3.3.6.2: Part of the framework list (own material)

3.3.6 THE LOCATION OF STRUCTURALLY VACANT OFFICES

The location of structurally vacant offices model of Wingerden van, R. (2013) is a model focussing on factors and criteria which are interrelated to the vacancy rate of offices. The model focuses on the city of Utrecht.

DESCRIPTION

Van Wingerden (2013) summarized different characteristics of vacant offices. This summary is based on four different researches and can be found in appendix 5.

- Transformatiepotentie: meten is weten - de Vrij (2004)
- Good buildings drive out of bad buildings - Geraedts and van der Voordt (2004)
- Out of office - Remoy (2010)
- De kantoorgebruiker en zijn pand - Hageman (2011)

The characteristics are divided in five different contexts related categories and one building related category

ANALYSIS

The findings of van Wingerden (2013) are based on a research in the city of Utrecht. He excludes for instance the accessibility of an airport. In my research I will have to determine which characteristics are important for my research for the city of Amsterdam. The parking measurement method in case of van Wingerden is to see if the office centre has potential or not. If there is offside parking it can also say something about the lack of master planning instead of the land prices. I will use the different methods in my case studies to see if an interrelation can be found between transformation potential and on- or off-side parking. Stacked parking or parking on floor level is in my opinion interrelated to the density of area and not to the facility factors.
Van Wingerden (2013) is not going into detail with the influence of the building characteristics and the obsolescence of a building. Vacant buildings are of influence to their context but also the other way around. Van Wingerden his research focuses on the context mine should include both context and building level.

CONCLUSION

The model focuses on the city of Utrecht but the aspects and criteria may be applicable on different cities. Van Wingerden (2013) researches the interrelation of these aspects and possible intervention strategies. This model primarily focuses on aspects that causes vacancy. More aspects applicable in a case will result in a higher risk on vacancy.

3.4 CRITICAL FACTOR FOR INTERVENTION POTENTION

Van der Voordt et al. (2007) sates that transformation is a potential intervention strategy in that may balance the demand and supply cycle of the real estate market. The decision making aspects for transformation given in the diagram overlay with the decision making aspects given in the conceptual model (chapter 2.2.1). These aspects are the main themes for the criteria used. The following themes may be of great influence for actors as owners, developers and municipalities. Figure 3.3.12 illustrates the different themes.

DAPTED FACTORS USED IN THE FRAMEWORK

In order to retrieve a complete list of all the different factors used for case studies or used in the models, all the factors are put into one list. Some overlap can be found within the factors of the different reports and thesis's used in the literature study. The overlap will be merged and the other factors will be complemented. The goal is to list all the possible success or fail factors of different intervention strategies. This framework is structured by different chapters, the themes used by Van der Voordt et al. (2007). The literature source of each factor is given. In appendix 8 a part of the list is given for clarification.

Framework

The critical factors found in the theoretical research form a framework for the empirical research. This framework forms the base for cases and interviews. Figure 3.3.15 shows the structure of the framework. The complete framework can be found in appendix 8.

1. Category - Theme of transformational factor.
2. Factors - A possible success or fail factor for a certain intervention strategy.
3. Definition - Clarification of the factor.
4. Type and unit - What is tested and in what unit?
5. Scale - Is the factor in building or context scale?
6. Data source - What is the source of the data used for answering?
7. Literature study source - In which part of literature study can this factor be found?

CONCLUSION

The previous chapter resolved in a complete list of all possible factors concerning the decision for a certain intervention strategy. In order to create a usable decision support model, the list should diminish to the most important factors. The list is purely based on theory; case studies and interviews should the main factors. The remaining list will form the foundation for the DSM.

EMPIRICAL RESEARCH | 4

4.1 CASE STUDIES

Criteria	Selection
Function	- Original function: offices - New function different or extreme makeover of existing function.
Location	- Within the municipality of Amsterdam and Haarlemmermeer (Schiphol) - Not in only industrial area's - All other types of neighbourhoods
Building specifics	- >4.000 sqm
Timing	- Realised or in construction - Time of original completion: after 1950 - Time of final completion: after 2007 but before 2017
Vacancy	- Structural vacant - Current vacancy: < 20% - No new structural vacancy in for the coming 15 years
Data	- Sufficient available data.

Table 4.0: Critteria and selection for the case studies (Own material)

Fig 4.1.1: The Locations of the different case

Fig 4.1.2: Impressions and photos of the cases

4.1.1 RELEVANCE

The aimed result of the case studies is a summary of different transformations of vacant office buildings in Amsterdam. Besides the options in transformation, the motives, its aimed success, the opportunities, the involved risks and the context of the building are examend. Where literature is the theoretic approach, case studies will research the projects in practise. Sometimes other methods are used practise then theory suggests. What where drivers and decision factors behind transformation? The case studies should provide more practical information of a transformation project.
After the completion, of the aimed result of a Decision Support Model, the model will be tested on these case studies. Are the suggested solutions o the DSM the same as in the case, or was another solution a better one?

4.1.2 CRITERIA & SELECTION

Because of the variety of office spaces in Amsterdam some criteria's are set. These criteria can be found in table 4.0

4.1.3 FRAMEWORK

The aspects implemented determine the usability of a certain DSM. The list of possible critical aspect obtained by the theoretic research need to be validated by the empirical research. Where theoretical research determines theoretical involved aspects the case studies will result in the determination of actual aspects.
In order to find relations between several factors and the success or failures of cases, lots of data is needed.

Because of the time restrictions a systematic approach is needed. The leading framework will help to retrieve useful and comparable information. The first part of this framework is an introduction and helps to understand the building and its context. The second part will provide a checklist with set values in order to compare different cases.

GOAL CASE STUDIES

The goal is to determine the decision-making aspects within the determination of an intervention strategy.
This would result in an inventory of all the possible involved factors within this process.
This information will address to a consistent decision support model.

4.1.4 PROPESED CASES

Due to restricted time and pages, a selection of five cases is made. These cases differ by location and function in order to gain us much experience as possible. The selection is based on the different locations and different real estate segment of the building 's location (Floyd & Allen, 2002). Knowledge is gained from literature and information given by the involved actors.

4.1.5 STRUCTURE

In order to get a comparative result all cases are examine in the same way. The case studies are a result of literature study and interviews with the involved developer(s).

Original Name	New name	City-part
01. Overhoeks tower	The ADAM tower	North
02. Rembrandtpark gebouw	Remada Hotel	West
03. BULL TOWERS	Arena towers	South-East
04. GAK Gebouw	De Studio	West
05. Triport 1-2-3	The Base	Schiphol

- **Information**: Original and current name, address, stakeholders, function(s) etc.
- **Introduction**: General information about the project,
- **Critical factors within the transformation**: Critical aspects concerning the transformation from initial phase to realization.
- **The process of the Transformation**: A summary of the most influential steps in the process.
- **The result**: What is the result and is the result a success?
- **Conclusion**: The main factors and aspects concerning this project.

4.2 CASES

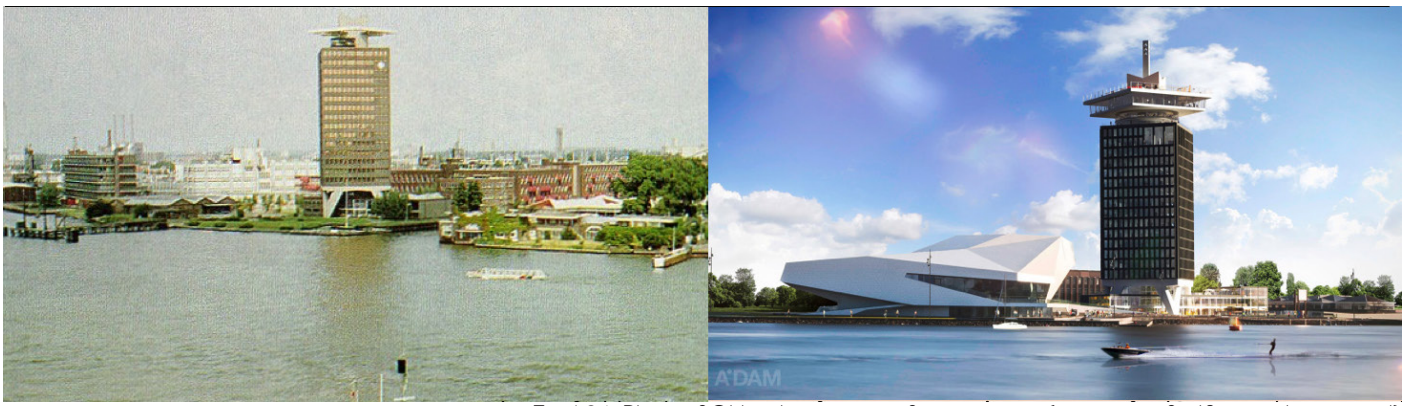


Fig 4.2.1: Photo of Old and impression of new situation (www.armisoft.nl&www.adamtower.nl)

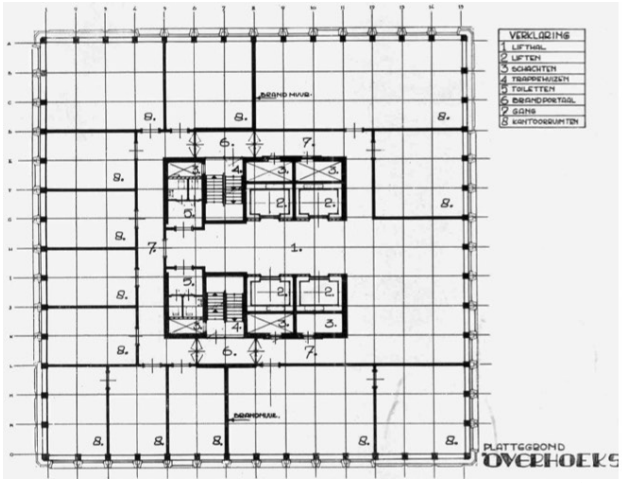


Fig 4.2.2: original Floor plan (www.armisoft.nl)

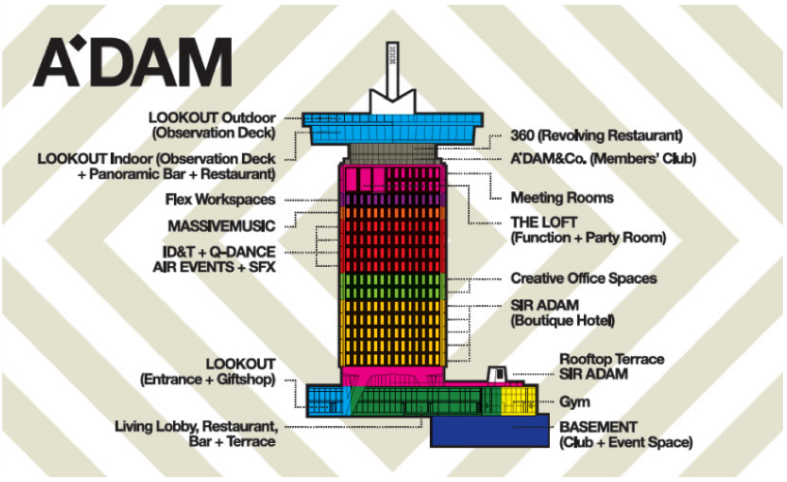


Fig 4.2.3: new Program (www.adamtower.nl)

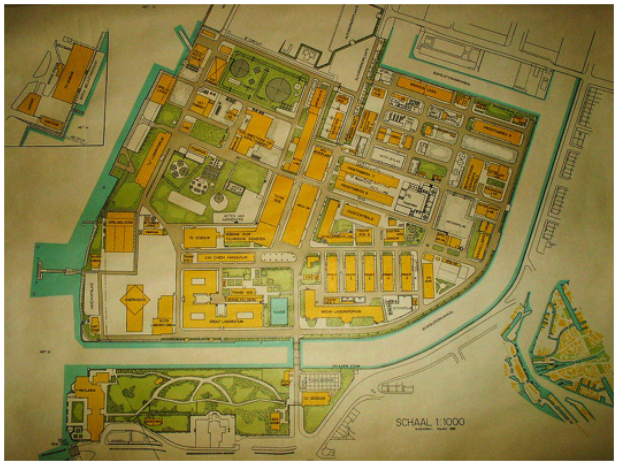


Fig 4.2.4: original master plan of Shell (www.armisoft.nl)

Fig 4.2.5: 2005 master plan (gemeente Amsterdam noordwaarts et al., 2005)

OVERHOEKS

YEAR OF ORIGIN: 1971
ORIGINAL GROSS FLOOR AREA: 8.660 M2
OLD FUNCTION: OFFICES – HEADQUARTER OF SHELL LABORATORY
ORIGINAL OWNER: SCHIPHOL REAL ESTATE
ORIGINAL ARCHITECT: ARTHUR STAAL
LAND PROPERTY: ROYAL DUTCH SHELL
NEW CONSTRUCTOR: J.P. VAN EESTEREN

A'DAM - OVERHOEKS 1, 1012 CC AMSTERDAM

YEAR OF COMPLETION: 2016
NEW GROSS FLOOR AREA: 16.000 M2
NEW FUNCTION: OFFICES, HORECA, LOOK-OUT & GYM
NEW OWNER: LINGOTTO
NEW DEVELOPER: LINGOTTO & PARTNERS
NEW ARCHITECT: CLAUS EN KAAN ARCHITECTEN
LAND PROPERTY: MUNICIPALITY OF AMSTERDAM

INTRODUCTION

The Overhoeks tower gained his name by the characteristic design of Arthur Staal. The 80 meter high office tower thanks his name to the 45° position to the IJ-river. The tower opened in 1971 was the headquarters of the Laboratorial area, of Royal Dutch Shell Oil Company located behind Amsterdam CS. In 2005 Shell started to relocate and sold the land to the Municipality of Amsterdam in 2009. The partly prefabricated construction was progressive for its time. The bearing walls in the façade where filled with prefab façade elements and stabilized by the central core. In 2012 the municipality of Amsterdam wrote a tender for the tower. The tender was won by Lingotto and his partners S. Groet (Club air), D. Stutterheim(ID&T) and H. Brouwer(MassiveMusic). A'dam or, Amsterdam and Music should act like a vertical city with a 24/7 programme. This programme focuses on music and musical events. Claus and Kaan Architects won the design challenge with a design based on the old situation. The construction and floors where kept and the old façade panels replaced with new, more open, ones. The 500 ton concrete of the 500 removed panels where crushed and reused, within Amsterdam, by the constructor. The realisation is planned in spring 2016. The old Shell area is transformed to a high-end mixed-use area. The A'dam is the first of five towers planned in the overhoeks area. The Overhoeks area is part of a master plan with a GVA of 437.000 sqm. 70% is planned for residential use, 3.200 dwellings for 4000 habitants, 30% for other functions.

CRITICAL FACTORS WITHIN THE TRANSFORMATION

With the reorganisation of the shell area, the former office building did not meet the higher standards of the current office market. The new way working in modern offices would not fit in the tower. Without any adaptation, the tower with its small floor plan and narrow core could not function as a modern office building. The investment for a standard renovation to meet these demands outran its benefits. The building with its construction and prefab façade panels could easily be transformed. The location, the positioning and the marking crown made the Overhoeks tower an icon of the city of Amsterdam. The municipality of Amsterdam decided that the building should be transformed, maintaining its unique composition. The municipality made the decision for the transformation upfront. Lingotto as project developer, decided to partner-up with some parties outside the building sector. The inclusion of different partners at the initiation phase resulted in an enrichment of knowledge.

THE DEVELOPMENT PROCESS

1. The structural vacant office tower.
2. The municipality of Amsterdam wrote a tender for the transformation of the tower, which Lingotto won.
3. A feasibility study and market analyses resulted in a new program for the tower.
4. A partnership was formed meeting this new program
5. A new design was made maintaining the former looks of the building. This design made use of the former construction, everything else had to be replaced.

THE RESULT

In order to define the programme, Lingotto and partners started with a market analyses. Amsterdam-North is home for the creative-class of the capital city. The partners of Lingotto all pioneers in the music industry and will act as a catalyst within the project and its surrounding area. Accept of the barring construction the building is completely renewed. The new looks of the façade match the old looks with some small upgrades. The façade is more transparent and the characterizing crown became a lot bigger. One of the mayor additions is a big underground parking garage. The programme shifted to a multi-tenant, mixed-use building contributing to the desired with a 24-7 cycle of the building and its context. There where, so far, no mayor setbacks within the project. A bit more asbestos where found, but this did not lead to any delays.
According to Lingotto, a project is a success when there is (1) value added to the building or the city, (2) the occupiers are satisfied and by (3) by increase of the financial value of the building.

CONCLUSION

The former office tower did not meet the higher standards of the current office market. A renovation of the building was not sufficient; the municipality decided a more radical intervention was needed. Lingotto used the desired program as base for the transformation. Lingotto chose to develop not only for, but also with the desired future tenants. This tactic optimised the use and potential of the building. The municipality of Amsterdam is planning more high-rise buildings in the overhoeks area. The preferred location and the rising creative class in Amsterdam-North made gave this project lot of potential upfront.

Triggers for the transformation of the Overhoeks Tower, besides the structural vacancy, where:
- **The Market**: The tower is a part of a bigger development program of the area. The transformation of the tower should act a catalyst for the whole area.
- **The Location**: The tower is a characteristic of the IJ-river area and is located near the city center.
- **The Building**: The building was a dysfunctional monument making transformational the most logic intervention strategy.

4.2 CASES

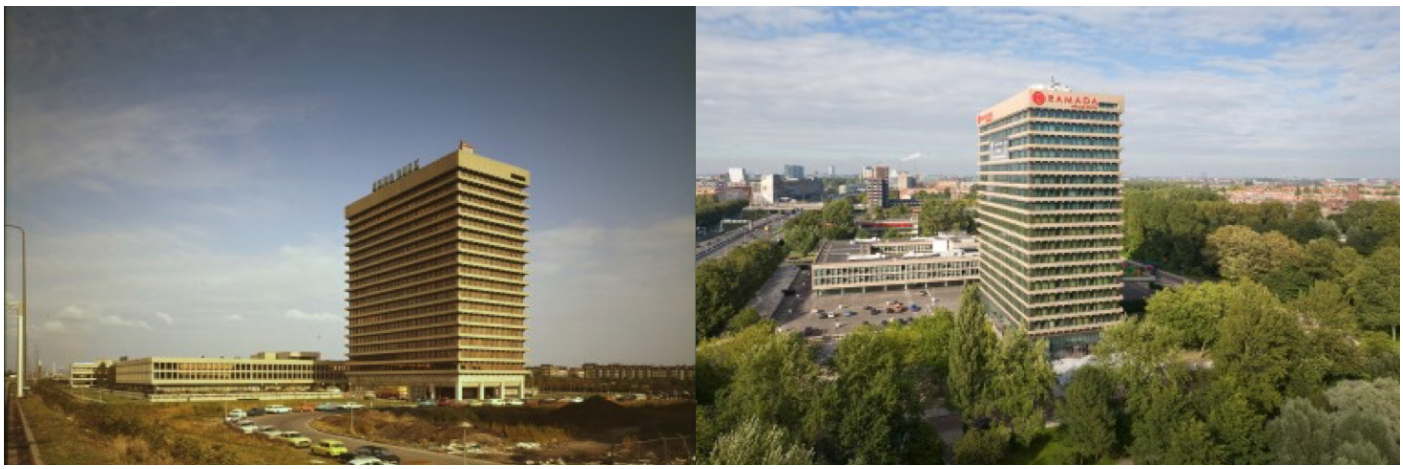
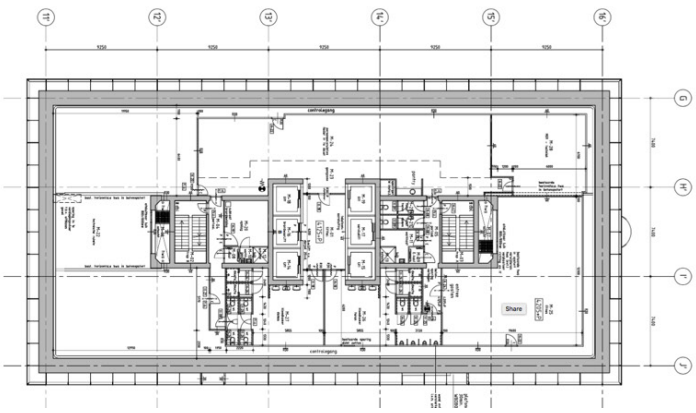


Fig 4.2.6: Photo of Old and situation (www.kennisbankherbestemming.nl)



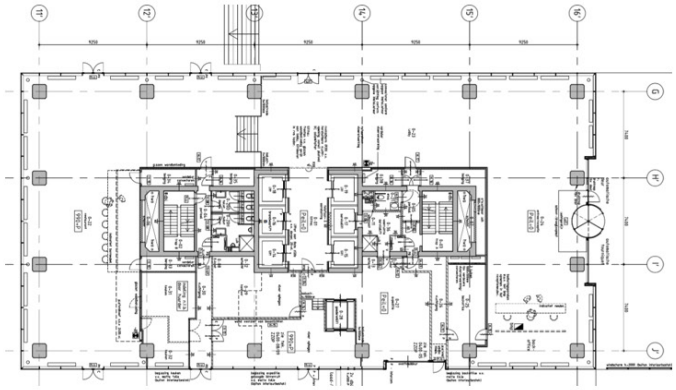


Fig 4.2.7 & 4.2.8: Floor plan ground floor & elevation floor

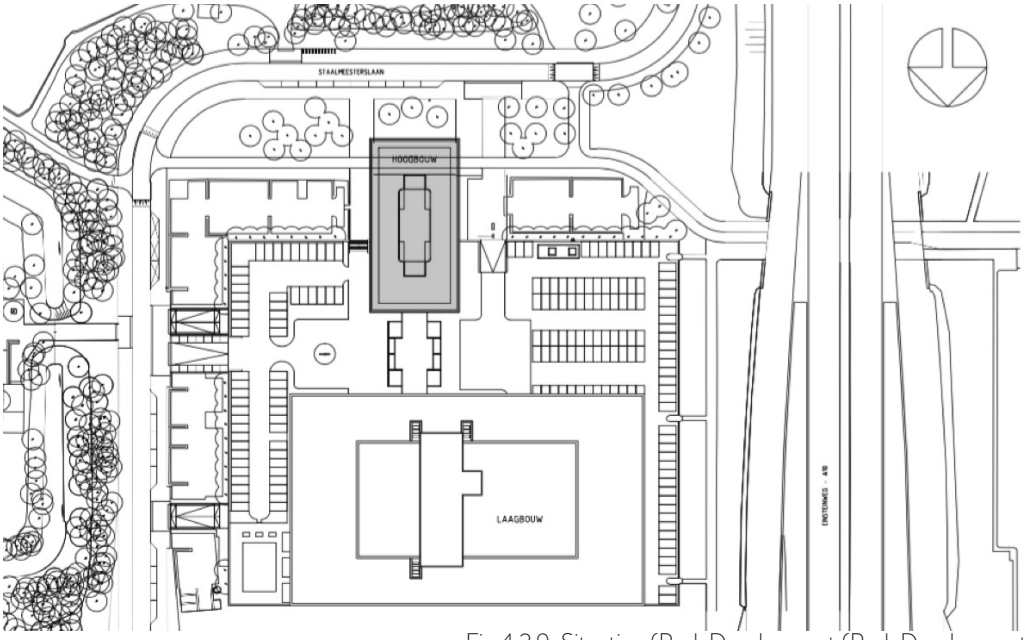


Fig 4.2.9: Situation (Peak Development (Peak Development)

REMBRANDTPARK GEBOUW

Year of origin: 1970
Original gross floor area: 38.000 m2
Old function: Offices
Original owner: Vastint
Original developer: Unkown
Original Architect: ZZ+P Architecten
Original Constructor: Van Rossum
Land property: Municipality of Amsterdam

RAMADA APOLLO HOTEL– JAN EVERSTSENSTRAAT 171 - AMSTERDAM

Year of completion: 2011
New gross floor area: 38.000 m2
New function: Hotel, restaurants and educational
New Owner: Vastit
New Developer: Peak Development
New Architect: ZZDP
New Constructor: BAM en De Nijs
Land property: Municipality o Amsterdam

INTRODUCTION

Peak Development transformed, on behave of Vastint, the former Rembrandtpark office building in 2009. After retraction of the occupiers, the 38.000 square meters office where left empty. The redevelopment of the structural vacant office building into a hotel, education, restaurant and student housing was the first in his kind. This redevelopment was a challenge for both Peak development but also for the Municipality of Amsterdam. The redevelopment resolved in big success, for building and its surroundings.

CRITICAL FACTORS WITHIN THE TRANSFORMATION

Just like the Arena towers; the Ramada tower was an office oif the ABN AMRO. With the centralisation of the offices these offices where left structural vacant. With no future perspective for new tenants Vastint was forced to intervene. Dwellings could not be realised because of the highway. In the supersaturated office market of 2009, tenants moved to offices on the best locations with the highest conveniences for the same price. 38.000 square meters is hard to lease at ones and smaller companies would not go there alone. Tenants needed to be found before any investments where done. Peak development decided to separate the high- and low-rise. The high-rise should accommodate a mid-segment hotel. The Hotel-School The Hague would lease the low rise. The hotel school and the Remada hotel could start collaboration. This strategic match resulted in two long-lease contracts and the transformation project started. Remanda Hotel is a mid-segment hotel with average room prices this and restrictions of the original architect and the bearing facade, resolved in the conserved façade.

THE DEVELOPMENT PROCESS

1. ABN AMRO and Getronics moving out, leaving the building structural vacant.
2. Several studies where done to determine the future perspective of the building.
3. In order demish the risk, tenants needed to be found.
4. The match between the Hotel-School and Remada hotel resulted in a new tenants
5. The transformation started.

THE RESULT

The transformation of the Remada Hotel, was one of the first big transformation projects in Amsterdam. Transformation was quite new for developers but also for the municipality of Amsterdam. Peak development is therefore one of the Pioneers in transformation of offices buildings. A cost and benefit analyses resulted in the decision to transform the buildings. The buildings where out-dated and did not meet the new standards. The floor plan of the tower was perfect for a hotel, the shafts located in the centre, and enough facades for the rooms. The concrete bearing façade was too expensive to replace, and the original architect restricted big adjustment in the façade. Peak decided that climate glass and better isolation would be sufficient for a mid-segment hotel.

CONCLUSION

The transformation of the Rembrandtpark buildings is one of the first transformations in Amsterdam. Despite of the location and size of the hotel, the hotel is always fully booked. The hotel and the Hotel-school are still happy with their new location and their collaboration. The transformation of the dysfunctional asset resulted functional asset, and can therefore be seen as a success for Vastint.

Triggers for the transformation of the Rembrandtpark building, besides structural vacancy, where:
- **The market**: There still was demand for real estate, only no demand for offices.
- **The Location**: The highway next to the location made residential use prohibited. The well-connected location with enough parking spots was perfect for educational or short-stay use.
- **The Building**: The bearing façade did not allow major change in appearance, but created a free floor plan.
- **Adaptability**: The possibility to fit a Hotel in the current building. This resolved in financial benefits. Transforming the building would be cost saving.

4.2 CASES

Fig 4.1.10: Photo of Old and situation (www.dqsbv.nl)

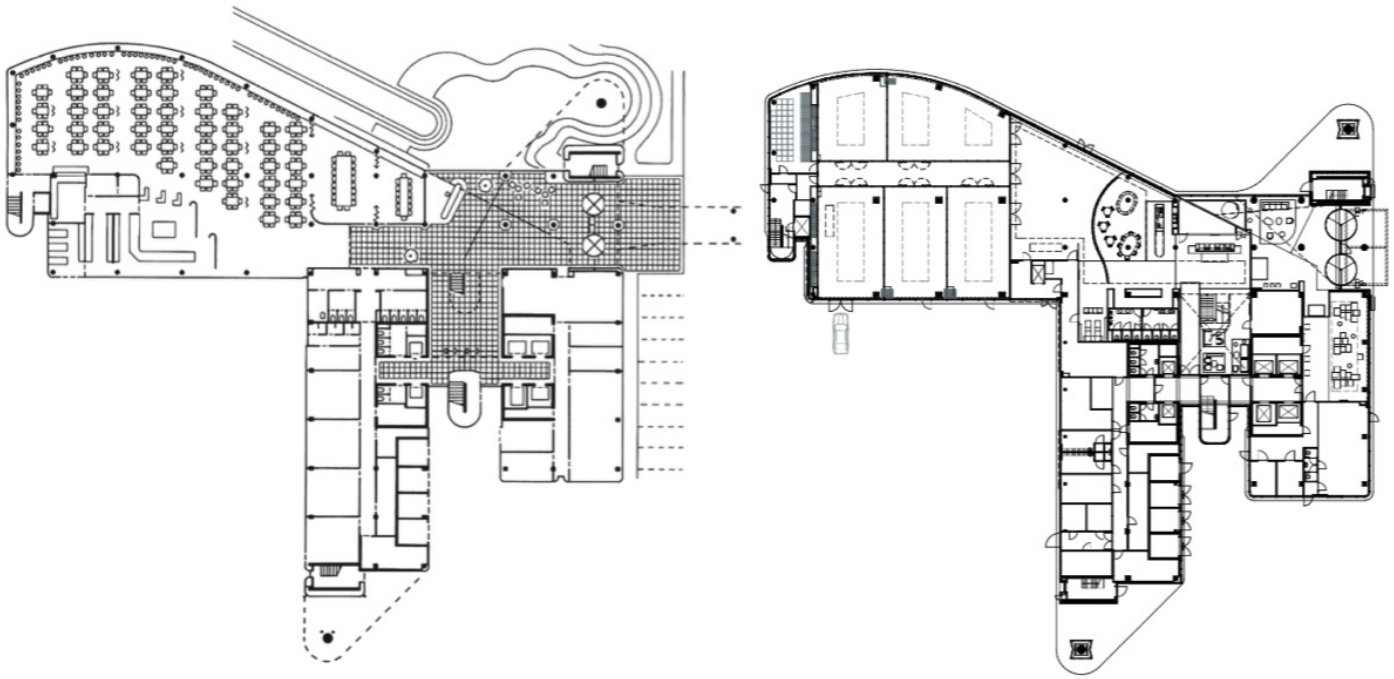


Fig 4.2.11: Floor plans Old and new situation (www.gebouwdin.amsterdam.nl)

BULL Towers

Year of origin: 1990
Original gross floor area: 31.000 incl. laagbouw
Old function: Offices
Original owner: IVG Institutional Funds GmbH
Original developer: G&S Vastgoed
Original Architect: ZZ+P Architecten
Original Constructor: Van Rossum
Land property: Municipality of Amsterdam

Arena Towers – Hoogoorddreef 66 – Amsterdam

Year of completion: 2013
New gross floor area: 22.423m2
New function: 2 Hotels with conference rooms.
New Owner: IVG Institutional Funds GmbH
New Developer: Peak Development
New Architect: ZZDP
New Constructor: AKS bouw / Vink+Veenman
Land property: Municipality of Amsterdam

INTRODUCTION

The two office towers on the corner of Hoogoorddreef and Holterbergweg has transformed to two hotel towers. After five years of structural vacancy IVG decided that a radical intervention was needed. The transformation is in line with the new strategy of Zuidoostlob and the Kantorenloods of the municipality of Amsterdam. This office and transformation policy should result in a mixed- and new functions that should enrich the office area.
The Holiday inn (100 rooms, 4 stars) and the Holliday express (340 rooms, 2 stars) also facilitate congress rooms and enough parking spots for their guests. The silver/metal façade made room for a bright white façade with deep mouldings. The complete façade was stripped from its constructions and the whole interior, except the elevator shafts, was renewed. Two different architects worked together to design this transformation. ZZDP was responsible for the new exterior and Mulderblauw Architects designed the new interior. As a result of the retraction of the main tenant, the buildings where left structural vacant. In the new situation the low and high rise are separated. The low-rise is transformed to Praxis new headquarters.

CRITICAL FACTORS WITHIN THE TRANSFORMATION

Vacancy occurred when the main tenant ABN AMRO moved out of the building. The Bank decided to centralize all their offices in the new financial district now known as the ZuidAs. The lease contract expired and they moved out, leaving the building empty. IVG Institution tried to attract new investors for the office building but without any result. After 7 years of structural vacancy and without any future perspective IVG was forced to change their strategy.
- ABN AMRO grew out of the current building. ABN AMRO was forced to move out or to expand.
- Technical state of the building; The building was out-dated for the new demands. The building was rented for 20 years and some of the climate installations and other conveniences where out-dated.
- Book-value; IVG bought the buildings with a leaser in it, this resolves in a higher book value.
- Social-economic responsibility; The building was built for at least 50 years, it was irresponsible to demolish the complete building.
- Financial; A simple cost and benefit calculation, the investment to demolish and built was to big.
- There was already a new renter, a hotel and this function fitted perfect in the floor plans.
- Energy-label; the energy label was substandard.
- Future perspective; A sufficient transformation increased the chances of selling the asset.

THE DEVELOPMENT PROCESS

1. ABN AMRO moved out resulting in 7 years structural vacancy.
2. IVG was forced to invest to counteract the losses.
3. A new leasing party enlisted.
4. IVG invested in a transformation after agreement on the leasing contract for another 20 years

ADVERSITIES

The new leaser agreed on the transformation but did not have any experience in transforming old offices. The leasing party was responsible for the interior while the developing party was responsible the exterior and the construction. The construction of the towers consist out of pre-stressed concrete, which makes it hard make any adjustments in the floors. These three factors resulted in some conflicts and delays.

THE RESULT

The transformation of the Bull Towers into the Arena Towers is a great success. All involved parties met their goals; the asset is profitable and the hotel is up and running. The hotel is in line with strategy of the area, and the structural vacancy is solved for the coming 20 years.

CONCLUSION

Triggers for the transformation of the BULL Tower, besides structural vacancy, where:
- **The market**: There still was enough demand at the location.
- **The Location**: The policy of the municipality of Amsterdam to create a mixed- and new function, which would enrich the office area. A hotel function would fit perfectly in this policy.
- **The Building**: The status of the original building, a significant part of the building could be re-used.
- **Adaptability**: The possibility to fit a Hotel in the current building. This resolved in financial benefits. Transforming the building would be cost saving.

4.2 CASES

Fig 4.1.10: Photo of Old and situation (www.dqsbv.nl)

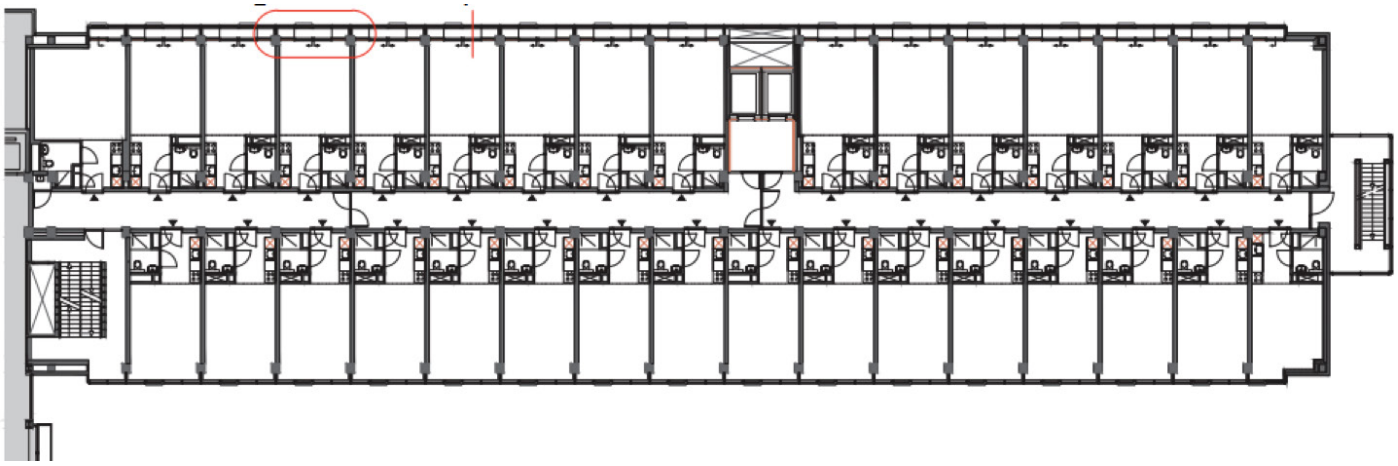


Fig 4.2.12: Floor plan current situation (AM)

GAK-gebouw –

Year of origin: 1960
Original gross floor area: 40.000 m2
Old function: Offices
Original owner: IVG Institutional Funds GmbH
Original developer: Municipality of Amsterdam
Original Architect: Ben Merkelbach
Original Constructor: Unknown
Land property: Municipality of Amsterdam

INTRODUCTION

The former Municipality Administration office (Gemeentelijk Administratiekantoor – GAK) was one of the first office buildings with aluminium curtain façade construction. The 155 meters wide and 47 meters high steel construction with the concrete floors used to be one of the biggest and most advanced office buildings of the Netherlands. The centralisation of al the 23 smaller municipality administrations offices asked for a building that could house 3000 employees. Ben Merkelbach designed the first complete closed climate controlled office. The climate was controlled by air conditioners, cold and heat storage in the ground and heat absorbing glazing.
The innovative double glazed heat absorbing glass gave the building the nickname the aquarium. The GAK building is nominated as a monumental building. The office building became structural vacant in 2005.
The first initiative of AM was to renovate the office and at a new educational function. The new market conditions let to the current program. Major visual changed where prohibited because of the nomination for the monumental status of the building, AM Vastgoed designed a new programme with 320 comfortable but affordable dwellings and 2.000 square meter commercial spaces. The dwellings fitted perfect in the structural grid of 4 x 7,25 meter and 4 x 3 meter with a floor height of 3,25 meter. The dwellings vary between 30 to 40 square meters with their own bathroom and kitchen. Initially, all the 320 apartments where for sale, but Stadsgenoot bought a major part of these apartments.

CRITICAL FACTORS WITHIN THE TRANSFORMATION

The building was structural vacant since 2005 and owned by the municipality. The vacant building cost the municipality money, an intervention was needed. The proposed vision to diminish the structural vacant office buildings in Amsterdam forced the municipality to solve vacancy in their own real estate portfolio.
The nomination for monumental building made the option for a transformation or a renovation of the current building decisive. The building was to big and to out-dated to house another office function. With no demand for offices, transformation was the only option left. With shortage on the housing market and the prefered location, within the inner borders of the A-12 led to current program. By proposing, smaller, affordable but comfortable accommodation AM took a risk. In order to decrease this risk AM conducted a survey in their target group. The idea behind this survey was to involve the future residents in the initial phase of the project. To do so, the future residents could express their wishes and demands. In the second stage of the project future residents could participate in the actual design in return of a commitment of at least 50% of the group.

De Studio – Bos en Lommerplantsoen 1 – Amsterdam

Year of completion: 2015
New gross floor area: 40.000 m2
New function: 320 Students / starters accommodations.
New Owner: Stadsgenoot
New Developer: AM Vastgoed
New Architect: Wessel de Jonge
New Constructor: Royal BAM Group
Land property: Municipality of Amsterdam

THE DEVELOPMENT PROCESS

1. In 2005 the GAK-building came structural vacant.
2. The municipality of Amsterdam came up with a strategy, which should reduce the amount of structural vacant office buildings in Amsterdam.
3. The GAK-building was nominated for a monumental status; this made the decision for a transformation intervention decisive.
4. AM came up with a renovation plan for the building but had to adjust the program due changing market circumstances.
5. AM involved their target group in the initial stage of the project to reduce the risk and thereby increase the probability of success.
6. The innovative programme responds to the surplus of offices and housing shortage in Amsterdam.
7. Part of the dwellings is sold to individuals but a larger part is sold to a housing association.

ADVERSITIES

The nomination for the monumental status of the building was for the intervention strategy decisive. A disadvantage of this nomination was that no major changes could be done at the appearance of the building. The glass façade had to be replaced for a new one with the same appearance. This meant that balconies were excluded and that open able windows should be processed in the façade. AM placed a big collective rooftop at the building and made use of a smart design of open able windows.
A major setback was the amount of asbestos that was found. The amount of asbestos calculated by several companies was much too little. This resulted in some financial losses. AM learned from the economical crises and decided to adjust the book value and take their loses.

THE RESULT

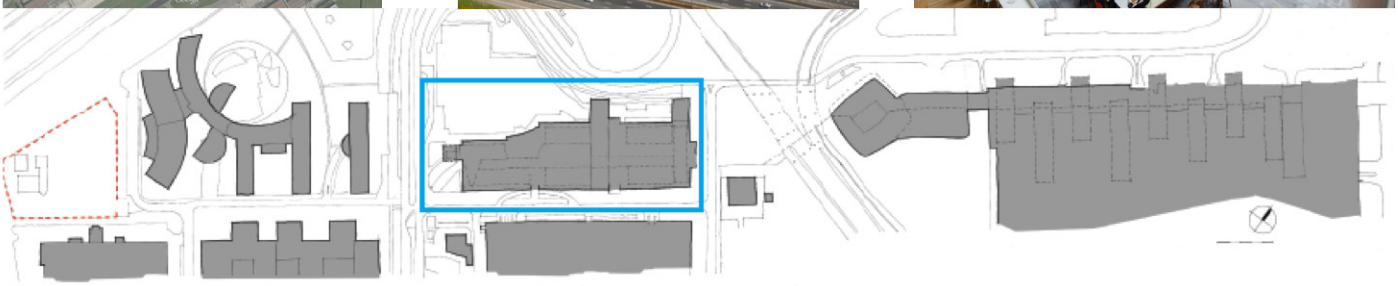
The Studio can be seen as a great success, although AM made a lost of several million euros. AM accepted the aimed loss in book value and sold everything. AM responded to the oversupply of offices and the housing shortage in Amsterdam. All the dwellings are sold and the residents are still satisfied. AM decided to invest more in aftercare, and tries to stay involved even after completion. The new programme is such an success that even plans are made for expansion of the building with a comparable design.

CONCLUSION

Triggers for the transformation of the Studio, besides structural vacancy, where:
- **The market**: There still was enough demand at the location but for another function.
- **The Location**: The preferred location offered enough demand for the number of dwellings.
-**The Building**: The nomination for a monumental status made the decision for transformation decisive.
-**The program**: The affordability of the small but comfortable apartments.

4.2 CASES

Fig 4.2.13: Photo of Old and situation (www.schipholthebase.nl)



Triport 1-2-3

Year of origin:
Original gross floor area:
Old function: Offices
Original owner: Schiphol Real Estate
Original developer: Schiphol Real Estate
Original Architect:
Original Constructor:
Land property: Schiphol Real Estate

The Base - Evert van de Beekstraat – Schiphol

Year of completion: 2016
New gross floor area:
New function: Offices, HORECA, Gym.
New Owner: Schiphol Real Estate
New Developer: Schiphol Real Estate
New Architect:
New Constructor:
Land property: Schiphol Real Estate

INTRODUCTION

The Base is the new name former Triport 1-2-3 office building. The Triport once build in 1996 had a size of 36.000 square meter GVA. The building composition existed of three individual office towers. Schiphol Real Estate (SRE) is the owner of almost all the land, buildings and infrastructure within the Schiphol Area. SRE is a direct daughter company of the Schiphol Group and is responsible for the development, exploitation and maintenance of the area and all its buildings. Their ambition in included in their slogan: 'Schiphol Real Estate creates preferred locations'. SRE is currently upgrading their main business district called Schiphol Central Business District (CBD). The Base is a benchmark project and was the first big transformation done by SRE. The former Triport complex became more sustainable, livable and attractive including the newest confidences for its users and visitors. The three towers with the name Triport 1-2-3 are named The Base A-B-C and are connected by the ground floor. The public functions such as a library, restaurants, bar, fitness, coffee corner, day care and an art gallery and situated around a big atrium. SRE is acting owner and will probably own the building in the future. Triport was partly structural vacant when the two biggest occupiers, the army police and Transavia, announced that they where moving out. SRE wanted a multi-tenant building with a tenant who where not forced to rent in the Schiphol area. "The buildings where not old enough to demolish them. Demolish and new build is not part of the SRE strategy" explained Pieter van der Horst (2015a) the developer of the Base project. "The prices are quite high in the Schiphol area, you should give some quality and facilities in return. The Base should act like a townhouse with a lot of public functions and be a boost for the whole central business district." SRE upgraded the climate systems, gave the building a modesty facelift and connected the buildings. A bright atrium is host to the main public functions and is localized in the centre of the building.

CRITICAL FACTORS WITHIN THE TRANSFORMATION

- The Base was structural vacant without any future perspective. The vacancy rate is the most important factor. At the Base, 20.000 of the 36.000 m2 was vacant because of the departure of the military police (part 2) and Transavia (part 3). Since the building was relatively new, transformation was a logical choice. Other factors where,
- Investment; it was unnecessary to rebuild; partial changes were enough.
- Ownership; SRE is only acting owner the current owner is APG.
- Intern company policies; SRE don't feel the need to sell or demolish their vacant buildings. Schiphol is working on her sustainability strategy, transformation is in some way very sustainable.
- Financial profitability; The revenue of an investment is very low; this is why most buildings already met their investment.
- The Context; The Base is part of a master plan owned by SRE. The transformation of the Base should act like a catalyst of the total business district. The investment of the Base was outrageous; a bank would never have done such an investment. The boost given by this transformation was necessary for the area to maintain its value.

THE DEVELOPMENT PROCESS

1. The expected structural vacancy of The Base.
2. What intervention strategies are in line with the SRE strategy / policy? Which intervention strategy fits best?
3. Market analyses. Schiphol has a program per district and not per building. Which facilities where missing and can they fit within the current buildings?
4. Is the current indoor climate installation sufficient?
5. New design and image, which is inline with the strategy and image, program and climate demands.

THE RESULT

One of the adversities during the process was the delay of the construction – due to a protected plant; the military police was not able to leave the building, since their future location was not finished yet. But overall, the Base project is a success; it is SRE's pride.
The success can be measured within the commercial success of an asset. This is the main objective of a commercial real estate company. A project is a success if the building is voluntary and fully occupied. Some companies are forced to accommodate at Schiphol, such as border patrol and army police. The Base was fully occupied within the aimed period and can therefore be seen as a success. With all the public facilities, the Base does function as a town hall in this area and can be seen as a catalyst in this area. The innovative concept is a great success, there are plans to extent the formally vacant office configuration.

CONCLUSION

The original building did not function optimally; the DNA was not strong enough to save itself. On the other hand, the building was relatively young (and partly in use) – so transformation was the most logical option
The Base is fully occupied, so this can be seen as a success. The original buildings Triport 1-2-3 did not fit in our strategy. The buildings where out-dated and did not meet the demands of our target group. Demolishment of such a young building is not social-economic responsible and this is in conflict with the Schiphol policy. The transformation of The Base fitted perfectly in our general strategy. The Base had an extreme essential make over, the image changed but the outside appearance did not. Concerning the Base, most delays accord because of problems with the constructor.

Triggers for the transformation of the Triport 1-2-3, besides the expected structural vacancy, where:
- **The Market**: The Schiphol Central business district is one of the

4.2 CASES

most expensive office areas in the Netherlands. Tenants demand high conveniences for these price, something SRE did not offer. The Base could meet this demand.
-The Location: Part of a Master plan - The base as part of the central business district of Schiphol could not be left vacant. The expected vacancy would infect the surrounding area. Schiphol Real Estate was therefor forced to intervene.
-The Building: The buildings where quite new. Significant part of the buildings met the current and future demands.

4.3 INTERVIEWS

The interviewees where asked on certain aspects of interventions and transformations. The goal of these interviews is to gain more practical information about the decision process and transformations in general. The interviews are concluded and kept anonymous. The opinion of an actor does not have to reflect a companies opinion or ambition.

4.3.1 INTERVIEWEES

Name	Function	Company
P. Braam	Property Manager	Schiphol Real Estate
P. van der Horst	Senior Developer	Schiphol Real Estate
L. Walraven	Senior Developer	Peak Development Group
E. Lelyveld	Senior Developer	Lingotto
R. Huikenshoven	Director – Senior Developer	AM Vastgoed
O. Dwars	Chief Manager Sustainability	VolkerWessels
C. Beelen	Senior Developer	G&S Vastgoed
J. Wellink	Asset manager & Developer	Panta Real Estate
R. Savelsbergh	Senior Developer	Forerunners
R. Moritz	Director – Senior Architect	19 het Atelier Architecten
I. Klevering	Senior Architect	19 het Atelier Architecten

4.3.2 TRANSFORMATION IN GENERAL

CAUSES OF THE STRUCTURAL VACANCY

Most structural vacant buildings are in good shape, but not in the right shape for its current function. The problem is the book value created by an investor and owners not the real estate itself. Lots of real estate related companies had problems in the economic crisis of 2008-2016; this changed the mind-set of lots of developers, investors and building owner. This is one of the positives results of the last recession. The main cause of the current vacancy according to is that a lot of real estate can be marked as “problem real estate”. Too many buildings have been constructed Tenants will always choose for the highest conveniences for their money. The crisis has played a big role in this process, because of the book- and market value. “A building was often displayed in the books with a rental price of 250 euros, while the owners could not pull this price off. Instead of lowering the price and admit that their asset has decreased in value, owners would choose for structural vacancy.”

WHY TRANSFORMATION AS AN INTERVENTION STRATEGY?

Lots of transformations happen because of the high vacancy rate on preferred locations. Due the economic crisis the demand for real estate changed, the need for real estate will always be there, but demand for a type of real estate changed. Transformation could be seen as a type of sustainability, but the result is what matters. When the investment does not meet the added value, a building owner may chose for demolition and rebuild. When a Transformation is chosen, the building mostly gets stripped to its casco. If the casco has too many restrictions, demolition is probably a better option. Besides a market analyses, building characteristics are very important for the consideration intervention strategy. The zoning is less prominent within this decision. Vacant buildings are considered as a problem, municipalities will probably help to solve this.

The economic crises have played his part in this development. Lots of buildings became structural vacant, forcing owners and investors to a possible intervention. Investors had to decrease in book value, which translate itself in the market value. Some functions are less profitable then other, a decrease in market value makes these functions possible. The location and the building itself can meet new functions.

Transformation of vacant buildings is a sustainable solution for this 'problem real estate', since it is always more sustainable to reuse than to rebuild. Transformation is often applied to buildings with a cultural or historical value. In determining whether to transform vacant buildings or not, diminishment of a building's value, knowledge, experience and vision are important factors in the decision making process.

One of the reasons for the current raising numbers of redevelopment is influence of sustainability in general. A transformation of an existing buildings will result in less material pollution. Never the less an investment of a transformation is still relatively high, a 1000 euros per square meter. This means explains itself in materials and labour cost. The sustainability lays in the existing connections and infrastructure. Besides reusing a building you are reusing a plot. The government is bit more flexible concerning zoning plans of vacant offices, simply because structural vacant offices will infect its surroundings.

THE PROCEDURE

Before making a decision on an intervention strategy, most companies uses a quick scan methode to map the possible options. If the building has any future perspective, a more thoroughgoing research about the location, building structure, zoning plan, future transit and market. This would not only happen when a vacancy problem occurs, but also when a building is fully occupied.

For this quick scan and further research, companies relays on the knowledge of its employees, complemented by some calculation models. For deeper financial research most companies cooperate with an external company, a good company knows where it needs support.

CRITICAL FACTORS FOR A TRANSFORMATION PROJECT

Critical factors for transformation are future perspective and profitability; other important factors are image, changing market circumstances and the buildings context. Considering a transformation, you should always look at the unchangeable fact such as accessibility, neighbourhood facilities and pollution.

A facelift, the replacement of a building's facade, is often used for a transformation because of environmental requirements such as energy savings and ofcourse image change. The condition of the building, the structure and routing are important for the decision of a specific intervention strategy. According to some actors a project is a success if it meets the requirements for the coming 25 years. While designing a transformation, an Architect should always keep future adjustments in mind.

4.3.3 CRITICAL ASPECTS WITHIN A TRANSFORMATION PROJECT

The interviewees where asked to adjudicate the theoretical framework. This framework is a summary of aspects involved in a transformation intervention. The experts where asked to give their opinion about the importance of the aspects. The participants were asked to validate the set of criteria. The complete list of aspects can be found at theoretical framework in chapter 5.

LIKERT SCALE

The Likert scale is one of the most common investigation techniques towards the investigation of attitudes about an object(Bryman, 2012). The Likert scale is a multiple-indicator or multiple-item measure methods to measure multiple opinions about the same topic. The survey consists out of a set of statements, the interviewee response with a level of agreement. For instance, 5 is very positive and 1 is very negative.

4.3.4 A DECISION SUPPORT MODEL

None of the interviewees where using a certain model concerning intervention nor transformation strategies. The decision is based on years of experience in the field and knowledge gained from both educations as practise. Most of the existing models where seen as too thoroughgoing and therefore user-unfriendly. Each and every project is seen as unique; therefor each and every project needs a special approach. There is no need for a too specific model; there is need for one comprehensive user-friendly model. A general quick scan that helps to determine potential solutions for a vacant office building

Some models where used to determine the financial feasibility.
Models used involved
- Financial feasibility

All of the involved companies used the IRR as an investment indicator.
- Energy label

Most companies used energy labels to determine the environmental aspects of a building. Contradicting to this is that, the energy label was seen as unimportant. All companies use a minimum energy label of A+. New adapted buildings with an energy label below A+, would face a new vacancy risk.

The interviewees where interesting in a user-friendly and comprehensive model. This model should be known as a general quick scan including the major aspects of a transformation. A very thoroughgoing model is still very generalizing and therefor missing its goal. The hardest part in such a model is to quantify soft aspects such as sustainability and architectural value.

THE MODEL | 5

5.1 THE DECISION SUPPORT MODEL

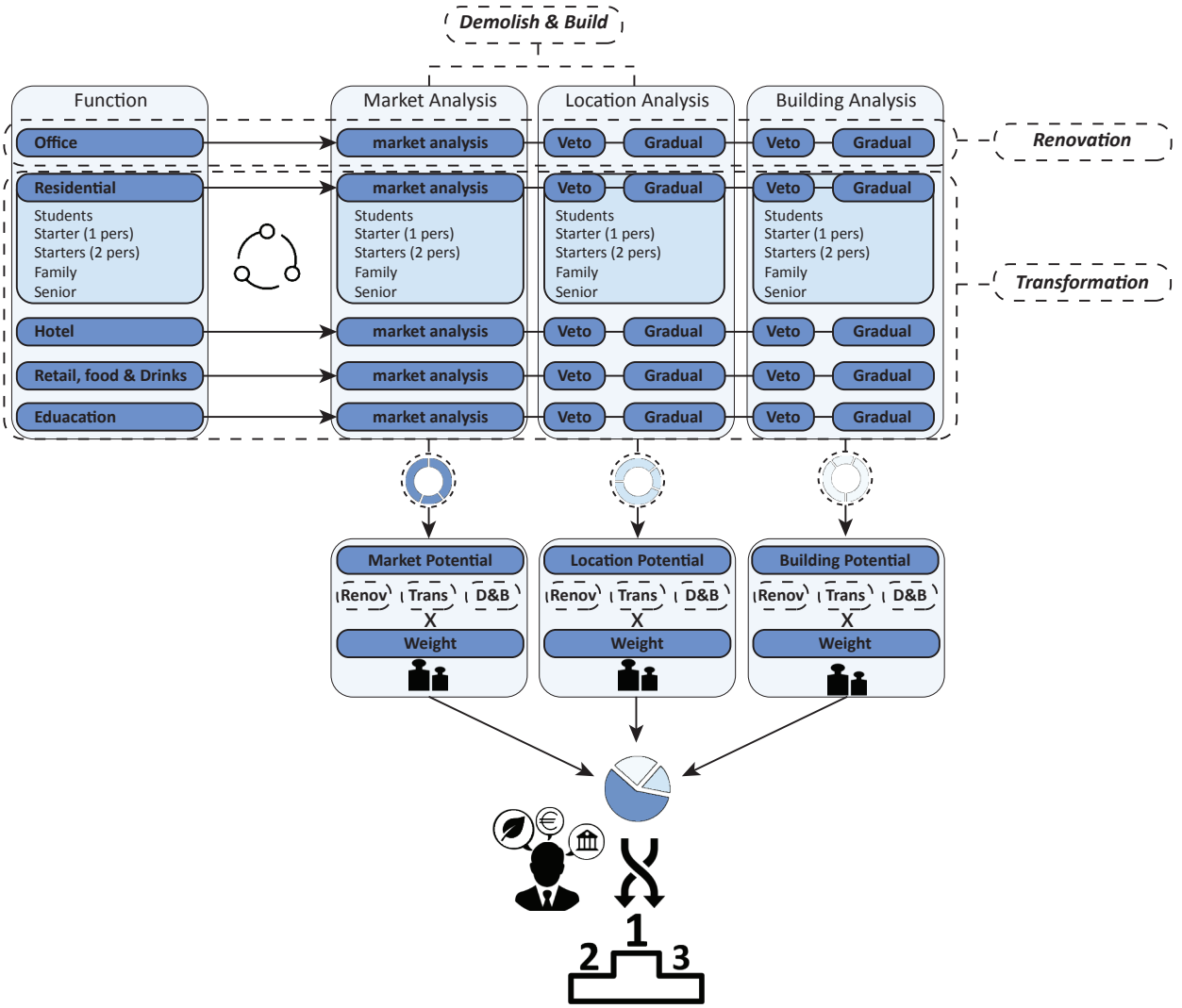


Fig 5.0.1: Systematic diagram of the model (Own material)

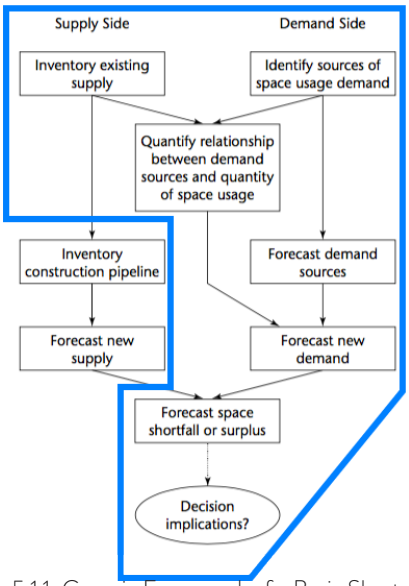


Fig 5.1.1: Generic Framework of a Basic Short-Term Structural Market Analysis for Real Estate (Geltner, Miller, Clayton, & Eichholtz, 2007, p. 111)

0) Vacant office building
1) Involved functions
2) Market Potential - The market potential is a quick scan of the current demand in the neighbourhood.
3) Location potential
a. Exclusion - based on a set of veto criteria, when a veto occurs the function is excluded.
b. Gradual – based on a set of gradual criteria that can be positive or negative for a function.
4) Building potential
a. Exclusion - based on a set of veto criteria, when a veto occurs the function is excluded.
b. Gradual – based on a set of gradual criteria that can be positive or negative for a function.
5) Weigh factor
a. A weigh factor is implemented that makes a distinction in importance between the three analyses.
b. A weigh factor is implemented that makes a distinction in importance all criteria.
6) Ambition of user
a. Financial profitability
b. Sustainable contributions
c. Architectural and cultural value
7) Recommendation for a certain intervention including
a. Function
b. Intervention
c. Specific intervention
d. Ambitions

5.1.1 MARKET ANALYSIS

The first step in the DSM is to determine and compare the best possible functions. Successful real estate developments are based on knowledge of the underlying economic and geographic forces that govern urban land values and location patterns(Geltner et al., 2007, p. 103).
According to Gentler et al. the market analysis is designed to assist in several market depending decisions. The provided market analys method is for new buildings and function. In the DSM, location and building are already set. The main questions have to be modified to serve the purpose of the DSM.

The most important decisions applicable to the DSM are:
-Where to locate a branch office
    o What branch office fits the applicable location?
- What size or type of a building to develop on a specific site
    o What size or type fits the specific site?
- What type of tenants to look for in the marketing a particular building.
    o What is the best applicable target group?
- What the rent and expiration terms should be on a given lease
    o What is the average acceptable rent?
- When to begin construction on a development project
    o When to start a redevelopment?

GENERAL FEATURES OF REAL ESTATE MARKET ANALYSIS

A real estate market analysis seeks to quantify and forecast the future supply and demand for the concerning location. A practical market analyses is based on realistic data combined with common sense. A market analyses can be applied relatively quickly and inexpensively and is therefore easy to communicate to others without knowledge of a real estate market (Geltner et al., 2007).

PURPOSE OF A MARKET ANALYSE

- Feasibility analysis: A microanalysis focussing on a particular building or site.
- General characterization of a real estate market: Used to quantify an forecast the supply and demand for a space based on forecast rates such as future rents, population and vacancy.

VARIABLES AND INDICATORS

A typical market analysis based on variables or indicators that quantify values for both demand and supply. An typical list of market descriptive variables provided by Geltner et al(2007).
- Vacancy rate
- Rent Level
- Quantity of new constructions
- Absorptions of spaces.

DEMAND DRIVEN ANALYSIS

The analysis performed by the DSM is focussed on the demand side of a market analyses but also makes an inventory of the existing supply.
In figure 5.1.1 a generic framework of a basic short-term structural market analysis is shown. Current office locations in Amsterdam are completed and saturated. Therefor the influences of future construction plans are negligible. The model does not include the inventory of construction pipeline or the forecast of new supply. The real estate market is completely depending on the demand and

5.1 THE DECISION SUPPORT MODEL

Drivers by property type / function

Function	Demand drivers
Residential (apartments)	Population Household formation Interest rates Employment growth
Retail	Aggregate disposable income Aggregate household wealth Traffic volume
Office	Employment in office occupation
Hotel & convention	Air passenger volume Tourism receipts or number of visitors

Drivers implemented in the DSM

Function	Driver
Residential	- Population - Household formation - Employment growth
Retail	- Aggregate disposable income - Aggregate household wealth
Office	- Employment

Drivers excluded in the DSM

Function	Driver	
Residential	- Interest Rate	The housing market in the municipality of Amsterdam is less depending on the interest rate. The demand for housing in Amsterdam keeps rising. A higher demand rate result in higher prices(Groot, 2015).
Retail	Traffic volume	A higher traffic volume is not interrelated to a higher number of retail businesses. The retail market is divided in different segments. The traffic volume in some retail areas such as inner city shopping area is subsistence.
Office	Employment in office occupation	The current rate of employees living in the same area as their office is still very low(Graaf, 2015). The Zuid-As, Amsterdam main financial office centre has a very low residential rate. Employees prefer housing in the city centre or in housing area close to the Zuid-As such as Oud-Zuid. There is an upcoming housing trend in the Zuid-As area, but this is also depending on the housing shortage in Amsterdam.
Hotel & Convention	-Air passenger volume	The Schiphol are and the municipality of Amsterdam are both depending on a different segment of tourism. The typical tourist will try to go to the inner city of Amsterdam, while the business related visitors stay closer to Schiphol(Fedorova & Bicknese, 2014)
	-Tourism receipts or number of visitors	The typical tourist in Amsterdam will visit the city centre but may stay outside the city. The rate is depending on the budget of the tourists and the availability of rooms(Fedorova & Bicknese, 2014).

supply flows. The property market has a key influence on the determination of function potential (Jones, 2013). Functions will attract similar functions. The presents of equal or related real estate types is therefore essential.

FUNCTION FOLLOWS FUNCTION

- Definition of an office location site or a group of sites with building are realized or can be realized, which primarily accommodate an office function (Provincie_Noord-Holland, 2014).
- Definition of a residential area A residential area is an area within the municipality where the dwellings forms the major property type(Van Dale, 2015).

According to both functions, clusters of property types are interrelated to the demand in the area (Jones, 2013).
Based on this conclusion two assumptions are made
1. The ratio of the property type in its context is interrelated to the demand in the area.
2. The in-or decrease of this ratio is representable for the in- or decrease in demand.

CONCLUSION

A real estate market analysis is a quick scan to determine possible property types on the corresponding location. Sucecesful real estate developments are based on realistic data combined with common sense. A market analyses can by applied relatively quickly and inexpensively and is therefor easy to communicate to others without knowledge of a real estate market(Geltner et al., 2007).
The DSM makes uses several variables to determine the demand for a certain property type.

1. Prospect

Population: In- or decrease
Offices: In- or decrease
Residential: In- or decrease
Retail: In- or decrease
Hotel: In- or decrease

2. Property type specific

- Office
  - Employment in office occupation
- Residential
  - Household formation
    - a) Student accommodations
    - b) Single-person apartments
    - c) Two-person apartments
    - d) Family accommodations
    - e) Senior accommodations
- Hotel
  - Number of hotels in the area
- Retail
  - Aggregate disposable income + Aggregate household wealth
- Educational
  - The type education and institution.

5.1 THE DECISION SUPPORT MODEL

Veto criteria (step 1)

Aspect	Gradual	Data input	Included / Excluded in DSM
The policy of the municipality of Amsterdam	Building is localized at a location primarily for housing	OIS Amsterdam	Included – The municipality stimulates office functions in primarily office areas (Geraedts & Voordt, 2007a). The DSM uses the real estate typology of the neighbourhood.
Parking capacity in direct surrounding	Parking capacity in direct vicinity =< 1 spot/200 square meter GFA.	OIS Amsterdam	Excluded - According to the Gereadts & Voordt (2007a) this criteria does not apply for the city of Amsterdam.

Gradual criteria (step 1)

Aspect	Gradual	Data input	Included / Excluded in DSM
Geographic location	City =< 50.000	OIS Amsterdam	Excluded - The DSM is made for the municipality of Amsterdam with 7.8 million residents.
Location is specific neighbourhood	Positive for office functions	OIS Amsterdam	Included – The DSM compares the number of offices with the Amsterdam averages offices per neighbourhood.
Concentration of buildings with low rent-prices	More buildings with rent =< €90 /sqm GFA	OIS Amsterdam	Excluded – Lower rent prices can be positive for starting companies or companies in the creative class segment(Gemeente_Amsterdam_Ontwikkelingsbedrijf, 2009).
Spatial and functional quality	Mono functional location	OIS Amsterdam	Included – facilities and context are included
Accessibility	Highway => 5km Railway station => 2km Bus/tram/metro=>1km	OIS Amsterdam OIS Amsterdam Input user	Included
Facilities	Supermarket => 500m Restaurants =>500m Recreation =>500m Bank =>500m Amount of facilities < average	OIS Amsterdam OIS Amsterdam OIS Amsterdam Input user OIS Amsterdam	Included Excluded
Public safety	Vandalism, feeling save	OIS Amsterdam	Included
Contextual inconveniences	None or bad insolation Health hazards or pollutions. Wind turbulence>= 50 days a year	Input user Input user -	Included Included in legal aspects Excluded
Visual spatial quality	Type of neighbourhood Little or no public green	OIS Amsterdam	Included

Veto criteria (step 2)

Aspect	Gradual	Data input	Included / Excluded in DSM
Demand for housing	There is no demand for housing	OIS Amsterdam	Included
Urban context	Zoning plan excludes housing Health hazards or pollution	Input user	Included

Gradual criteria (step 2)

Aspect	Gradual	Data input	Included / Excluded in DSM
Spatial	Bad view at 75% of the GVA	OIS Amsterdam	Included
Facilities	Healthcare Education	OIS Amsterdam	Included
Accessibility	Bad traffic flow Parking spots – distance to	- Input user	Excluded pervert housing locations in Amsterdam are not related to the traffic flow Included
Representativeness	No other buildings in direct context Bad liveability Bad social image	Input user OIS Amsterdam OIS Amsterdam	Included
Legal	Noise pollution on façade >50 dB (housing) >60 dB (offices)	Input user	Included

5.1.2 LOCATION ANALYSIS

The location analysis is based on existing models. The first step is to analyses the location for an office function. When the function remains the same, the intervention strategy is called a renovation. The second step is to evaluate the possibility of other functions such as housing, a hotel function, retail, food & drinks and an educational function. When the function changes in the current building the intervention strategy is called a transformation. There is some overlap in the graduate criteria of both models.

STEP 1. RENOVATION - VACANCY RISK METER

The first step in the location analyse is the vacancy risk meter (in Dutch leegstandrisicometer) (Geraedts & Voordt, 2007a). This tool was developed measure to risk and potential of offices in Rotterdam. The tool is based on the opinion of 50 involved real estate experts. The tool can give a verdict about future potential of an office building. The criteria used are adapted to usable criteria for the municipality of Amsterdam.
In order to predict the potential for an office function, the model uses a set of veto criteria, criteria that lead to exclusion of an office function. When a criterion is answered with yes, and there is no room for improvement, the criterion is a veto. The second step is a set of gradual criteria, criteria that are seen as positive or negative for a future office function. When answered with a yes, the criteria give a positive result. The third step is to predict the building potential for an office function, the following chapter will elaborate more about this step.

STEP 2. TRANSFORMATION TO RESIDENTIAL USE – TRANSFORMATION POTENTIAL METER

The second model used for the DSM is the Transformation potential meter (in Dutch Transformatiepotentiemeter)(Geraedts & Voordt, 2007c). This model is designed to measure the possibility and potential to transform a vacant office building into dwellings. The model uses the same steps as the vacancy risk meter (Geraedts & Voordt, 2007a) used in step 1. First a set of veto criteria followed by gradual criteria. The model distinguishes demands of different target groups. Some target groups have different demands for instance the accessibility and facilities in the direct surroundings.
There is a lot of overlap in these criteria, but the some values differ per function. These differs are adapted in the DSM.

Target group profiles
An adaptation and summary of the demand of the target groups used in the Transformation potential meter(Geraedts & Voordt, 2007c). The DSM uses these target groups to specify the specific residential property use.

Target group	Location demands	Minimum space demands UFA
1. Students	In strong urban area Lots of facilities	35 m2
2. Starters (1 pers.)	In strong urban area Lots of facilities	75 m2
3. Starters (2pers.)	In strong urban area Lots of facilities	90 m2
4. Family	Safe environment Supermarket in direct area (<500m) Public transportation in direct area (<500m)	100 m2
5. Senior	Sub-urban area Spatial green	90 m2

5.1 THE DECISION SUPPORT MODEL

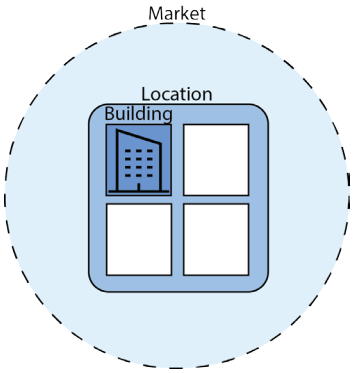


Fig 5.1.4: Ownership and involvement (own material)

Step 1 - Gradual criteria

Aspect	Gradual criteria	Data input	Included / Excluded in DSM
Year of Construction	Between 1960-1980	Input user	Included
Spatial – visual quality	- Out-dated appearance - No own/strong identity in context -No representable appearance - Bad recognizable entrance	Input user	Included
Appearance & Identity	- Traces of vandalism - Graffiti on façade - Decayed façade - Not representable - Specific for semi-government	Input user & database	Excluded – These aspects overlap too much with the spatial- visual quality and can be merged.
Technical quality of the skin	- Bad quality facade - Bad quality open parts - Bad quality roof	Input user	- Included
Technical quality of installations	- Heating >= 10 y. - Cooling >= 10 y. - Air treat. >= 10 y. - Water >= 12 y. - Illumination >=10 y. - Communication>= 5 y. - Security >= 7 y. - Maintenance >= 5 y. - Infrastructure >=10 y.	Input user (If unknown= same as construction year)	- Included and merged into one. It is too specific for the DSM. When age > 15-year replacement is required (Syllabus_VastgoedCert, 2015).
Environmental quality	- Bad energy achievement - Bad sound insulation - Unhealthy	Input user	- Included as energy label - Excluded, cause is too hard to determine. - Included as health hazards
Functional quality	- Floor height <=2,60m or >=3.60m - Bad horizontal layout - Unit size for attraction or repulsion >= 900m2 - No flexible floor plan - Nr. of elevators <= per 1350m2 GVA - Width circulation <= 1,7m - Useable floor load <= 3,5 KN/m2 - No room for Electra	Input user	- Included - Included as grid - Included as grid - Included - Included - Excluded, not relevant - Excluded, not relevant

Step 2 - Gradual criteria (addition to step 1)

Aspect	Gradual criteria	Data input	Included / Excluded in DSM
Year of Construction	Office is recently built <3 years	Input user	Included
Vacancy	- Is partly vacant - Vacant for < years	Input user	Included
New units	- Capacity <= 20 units - No possibility to fit in the desired program	- Input user (GFA) - Input user (smallest useable floor height)	Included
Possible expansion	- No horizontal - No vertical (top) - No vertical (basement)	Input user	Included
Condition	Structure	Input user	Included
Adaptations	- Grid of the façade < 5.40m - No open able windows - Possibility to add balconies	Input user	Included
Visual quality	- No possibility to create a residential image	Input user	Included as – structural façade or not
Circulation	Bad or cloudy circulation and entrance	Input user	Included
Building act	- No elevators in building > 4 elevation floors - Distance to horizontal fire exit >50m - No fire straits	Input user	- Included - Excluded, assumed the current building is safe according the building act. - Excluded – idem

Step 3 - Veto criteria

Aspect	Gradual	Data input	Included / Excluded in DSM
Floor height	Function <2.10m = Veto Food & Drinks <2.40m = Veto	Input user + Building act	Included
Structural	Bad condition structure =Veto	Input user + Ratio	Included - A bad construction is cannot be reused.
Circulation	- No elevators in building > 4 elevation floors and no possibility to add one = Veto	Input user + Building act	Included
Installations	Installations age > 10 year = Veto (intervention with no new installations)	Input user + Ratio	Included – old installation could not be reused

5.1.3 BUILDING ANALYSIS

Just like the location analysis, the building analysis is based on two existing models. The drivers or the so-called aspects are merged to one comprehensive list. There is some overlap in the graduate criteria of both models. Both models are a made in 2007, thus some criteria may be a bit out-dated. The building act (in Dutch Bouwbesluit) is used to check the criteria.

STEP 1. RENOVATION - VACANCY RISK METER

STEP 2. TRANSFORMATION TO RESIDENTIAL USE – TRANSFORMATION POTENTIAL METER

There is some overlap in the graduate criteria of both models.

STEP 3. BUILDING ACT AND RATIO

All the criteria used in both models are up-to-date but some extra veto criteria are found and implemented in the DSM. The current acting building act is the building act 2012(Rijksoverheid, 2012a). Some other veto criteria are assumption based on logical values.

5.1.4 WEIGH FACTOR

Some weigh factors are implemented in the model in order to make a distinction in (1) the analyses and (2) the used criteria.

STEP 1 – WEIGH FACTOR APPLICABLE ON THE ANALYSES

The first weigh factor used is the weigh factor applicable on the three different analyses. The weigh factors used in both models, Vacancy risk meter(Geraedts & Voordt, 2007a) and Transformation potential meter(Geraedts & Voordt, 2007c) are used. The weigh factor for locations analysis is 5 and for the building analysis is 3. There is no weigh implemented for the market analysis. There is no explanation for those factors so an assumption is made.

- The weigh factor is depending on the adaptability possibilities by the user. The user can, within legal restriction, adapt his building by own will. He is, or will be the owner of the building. The location is ground bounded and therefore less adaptable. The adaptability for he location but the user is less then the adaptability of the building. The adaptability of the location is depending on extern factors such as ownership of extern stakeholders and visions of the municipality. The influence of the owner on the market is even less then on the location. The weigh factor of the market analysis should therefore be even higher then the location analysis.

Weigh factor implemented in the DSM
- Building analysis – 3
- Location analysis – 5
- Market analysis – 6

STEP 2 – WEIGH FACTOR APPLICABLE ON CRITERIA

As stated in chapter 3.3, both models used, Vacancy risk meter (Geraedts & Voordt, 2007a) and Transformation potential meter(Geraedts & Voordt, 2007c), are based on the opinion of 50 real estate experts. During expert interviews with 11 experts on renovation and transformation project, some doubt aroused about the different criteria; should all criteria weigh similar(Beelen, 2016; Braam, 2015; Dwars, 2016; Huikenshoven, 2016b; Klevering, 2016; Ielyveld, 2015; Moritz, 2015; Savelsbergh, 2016; van der Horst, 2015b; Walraven, 2015; Wellink, 2016)?
For instance, should the distance to a sport facility weigh similar as the distance to a railway station? During the interviews the complete list all criteria gained was used. Some criteria where added along the research, and are not evaluated by the experts. In this case two solutions are possible: (1) the criteria is interrelated to an evaluated criterion or (2) an average value of 3 is awarded.

The participants where asked to validate the set of criteria. The Likert scale was used to validate the different criteria.
1= Not important in a renovation or transformation project
5= Very important in a renovation or transformation

Weigh factor

The weigh factor chosen is the modus value of the response. The modus is the score which occurs the most (Ostelo, Verhagen, & Vet, 2002).
This weigh factor multiplies the gradual criteria used in the DSM, creating a difference between the criteria.

5.1 THE DECISION SUPPORT MODEL

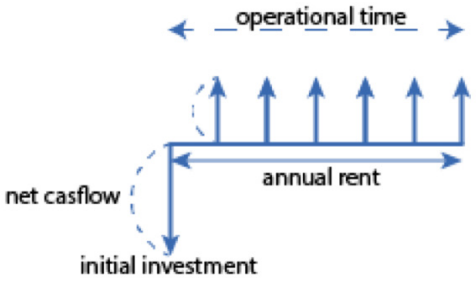


Fig 5.1.5.1: Cash flow – time diagram (own material)

# floors	Efficiency rate
2 – 4	88 – 91 %
5 – 9	84 – 88 %
10 – 19	77 – 85 %
20 – 29	75 – 83 %
30 – 39	74 – 79 %
40 +	72 – 77 %

Table 5.1 Efficiency GFA/UFA - floors (Jong, 2007)

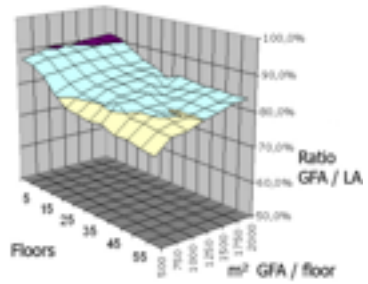


Fig 5.1.5.2: Efficiency – floor area (Jong, 2007)

5.1.5 AMBITIONS

The last step in the DSM is the addition of the users ambition. This ambition can reflect the main goal of a company. The different ambitions implemented in the DSM are (1) financial profitability (2) environmental sustainability and (3) architectural and cultural value. The mix of ambition should reflect the ambition of a company. The user indicates the level of ambition on base of a five-point scale.
5 = very high level of ambition
1 = very low level of ambition

5.1.5.1 FINANCIAL PROFITABILITY

Profitability is one of the ambitions included in the DSM. There are several methods to calculate the investment efficiency. The most common methods used are the Internal Rate of Return (IRR), the Total Rate of Return (TRR) and the Yield method (Binnekamp, Koppels, & Jong, 2016). The DSM compares different scenarios with different functions, intervention strategies and interventions. Which of the methods fits best for the DSM? The chapter will elaborate about the best method, the variables used in this and the assumptions made for this method.

PROFITABILITY INDICATORS

Internal Rate of Return - The internal Rate of Return (IRR) is the classical and traditional measure performance in real estate (Geltner et al., 2007, p. 190). The IRR is calculated for a longer period of time and most real estate property owners are not planning on to sell their property. The IRR is a dollar-weighted return and reflects the effect of the magnitude of capital invested during each period(Geltner et al., 2007, p. 192).
In order to calculate the IRR (1) the initial investment, (2) the net cash flow generated by the exploitation of the property and (3) the exploitation period (operational time of the investment).

Net Present value - The Net Present Value (NPV) is common used and has wide acceptance as a profitability indicator. The NPV works with a multi period Discounted Cash Flow (DCF) valuation. A discount rate of 7 – 8 % is used in the Dutch real estate market (Braam, 2015). The DSM uses a discount rate of 7,5%.
The NPV consist out of three steps (Geltner et al., 2007).

1. Forecast the expected future cash flows.
The model calculates the future cash flows with the annual rent income and a positive cash flow and the annual maintenance as a negative one.
2. Ascertain the required total return.
The total return is calculated by the initial investment and the net cash flow.
3. Discount the cash flows to present value at the required rate of return.
The required rate of return is the rate the investor wants for an investment.

The previous steps are merged in the following formula.

NPV = Σ (NCF/ (1+R)^T) – I)

- NPV = Net Present Value (euro)
- NCF = Net Cash flow per year T (euro)
- R = annual rent Interest rate in (%)
- T = Operational time (year)

Net present value and internal rate of return - The discount rate is the minimum rate an investor wants for their investment. The NPV is the amount the investor earns (if NPV is positive) or loses (if NPV is negative) over the operational time. A positive NPV could be a positive decision making factor. The IRR is the rate when the NPV equals zero.

Total Yield - A new method to estimate the profitability of in investment is the Yield method. The yield uses the gross initial rent, based on the market rent prices relates tot the market value of the asset. The market value is the market rent price divided to the yield. The yield used is the yield of comparable projects.

CONCLUSION

The internal Rate of Return (IRR) is the classical and traditional measure performance in real estate (Geltner et al., 2007, p. 190). In order to calculate the IRR the formula of NPV is used. The IRR is the interest rate of each year during the total operational period of the asset. In order to calculate the NPV a discount rate is needed. The discount rate is the interest rate an investor demands for the investment. A positive NPV would result in a positive decision. The DSM automatically uses a discount rate of 6,5%, but the user can differ from this rate. The user can apply the desired discount rate at the input sheet. The Yield method is a very specific profitability indicator. This makes it a very accurate indicator but also unusable for the DSM.
The model automatically uses an inflation rate of 1%, the user may differ of the rate and specify the desired inflation rate. The inflation rate fluctuates and is annually changing.
The model is able to include one fixed inflation factor; therefore the indicator used differs from a realistic IRR. The function of the IRR is to forecast and indicate the profitability of the investment of different interventions. The primarily goal of the IRR is to compare different interventions on a financial bases. The IRR given in the model may therefore deviate from the realistic IRR. The goal of the DSM is a quick scan method to determine the potential of several combinations of functions and interventions. The model is a simplified and generalized model and gives a quick but raw solution. The adapted IRR used in the model is sufficient enough to address this goal.

VARIABLES

In order to calculate the different IRRs input is needed. Most variables are found in the Research, Information and Statistics of Amsterdam, in Dutch OIS Amsterdam(Gemeente_Amsterdam, 2016). The formula used to calculate the IRR, stated in chapter 7.21, needs 3 different types of input.
1. The total operational time in years.
2. The initial investment in currency.
3. Net cash flow per year in currency.

EFFICIENCY RATE - GROUND FLOOR AREA / USABLE FLOOR AREA

Construction costs of a building are per square meter gross floor area while rent prices are based on the usable floor area (Wortman, 2008). According to Wortman (2008), the GFA/UFA ratio for dwellings is between 0,63 and 0,82. The higher this ratio, or closer to one, the more of the building is leasable. The ratio is strongly depending on the design of the building and the ability of an architect to harmonise the new program and the current building.
According to de Jong (2007) the efficiency rate of high-rise offices is strongly depending on the height of the building. The number of elevators is a strongly influencing the GFA/UFA ratio. Table 5.1 shows an interrelation between the efficiency rate and the height of a high-rise building. Figure 5.1.5.2 shows the decrease of the efficiency combined with the floor area. Tall high-rise buildings with relatively small floor area have a low GFA/UFA efficiency. The average building height in Amsterdam is 30 meters (Gemeente_Amsterdam, 2011), so the efficiency rate for offices should be 77 – 85 %. According to the expert interviews it is very hard to establish the same efficiency rate in building not especially designed for the function.
The efficiency rate is depending several factors including the design, type of building, function and the adaptability of the building. The model allows the user to specify the GFA/UFA for newly built and additive reuse. When unknown, the factor GFA/UFA used in calculations is between 0,63 and 0,82. A newly built building will have a higher space efficiently then a reused building. An assumption is made based on the efficiently the factor for transformation and renovation is lower (0,63) then when newly built (0,82). The DSM will use these values to create a difference in GFA/UFA ratio of a reused or newly built building and will result in more rent income. The maintenance or operational costs are based on ground floor area and are equal in both situations.

OPERATIONAL PERIOD

The lifespan of a building is the time between the completions of the building until it gets demolished. There are shorter lifespans within the total lifespan
- The economic life: ends when the building is not economical lucrative anymore.
- The service life: ends when the building no longer performs as intended.
- Technological life: ends when the performance of the building mismatches with the demands of the inhabitants.
- Design life: The intended life expectation of the designer. The engineers assure the quality of the design within that period.

The operational time used in de DSM is the time used in the calculation of the investment. The average invest period used by investors is 2 to 50 years, the average design life intended by the designer is 25 to 30 years(UVL_Engineering, 2014). The value of a building is depending on the quality of the design and therefore a more realistic lifespan 30 years is used in the DSM.

5.1 THE DECISION SUPPORT MODEL

Function	Fixed charges €/m2	Administration & lease cost €/m2	Maintenance €/m2
Offices	€4,3	€4,0	€8,5
Residential	€3,2	€4,0	€10,0
Hotel	€2,1	€4,0	€15,0
Retail, Food & Drinks	€6,0	€4,0	€5,5
Educational	€3,9	€4,0	€15,0

Table 5.2 Average maintenance costs Kopgroep, 2008)

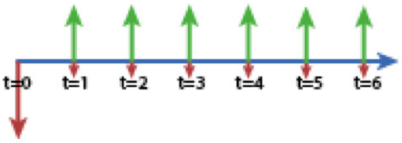


Fig 5.1.5.3: Cash flow – time diagram (own material)

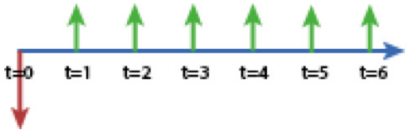


Fig 5.1.5.4: Net Cash flow – time diagram (own material)

INITIAL INVESTMENT

The initial investment at T=0 is the sum of different costs. These costs are ineluctable when choosing for an intervention strategy. The sum consists out acquisition and construction cost and the cost to upgrade the current energy label.

ACQUISITION COST

The total acquisition is the price paid for the office or the residue asset cost. The acquisition cost of an office building is one of the most important decision making factors for an intervention strategy. Investors and developers have their own way to calculate the acquisition cost (Voordt et al., 2007).

CONSTRUCTION COST

The construction costs are interrelated to the intervention strategy, the adjustments made to the current situation. The model is a systematic approach and uses only the major cost in a renovation, transformation or a newly built building. The construction cost is divided in demolishment costs and built cost.
According to Huls, a building cost management consultancy (Huls, 2016), the major building costs are that should be taken into consideration are the Construction or replacement of the
- Supporting structure
- The Façade
- The build in components
- The installations

When replacing the installation, built-in components, the façade or the complete structure, the demolishing cost of the current situation should be taken into account. The prices used in the DSM where provided by Huls building cost management consultancy (Huls, 2016) and where checked at reference projects in bulding compass, in Dutch Bouwkompas (Vonk, Wilde, & Groot, 2013). The cost prices for demolishment and construction can be found in Appendix 10.

Energy label upgrade - Since 2015, an energy label is obligated for newly build, transferred with sale or start of a rental contract of residential and non-residential buildings (Rijksoverheid, 2015). An upgrade of the current energy label can be obligated by law, but also may have some benefits. Extra costs when upgrading to a higher energy label are inevitable (BBN_adviseurs, 2012). Chapter 5.1.5.2 will elaborate more about the costs and benefits of a higher energy label. The extra costs due an energy label are added to the total in construction cost and thus the initial cost.

NET CASH FLOW

In order to calculate the IRR an investor will use the DCF method in order to make the future cash flow present. The DCF method depends on 4 variables that are reduced to 3 inputs. The most important variables are rental income, annual operating cost, major maintenance and end value.

Income - The positive cash flow consists out of rent income. A developer is creating a space market and is willing to sell the building as an asset to the asset market. The developer will try to capitalise the rent as high as possible in order to sell the asset to an investor for a higher price (Floyd & Allen, 2002).

Rent contracts - Different contract forms are used for different functions. The rent income for an office is set per year per UFA. Depending on the type of contract, the rent income of a commercial function may be partly related to the UFA and partly on the turnover or profit of the company. The rent income of a hotel is merely depending on the turnover of the company (Driessen & Wubus, 2007) . These variables are not included in the DSM, the DSM works with averages rent prices per square meter.

Average rent price - In order to compare different function all prices need to be square meter prices per years. The average prices per neighbourhood of offices, residential, retail and educational functions are given. These functions are related to a rent-price per square meter. These prices are strongly depending on the location of the building.
The estimated value of a hotel function is calculated differently. The income of a hotel is depending on the rent of rooms and other income such as income of food and beverage. In order to compare a hotel and other functions, the value calculation of a hotel is adapted. This calculation would give a usable impression of the square meter price of a hotel in Amsterdam. The hotel prices are less depending on the specific location within the region of Amsterdam. Hotels related to leisure and tourism are mostly localized in the city centre while business related hotels are localized outside the city centre (Gemeente_Amsterdam, 2016).

Residential rent prices are distributed by Pararius (2015) ,commercial rent prices by DTZ Zadelhof (2016) and the rent prices for a educational function by Bouwstenen voor sociaal (Baas, 2011) .

The rent prices for a hotel function are a bit harder to estimate. A well-known method to estimate the value of a hotel is a corollary of the ADR Rule of thumb and is called the room-rate multiplier technique (Oneil, 2003). This method multiplies the average room rate with the number of rooms and multiplies this amount with 1000. This calculation is already an oversimplified method to estimate the value of a hotel as whole.

A more applicable validated method is the revenue per available room method (RevPAR) method. The RevPar is calculated by multiplying the average daily room rate by its occupancy rate (Horwath_HTL, 2015). In order to estimate the value per square meter of a hotel the calculations are based on average values of Amsterdam.
The RevPar is the revenue per room per night. In order to calculate estimate price per square meter a year, this divided by the average room size in square meter and multiplied by the number of nights in a year. According to the HOSTA (2015) an average of 23,5-25% of the total revenue is paid for housing.

Assumption and variables
- The average classification of hotels in Amsterdam is three stars (Gemeente_Amsterdam, 2016)
- The average Revpar of a three star hotel room is €55 (Horwath_HTL, 2015)
- Rooms in a three star hotel have a minimum floor area of 22 square meter(hotelsterren, 2016)
- An average of 25% of the total revenue is paid for housing (Horwath_HTL, 2015)

Estimated income per square meter per year is ((55/22)*365)*0,25) €228.
This value is an average estimation of the square meter price; this estimated value would be sufficient for the purpose of the model.

Total rent income - In order to determine the total rent income of the DSM uses the following steps.
1. The DSM matches the neighbourhood and function to the distributed rent prices per month and square meter.
2. The prices are multiplied by twelve to gain the rent prices per year and are multiplied by 30, the set operational period.
3. The previews steps will resolve in the rent price per square meter a year. The rent prices are multiplied by the UFA of the building.

Costs - The costs are strongly depending on the discount rate and the building type and function (Jong & Arkesteijn, 2014). The operating cost is sum of the cost for taxes, insurance, maintenance, energy, management and cleaning. The leasing party pays some of these costs, like the cost of energy. The exploitation costs implemented in the model are fixed charges, the operational and lease cost and cost of maintenance. The purpose of the model is to compare different scenarios, the implementation of these costs will be sufficient for this purpose. Prices used in de DSM are average prices per function (Kopgroep, 2008).

Note: the source is may be outdated (2008). According to the expert interviews, these values are approximately correct. The operational costs are depending on the situation. and the average Dutch value is therefore hard to determine.

CONCLUSION

The IRR of each investment option is calculated in order to compare all combinations of interventions and functions.
The initial investment – This value is an input determined by the user
Net cash flow - The DSM uses a database of average values
Operational period – The operational period is set on 30 years.

RECOMMENDATION

The DSM is a simplified model; because of the complexity of these projects some costs or benefits are left out consideration. For the completeness of this model some values could be taking into consideration.

Costs - Additional cost – The additional cost due construction are fees for the architect and engineering consultants.
Legal costs – permit costs etc.

Benefits - Rent increase – depending on the contract the rent may increase over the years.

Simplification of the IRR formula - The model is a simplificated version of reality. The model uses key figures to quickly determine and reflect diverent intervention strategies. Because of the simplification the IRR function of Excel is sufficient. This function is an simplifaction of the IRR calculation.

5.1 THE DECISION SUPPORT MODEL

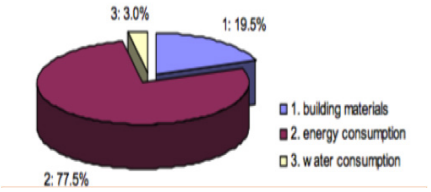


Fig 5.5.1: Division of the environmental cost (Dobbelsteen, 2004)

Function	EPC	Energy label
Offices	0,8	A
Residential	0,4	A++
Hotel	1	A
Retail, food & drinks	1,05	A

Fig 5.1.5.3: Cash flow – time diagram (own material)

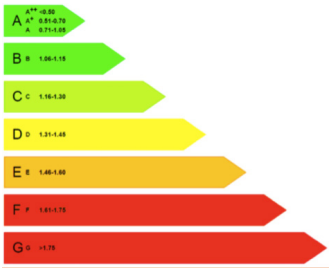


Fig 5.1.5.3: Cash flow – time diagram (own material)

New-Build	Energy use (MJ)	index cost savings	Index (label D = 1)
A++	148	1,00	0,29
A+	224	1,51	0,44
A	326	2,20	0,64
B	411	2,78	0,80
C	456	3,08	0,89
D	511	3,45	1
E	567	3,83	1,11
F	622	4,20	1,22
G	741	5,00	1,45

Transformation	Energy use (MJ)	index cost savings	Index (label D = 1)
A++	151	1,00	0,29
A+	228	1,51	0,44
A	332	2,20	0,64
B	419	2,78	0,80
C	464	3,08	0,89
D	521	3,45	1
E	577	3,83	1,11
F	634	4,20	1,22
G	755	5,00	1,45

Fig 5.5.5: EPC index (Groot, 2014)

Energy label	Points
A++	40
A+	36
A	32
B	28
C	15
D	11
E	5
F	1
G	0

Fig 5.5.6: Points for energy labels (Groot, 2014)

Other - Initial & friction vacancy – Due to vacancy the total rent income will be less.
Inflation – The inflation of the currency used.
Subsidies – Some subsidies are reworded when creating a more energy sufficient building(BBN_adviseurs, 2012).

5.1.5.2 ENVIRONMENTAL SUSTAINABILITY

Sustainability is one of the ambitions included in the model. The environmental load method of Dobbelsteen (2004) is partly used in the model. In this model a distinction is made between the annual load and the initial load. The annual load is the energy and water consumption per year of a building. The building materials cause the initial load. Building materials are responsible for 20,5% of the total environmental load. The energy consumption of a building plays a mayor role of 77,5% in the environmental load of a building. The water consumption of a building plays a nearly negligible role of 3% in the total environmental load. The model will make a distinction between the energy consumption and the building material of a building.

ANNUAL ENVIRONMENTAL LOAD - ENERGY CONSUMPTION

The energy label is a result of the European strategy for the energy performance of buildings. Energy labels are divined to categorise the energy consumption of a building. The labels correspond to the Energy Performance Coefficient (EPC) values of a building. The EPC is related to the climate heating, water heating, illumination, ventilation and the temperature reduction. Since 2015, an energy label is obligated for newly build, transferred with sale or start of a rental contract of residential and non-residential buildings (Rijksoverheid, 2015).
When newly build, the minimum obligated EPC is depending on the function.

$$EPC = \frac{Q_{pres;tot}}{330 \times A_{g;woon} + 65 \times A_{verlies}} \times \frac{1}{C_{EPC}}$$

EPC = The EPC of the residential function of the building.
$Q_{pres;tot}$ = The value of the energy use in MJ
$A_{g;woon}$ = The value of the UFA in sqm.
$A_{verlies}$ = The value of the unusable floor area in sqm
C_{EPC} = The value of the correction if necsisarry

When renovating or transforming the EPC value should at least be the EPC value of the original building (Bouwbesluit, 2014).

UPGRADE ENERGY LABEL - COSTS & BENEFITS

COSTS

According to a report of BBN advisors (2012) an initial investment is required when upgrading from a lower energy label. This upgrade is interrelated to a possible increase of rent income. In this report a distinction is made between offices build before 1989 and after 1989 both in poor conditions. BBN advisors also made a distinction between small (3000m2) and big offices (18000m2). The cases investigated by BBN advisors had both very low energy labels (label G and D). According to the report, every upgrade needs a specific investment. A summary made by de Groot (2014)of the interventions and values calculated by BBN Advisors (2012) can be found in appendix 9.

The DSM has a free input of the current and de desired energy label. The DSM finds the current energy label and the desired energy label and the corresponding investment costs of this upgrade per m2 GFA. The DSM calculated the investment for an upgrade from the original energy label to the desired energy label per m2 GFA.
The DSM recognizes the different in building year but calculates the average price per m2 GFA of both building sizes.

BENEFITS

1) Decrease of energy consumption

The extra investment for an upgrade of energy label results in a lower energy consumption (BBN_adviseurs, 2012). The annual environmental load will decrease according to EPC formula of NEN5218 (Groot, 2014) shown in figure 5.5.4. As stated by Dobbelsteen (2004) the energy consumption is responsible for the major part of the total environmental load of a building. Reducing the energy consumption will result in a reduction of the total environmental load.

2) Decrease of energy costs.

In figure 5.5.5 the cost of energy consumption corresponding to the different energy labels in the different cases of BBN Advisor is shown.
Lower energy consumption is interrelated to the annual energy costs of a building. De Groot (2014, p. 99) created an index (figure 5.5.5) for energy savings per household a years. The values in the index are again average values and may deviate from actual values. The index is based on the EPC formula, an average energy label D in Amsterdam. A distinction is made between a transformation and renovation project and a newly built building. De deference between these is the average floor height. Higher floor heights will, according to the EPC formula, result in a higher EPC value thus higher energy consumption. A floor height of 2,7 meter is used for the calculations for newly built offices. According to Bouwbesluit (2014) this is the minimum floor height required. When the current building has a higher floor height than average, the DSM see this a negative value considering the total environmental load of the building. According to de Groot, the Dutch average is label D the DSM is based on Amsterdam's average label C (energielabelatlas, 2015). The energy cost savings is interrelated to the energy consumption. A building with energy label G consumes five times as much energy as the same building with A++ would.

3) Increase of rent income

The Dutch non-liberated housing sector is regulated by the government and works with an appreciation system (Rijksoverheid, 2012b) in order to determine the rent prices. The maximal allowed rent for non-liberated housing works with point given for confidences in the building. The achieved point are corresponding with the allowed rent prices. The liberated housing market does not have such an appreciation system, but in order to determine an increase of rent for a higher energy label, the assumption is made that both systems are comparable. According to de Groot (2014, p. 101) the deference between energy label G and energy label A++ is 40 points. In order to determine the possible rent increase de Groot calculated the allowed rent increase per energy label. The rental prices according to the appreciation system for non-liberated housing can be found in appendix 10. The average price increase per point is €5,07 per point per month. This would result in an increase of (5,07 x 40 =) €203 rent per month. This increase seems a bit much for just energy savings. In order to get a more realistic amount, de Groot adjust this the amount to average energy saving per energy label. The average energy cost savings between label D (€1530) and label A+ (€670,76) is €859,24 a year. The difference between label A+ and D is 25 points, according the point system this would resolve in a increase of €126,75 per month and €1521 per year. This means that the rent increase more then the energy savings each month with a factor 1,77. This adjustment de Groot makes results therefore monthly increase (5,07/1,77 =) €2,86 per point per apartment. This amount is based on the non-liberated housing market.
The DSM makes a distinction between sizes of different apartments. Therefore an average energy factor is calculated that response to the m2 UFA of each apartment. The points given for an energy label upgrade multiplied by €2,86 is the rent increase per apartment. The total increase is divided by the total rent per average sized apartment. The average size of an apartment is the size is the average of demand by all target groups(Geraedts & Voordt, 2002) and is 78 m2. The rental prices used are provided by Pararius(Pararius, 2015) and is related to the neighbourhood given as input by the user of the DSM. These prices are average prices of the liberated housing sector of that neighbourhood.
This calculation resolve in a rent increase factor called the energy factor. The average energy label in Amsterdam is C and is set as a benchmark for this calculation.

Example
For this calculation the neighbourhood Willemspark is given with an average rent of € 21,03 /m2 UFA/month, thus (21,03 x 78 =) €1.640,34 per month. The allowed increase of rent according to the method above is (25 x 2,86 =) € 71,50. The energy factor is the aimed increase in rent ((1.640,34 +71,50)/1.640 =) 1,044.

These calculations are based on the appreciation system for the non-liberated housing market. But the amount of energy cost savings should by comparable to the liberated market. The increase is based on the housing use but is assumed to be comparable for the office market.

4) Other benefits

In the exploitation of the DSM the energy costs are for the leasing party and benefits of the savings on energy costs are calculated in the rent prices. Nevertheless a green label may have marketing benefits for the project a more comfortable indoor climate for the user. A good indoor climate positively effects on the productivity and health of its users or residents (BBN_adviseurs, 2012).

CONCLUSION

An upgrade of the energy label results in an increase of the construction costs, a decrease of the energy consumption and an increase of annual rent income. If the benefits way up to the costs, it is assumable that the highest possible energy label is desired.
The decrease of energy consumption results in a much lower total environmental load. The environmental load is the major parameter for sustainable ambition.
An energy label upgrade will result in a lower annual load factor with

5.1 THE DECISION SUPPORT MODEL

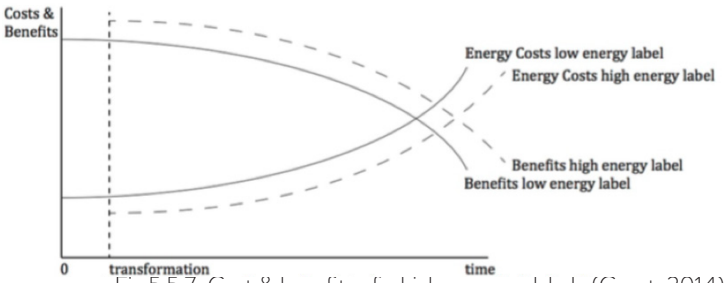


Fig 5.5.7: Cost & benefits of a higher energy label. (Groot, 2014)

Current energy label										
Desired label	Label	A++	A+	A	B	C	D	E	F	G
	G	5,00	3,31	2,27	1,80	1,62	1,45	1,31	1,19	1,00
	F	4,20	2,78	1,91	1,51	1,36	1,22	1,10	1,00	0,84
	E	3,83	2,54	1,74	1,38	1,24	1,11	1,00	0,91	0,77
	D	3,45	2,28	1,57	1,24	1,12	1,00	0,90	0,82	0,69
	C	3,08	2,04	1,40	1,11	1,00	0,89	0,80	0,73	0,62
	B	2,78	1,84	1,26	1,00	0,90	0,81	0,73	0,66	0,56
	A	2,20	1,46	1,00	0,79	0,71	0,64	0,57	0,52	0,44
	A+	1,51	1,00	0,69	0,54	0,49	0,44	0,39	0,36	0,30
	A++	1,00	0,66	0,45	0,36	0,32	0,29	0,26	0,24	0,20

Table 5.3 Indexation of energy label (own material)

Intervention	Supporting structure (59,5%)	Structural detailing (15,9%)	Built-in components (11,5%)	Finish (12,9%)	Paving (0,4%)	Total
1. Transformation with no intervention	No	No	No	No	No	**0**
2. Renovation/transformation with desired energy label	No	No	No	Yes	No	**0,129**
3.Renovation/Transformation with desired energy label and façade replacement	No	Yes	Yes	Yes	No	**0,403**
4. Renovation/Transformation to maximum height construction and zoning plan allows with desired energy label and replacement of the façade	Partly Depending on extra GFA added	Yes + extra Facade added	Yes + extra GFA added	Yes + extra GFA added	No	**0,403 +**
5. Demolish and built same building	Yes	Yes	Yes	Yes	Yes	**1,00**
6. Demolish and built max height zoning plan allows	Yes + extra GFA added	Yes + extra GFA added	Yes + extra GFA added	Yes + extra GFA added	Yes	**100+**

Table 5.4: Initial load calculation (own material)

Intervention	Energy label	Annual load index	Weight 77,5%	Initial load index	Weight 19,5%	Total Weight index
1. Transformation with no intervention	C	1	**0,775**	0	**0**	**0,775**
2. Renovation/transformation with desired energy label	A+	0,49	**0,38**	0,129	**0,025**	**0,405**
3.Renovation/Transformation with desired energy label and façade replacement	A++	0,32	**0,248**	0,403	**0,079**	**0,327**
4. Renovation/Transformation to maximum height construction and zoning plan allows with desired energy label and replacement of the façade	A++	0,32	**0,248**	(0,403+0,25=) 0,653	**0,127**	**0,375**
5. Demolish and built same building	A++	0,32	**0,248**	1,00	**0,195**	**0,443**
6. Demolish and built max height zoning plan allows	A++	0,32	**0,248**	1,50	**0,292**	**0,540**

Table 5.5: Initial load calculation (own material)

a factor. The current energy label of the vacant office building is used as a benchmark for the establishment of the initial factor.
Table 5.3 shows the factors used. When upgrading from energy label D to energy label A++ the annual load will decrease with a factor 0,29.

INITIAL ENVIRONMENTAL LOAD – BUILDING MATERIALS

The building industry is responsible for 50% off all material flows in the world(Dobbelsteen, 2004). The annual resources needed for the building industry in the Netherlands alone result in 120 million tons. 17 million of construction and demolition waste is produced yearly. According to this numbers one can assume that the other 88% of the material is used to coop with the annual grow of the real estate market.
Transforming or renovating building of the existing building would diminish the use of building material. The so called Three Steps Strategy, a logical approach written by the research group Urban Design and Environment of the Delft University of Technology should help to diminish environmental waste of the building industry(Dobbelsteen, 2004).
1) Avoid unnecessary demand for resources.
2) Use resources that are unlimited or renewable.
3) Use of limited resources wisely (clean and with a large return).
This strategy can be refined to the building industry
- Avoid unnecessary consumption of (waste) of material.
- Consider the option of not building. (Adapt the demand)
- Re-use or renovate a building instead of constructing a new one.
- Design efficiently.
- Use renewable or abundantly obtained resources.
- Use clean processes for extraction and manufacture and increase re-use of materials that are depleting or whose primary manufacture is harmful to the environment.

INITIAL LOAD INDEX

Different building components have different building cost. The supporting structure is responsible for 59,3% of the total building cost, while the structural detailing takes 15,9% (Dobbelsteen, 2004). Table 5.5.9 shows the energy cost of all building components.

Depending on potential reuse, each intervention strategy causes a different initial load. Renovating a building without a replacement of a façade will have a smaller initial environmental load then a demolish & newly built intervention. Interven-

tions in the current building will case an extra initial investment to the project.
In order to compare the different costs caused by interventions an initial load index is created. The current building will be used as a benchmark and has the factor 0.

Conclusion
According to the three steps theory, reuse of existing building material diminishes the amount of new building materials and thereby the environmental load of the building industry. Regarding an existing vacant office, the reuse of the building or its components result in less environmental load. The environmental cost per building compinent is shown in table 5.4 The supporting structure of a building has the highest environmental cost, preserving this would therefore result in less initial environmental load.

CONCLUSION
An indicator for the environmental sustainability is the environmental load. The total environmental load can be divided into the annual environmental load and the initial environmental load. The annual environmental load is depending in the annual energy consumption of a building, while the initial environmental load reflects the load causes by the use of building material. The initial load is a one-time load causes by the construction of a building. Therefore, reuse of building components reduces the initial load of a development. While the annual load causes a far bigger impact on the total environmental load then the initial load. The energy sufficiency of a building will result in less environmental load and a higher environmental sustainability.
The environmental sustainability of demolishment and newly build intervention strategy could be higher if a redevelopment of a vacant building cannot result a high energy efficiency. In theory, every building transformation could lead to a high energy sufficiency (energy label A++). In practise buildings built before 1989 (BBN_adviseurs, 2012) could only by really efficient (energy label A+) with major adjustments.
When a building is built before 1989 the model will decide a façade replacement is needed.
A total environmental load index is created when both the annual environmental load and the initial environmental load are merged. The annual load factor is based on the energy label of the building. The interventions used to calculate the initial environmental load are interrelated to energy labels. Therefore, it is possible to merge both factors.

Example
Table 5.5 shows an example of the calculations. In this example, the current building built in 1980 has energy label C, the desired energy label is label A++. Without a replacement of the faced, a construction year before 1989 result in a maximal label A+. The construction and zoning plan allows 2 more elevation floors on top of the current 8(+25% new built). The zoning plan allows a maximum height of 12 elevation floors (+50% new built). The annual load is responsible for 77,5% of the total environmental load, while the initial environmental load is accountable for 19,5%. Regarding both factors, the annual environmental load weighs 77,5% and the initial load 19,5%. The total environmental load factor is calculated with these weights.
In this example, intervention 3 has the least environmental load, so this would be the most sustainable intervention. This calculation also shows, a higher energy label achieved by a demolish and built, can be more sustainable then no intervention, or a intervention with a lower energy label.

5.1.5.3 ARCHITECTURAL AND CULTURAL VALUE

DETERMINE ARCHITECTURAL QUALITY
The value of architectural and cultural value is hard to evaluate. The Architecture nota define architectural quality as a combination of user value, future value and cultural value (Groenendijk, 1991). Cultural value was previously defined by the same nota as experience value. The key essence of architecture lays in the cultural value of an artefact and the degree the building and function concur.

User value – The user value can be tested with the demanded design program. The user value can also be interpreted as the user experience value. This value involves the spatial quality and internal aesthetic quality.

Future value – The future value is depending on the current trends and innovative technics. Currently sustainability is a term often used, buildings with sustainable materials in a sustainable way. The future value can be the flexibility of a design for future adaptations but also the durability of a building (Niemeijer, 2012).

Cultural value – Cultural expressions is hard to measure and can only be measured by the opinion of experts or the general opinion of the public, the quantifiable opinion of the public by sale rates and evaluation methods.
Groenendijk (1991) claims that , according to the same nota, the architectural quality is determined by the appearance of the building, not the program in the building. The program is accessory to the appearance, and can be changed overtime. The hazard in this interpretation is that architects would only concern about the form and skin of a building.

The willingness to pay - It is hard to estimate the architectural or cultural value of a building. Economics has a more precise definition of value based on profitability (Ready, 2002).
The guiding principle in defining the value of a public good, such as architectural and cultural value, is that the definition should be logically consistent with how the measurement of a private, market good is done. The market value of a product is based on the market value of the product, thus will have market prices. The market price is not benchmark for value, but is interrelated to the price the consumer is willing to pay (WTP) for the product. The value a person gets from enjoying a public good should therefore be relate price a consumer is willing to pay for the value.

CONCLUSION
The Architectural and cultural value of a building is a combination of the user-, future- and cultural value. These values are primarily based on user's experience and opinion. An opinion is a soft value and therefore hard to quantify. Nevertheless, the opinion of an (future) owner about the potential architectural & cultural is determinative for this value. If an (future) owner is willing to invest more money for a higher architectural value can be seen a financial value. The willingness to pay for a better design, or a design with more

5.1 THE DECISION SUPPORT MODEL

The Transformation of Valina, Wibautstraat 133, Amsterdam.

architectural- or cultural value, can therefore be expressed as a financial value.
This method claims that a higher architectural and cultural value leads to a better design and higher construction cost but also higher rent income.
Nevertheless a higher architectural value is not directly interrelated to higher costs (Groenendijk, 1991). The essence of Architectural and Cultural value cannot be expressed in a currency but it can be expressed in the willingness to pay when necessary.
The essence of a good design, thus a higher architectural and cultural value, lays in user experience, building appearance, and future value(Niemeijer, 2012).

Ecological user experience value is collection of qualities combining ecological and experience value.
- **Health quality**: defined by the climate system applied.
- **Design value**: well-designed solutions
- **External quality**: the quality aspects experience outside the building.
- **Future value**: Adaptability and flexibility.
- **Ecologic value**: the ecologic value such as improvement of the environment.

5.2 THE PROCEDURE OF THE DECISION SUPPORT MODEL

VALUES USED IN THE DECISION SUPPORT MODEL

Health quality – Climate installations
A higher energy label is interrelated to a better climate system. In order to validate this value, the DSM sees a higher energy label as a positive value.

Design value - Well-designed solutions
A good design has a high users function; a building is an object made to serve for a specific function. The experience of the user gets while using the building for its purpose.
- Good recognizable entrance
- Clear routing

External quality
- Out-dated appearance
- Decayed appearance
- Representable appearance
- Appearance and function concur (Huikenshoven, 2016b)
- Own or strong identity in context

Future value
Are the conveniences of the current design out-dated
- Façade meets current conveniences (shadings, materials etc)
- Structure meets current conveniences (floor height etc)

Ecologic value
The ecologic value is interrelated to the environmental load. Innovative methods can be added to the design such as solar panels or ground source heat pumps. These conveniences can be added to a future design. The possibility to add such a methods is seen as a positive value.
- The Possibility to add innovative sustainable technics in façade
- The possibility to add innovative sustainable technics in building

5.2 THE PROCEDURE OF THE DECISION SUPPORT MODEL

The steps described are the theoretical steps of the decision support model. The model is based on several interlinked excel sheets. The practical procedure can be explained in the following steps.

5.2.1 STEP 1 - FUNCTION SELECTION

The first set of chosen functions is based aspects and criteria of the Vacancy Risk Meter(Geraedts & Voordt, 2007a) and the Transformation potential meter (Geraedts & Voordt, 2007c). These models are regarding office and residential functions. The Transformation potential focuses on residential function and specifies this into different target groups. A set of other functions is chosen based on several expert interviews. Not every function would fit in a vacant office and could be intergraded in a certain DSM.

IMPLEMENTED FUNCTIONS
- Office function - The VRM focuses on the potential maintaining an office function.
- Residential – There is a housing shortage in Amsterdam(Dohmen, 2016).
o Students
o Starter (1 person)
o Starters (2 persons)
o Family
o Senior

The TPM focuses on different target groups applicable to Rotterdam. These target groups are the most common housing configurations in Amsterdam(Gemeente_Amsterdam, 2016).

-**Hotel function:** According to Lucien Walraven (2015) the Amsterdam real estate development market focused primarily on the

5.2 THE PROCEDURE OF THE DECISION SUPPORT MODEL

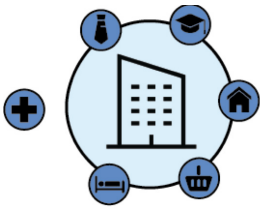
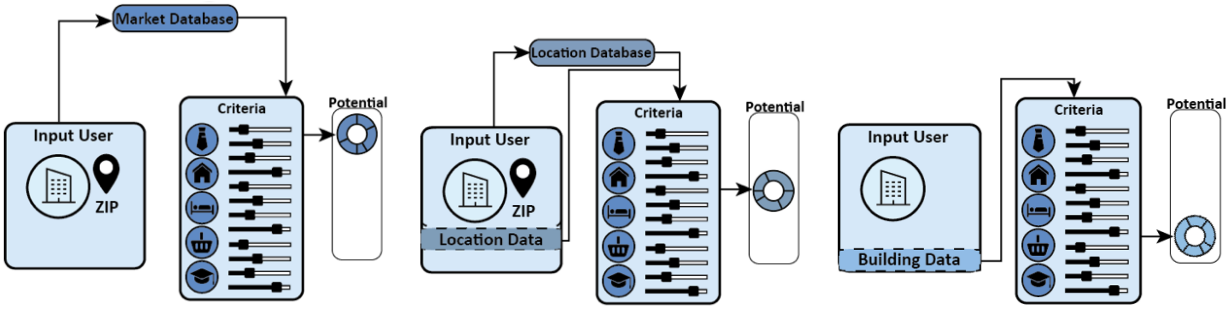


Fig 5.2.1 Function selection (own material)



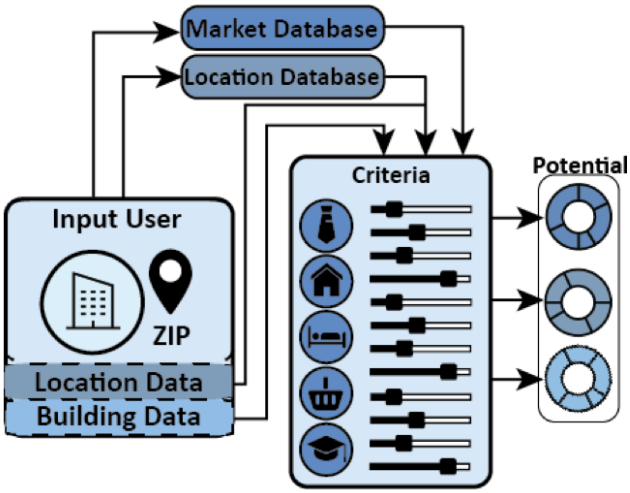


Fig 5.1.3 Function potential (own material)

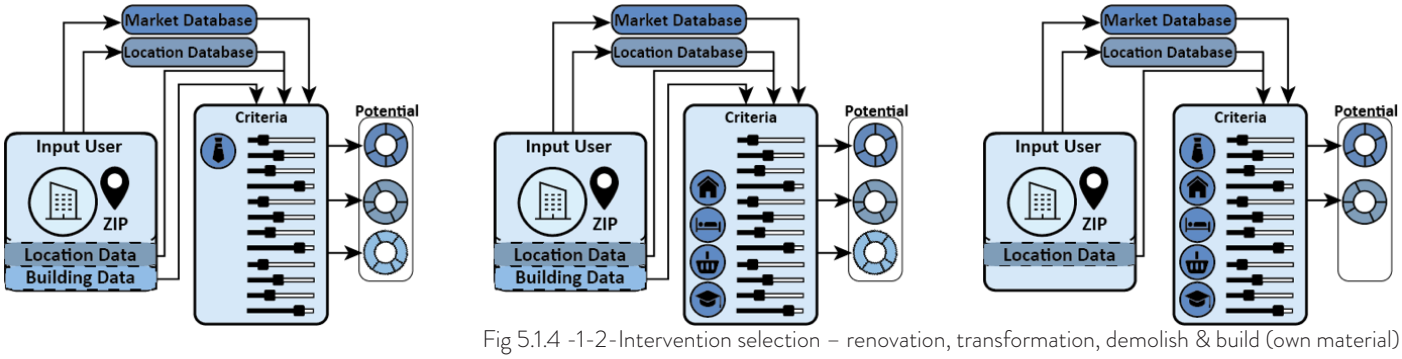


Fig 5.1.4 -1-2-Intervention selection – renovation, transformation, demolish & build (own material)

development of office buildings. This focus is now shifting towards the hotel market.
-**Retail, food & drinks:** The retail market is combined with the food & drink functions. Major retail buildings house certain function and are well combined. A food & drink function would probably not occupy a complete vacant office and should therefore be combined with an other function.
- **Educational function:** The number of students in Amsterdam still rises(abf_research, 2014), resulting in a shortage in educational space and students housing.

EXCLUDED FUNCTIONS
- **Health institutions:** The housing of a health institution is a very specific real estate market. The design of a health institution, such as a hospital is very specific and unique(Gemeente_Amsterdam, 2016). A certain function will not fit in a vacant office building.

The model cannot mix different functions; the function chosen is the main function.

5.2.2 STEP 2 - DETERMINE THE FUNCTION POTENTIAL

The function chosen in step 1 are evaluated on a set of aspects and criteria.
The first set of criteria are merged from
- Vacancy Risk Meter(Geraedts & Voordt, 2007a)
- Transformation potential meter (Geraedts & Voordt, 2007c)
Other aspects and criteria are based on
- Bouwbesluit (Rijksoverheid, 2012a)
- Expert interviews
- Ratio

There are no models used for the determination of aspects and criteria for hotel or retail, food & drink functions. Most of the criteria used for the evaluations are derivative criteria of office and residential functions. These derivatives are based on the opinions of experts obtained out of expert interviews.

All the functions are evaluated by the same criteria. When a graduate function is positively applicable on a function it is rewarded with a 1 or 2, if not with a 0. The number of points is divided in the total amount of point rewarded. When a criterion is not applicable on a certain function, the criteria are positively rewarded.

MARKET ANALYSIS
The criteria of used for the market analysis each potential function can be answered by information obtained from the Institute research, information and statistics (Gemeente_Amsterdam, 2016). All the market related information is merged into one sheet in the DSM called the market Database. In order to compare different areas within the city of Amsterdam, the market analyses should be very specific. The data published by the municipality of Amsterdam are divided into neighbourhoods. The city of Amsterdam counts 95 different neighbourhoods. When selecting a certain neighbourhood the market analysis is automatically done. Users of the model may not know in which specific area the building is localized. In order to avoid confusion the model asks the ZIP Code of the building. The model matches the insert ZIP code to one, or more neighbourhoods. The user is asked to select the right neighbourhood in the remaining list.

LOCATION ANALYSIS
The location analysis is based on (1) a general database obtained from the Institute research, information and statistics (Gemeente_Amsterdam, 2016) and (2) input of the user. The input asked is on a more specific level then the database.

BUILDING ANALYSIS
Each and every building is more or less unique. Therefore the building analysis is completely based on users input.

5.2.3 STEP 3.1 – DETERMINE THE INTERVENTION POTENTIAL

The third step is to determine the intervention potential of each intervention strategy.

In chapter 3.1 the different intervention strategies are elaborated. The primary main goal of the DSM is to reduce the number of empty office buildings in Amsterdam. The DSM helps the user solve the current or future vacancy problem in his portfolio or to determine future value of a vacant office building.
Selling a building is not a solution for the vacancy problem in Amsterdam. Consolation could decrease the vacancy rate when a temporarily act as a catalyst for other vacant buildings.

RENOVATION
When remaining the office function the intervention strategy is renovation. One of the vacancy causes explained is the lack of conveniences. When renovating an office building, with a better climate installation, more facilities or a facelift, these conveniences can be met. Figure 5.1.4-1 shows the process to determine renovation potential.

TRANSFORMATION
When another function is chosen in the same building, the intervention strategy chosen is a transformation. The current building needs an adaption to meet its new requirements. While adapting to its new function, it is common to upgrade the building to current or future conveniences. This should upgrade will longer the buildings lifespan, making the investment more profitable. Figure 5.1.4-2 shows the process to determine transformation potential.

DEMOLISH AND BUILD
When the current building has no future value, the building could be demolished and newly build. In order to determine the potential for demolish and build, the DSM disregards the building potential in the consideration for future potential. Figure 5.1.4-3 shows the process to determine demolish and build potential.

5.2.4 STEP 3.2 – A MORE SPECIFIC INTERVENTION

There are several types of renovation, transformation or demolish and build interventions possible. The most common specific interventions are implemented in the DSM. According to the expert interviews, the most common specific interventions are stated. The different interventions are an addition to the previous intervention.

5.2 THE PROCEDURE OF THE DECISION SUPPORT MODEL

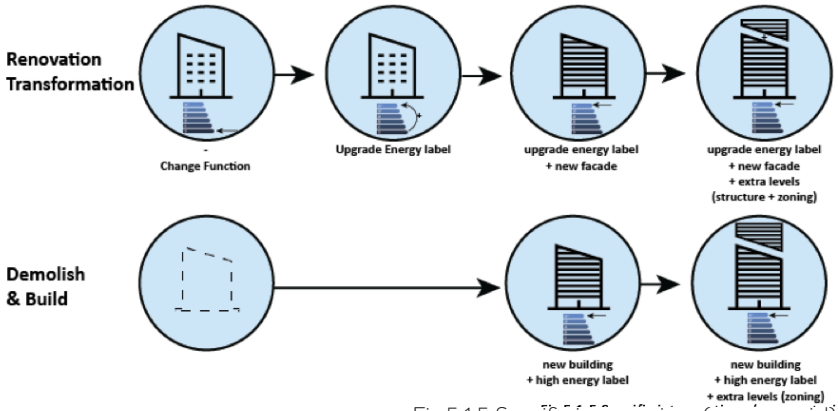


Fig 5.1.5 Specific interventions (own material)

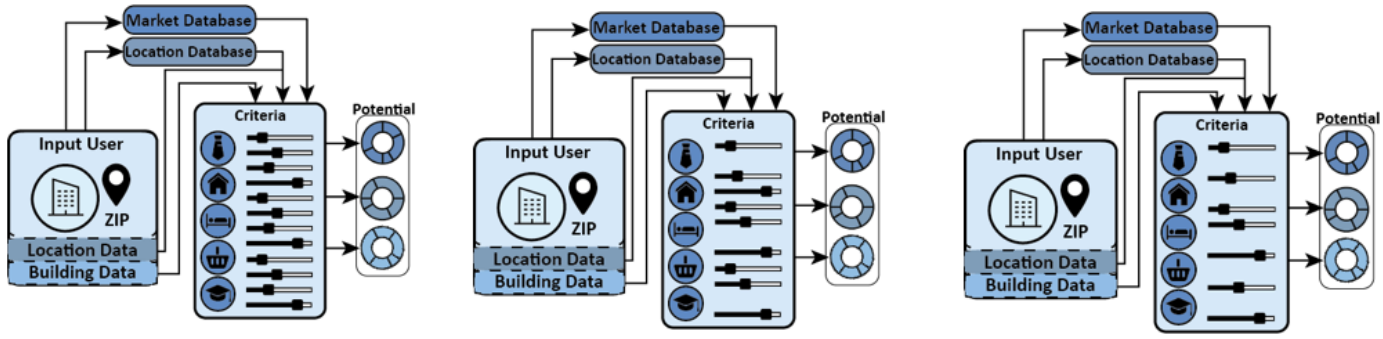


Fig 5.1.5 Specific interventions (own material)

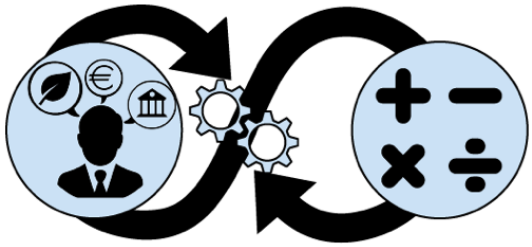


Fig 5.1.7 Quantifying the ambitions (own material)

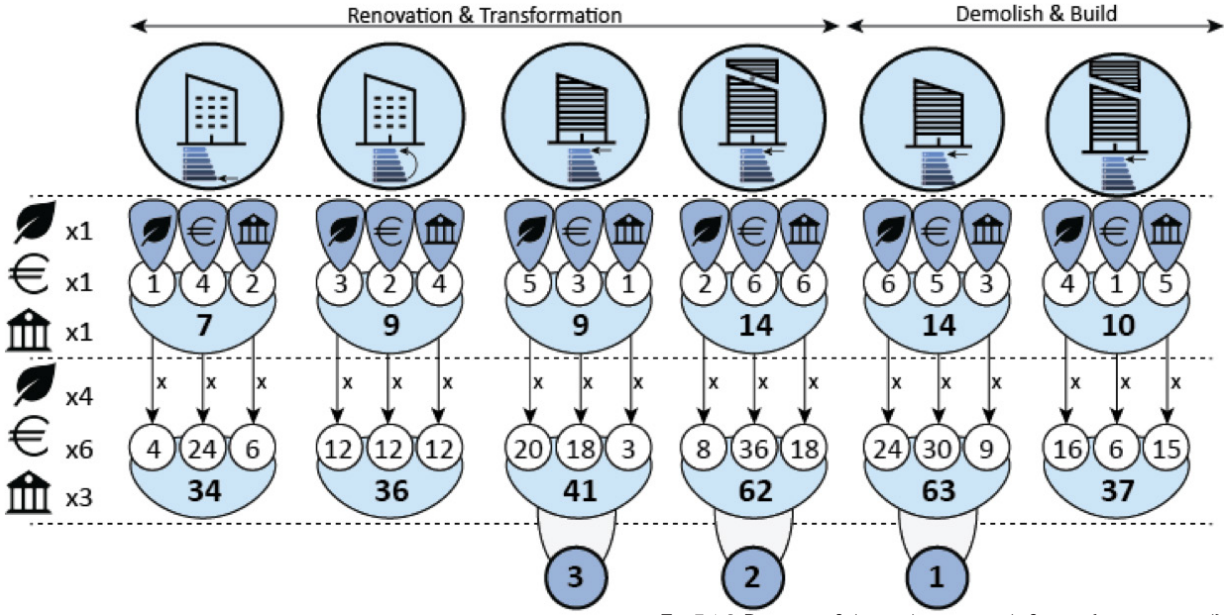


Fig 5.1.8 Process of the ambition weigh factor (own material)

Upgrade of the energy label – Energy level upgrade by replacement of the old installations. A building before 1989(BBN_adviseurs, 2012) can not meet an energy A++ level with just a replacement of the installations. In order to meet a A++ level an update and a new façade is needed. When demolish & build an A++ level is realized.

Façade replacement – A new façade can result in a (1) higher energy label, (2) a higher architectural & cultural value or replace the current appearance of the building. When demolish & build, the desired façade is realized.

Extra levels – Extra levels can make a project more profitable. With a transformation intervention, the amount of levels allowed is depending on the structure and the zoning plan. When demolishing & build the amount of levels allowed are depending on the zoning plan.

The DSM selects the involved criteria for each specific intervention. Criteria related to the upgrade of the intervention are left out determination for that specific intervention potential. The model is now able to select the best function related to each specific intervention. The three combinations with the most potential are sent to the Summary & Ambition sheet.

5.25 STEP 4 – QUANTIFYING THE AMBITIONS

The next step in the model is to quantify the ambitions. Chapter 5.1.5 elaborates about the different ambitions and the interrelated criteria. The ambitions are quantified by the users input implemented databases.
The implemented ambitions are: financial profitability, environmental sustainability and Architectural- and cultural value.

FINANCIAL PROFITABILITY

Financial profitability is one of the ambitions implemented in the DSM. Profitability is one usable business motives. In chapter 5.1.5.1 the financial profitability indicator is reasoned. The IRR is needed for each combination of functions and interventions. The IRR is depending on the Investment paid at T=0, the net income per year and the operational period (Geltner et al., 2007).
The investment is depending on the acquisition cost, construction costs and the costs for an upgrade of the energy label. The acquisition cost relays on input of the user, the construction costs are retrieved from the financial database sheet. This sheet is a summary of all prices concerning construct. The energy costs are retrieved from the energy database.
The net income is depending on the amount of rent retrieved. The average rent of each function deviates for each neighbourhood. The market prices used for this calculation are retrieved from the market database. The calculation for the increase of rent income due the upgrade of the energy label is based on (1) rent prices, (2) the average size of a dwelling, stated in the connection sheet, and the index values stated in the energy database.
The operational period is set on 30 years.

All the financial scenarios are stated and calculated in the scenario worksheet. This sheet makes a summary for each scenario; this summary includes (1) investment, net income, net cash flow, NPV and IRR. The IRR for each scenario is automatically calculated in the IRR worksheet. The last step in this calculation is to match the three combinations with the highest potential with their IRR. These IRR values are sent to the Summary & Ambition worksheet.

ENVIRONMENTAL SUSTAINABILITY

The environmental load is the indicator used for the environmental sustainability. The environmental load is based on (1) the annual environmental load and (2) the initial load. The energy label of the building determines the annual load. The degree of intervention determines the initial load. The reasoning for both indexes are stated in chapter 5.1.5.2 and can be found in the DSM at the energy worksheet.

ARCHITECTURAL- EN CULTURAL VALUE

The last implemented ambition is the architectural and cultural value. These values are hard to quantify and are based on the users input and knowledge.

THE AMBITION WEIGH FACTOR

The best combination of function and specific and intervention is given in the Summery & Ambition sheet. The DSM creates index of the top 6 of the ambitions, six relates to the best ambition and 1 to the lowest. Every combination is assigned with the degree of ambition. According to the ambition, the best combination is the combination with the highest ambition value.
The weigh factor multiplies each ambition separately resulting in an adjusted ambition level for each ambition. The DSM matches the highest total ambition and returns the highest three combinations. These three combinations of functions and specific interventions are summarized and state as best three interventions for the current building.
Figure 5.1.8 illustrated the process of the weigh factor.

5.3 SHEETS USED IN THE MODEL

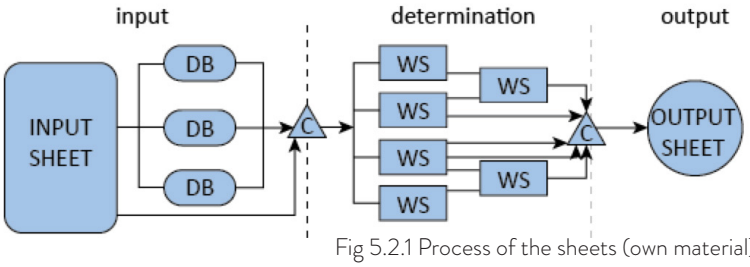


Fig 5.2.1 Process of the sheets (own material)

1 Market		Value	
Area			
1 ZIP code numbers		1075	
2 Select the neighbourhood		WILLEMSPARK	
2 Location			
Site			
1 None or bad insolation	<	50%	of time
2 Bad view at 75% of GVA		NO	*Yes / No*
3 Next to highway		NO	*Yes / No*
4 Other buildings in direct context		YES	*Yes / No*
3 Building			
3.1 *general*			
1 Construction or last renovation Year		1951 - 1960	*Year of completion*
2 Gross Floor Area (total)		2850	*m2*
3 Gross Floor Area (ground floor)		750	*m2*
4 Ambition			
1 Financial Profitability			0 *importance (5 high - 1 low)*
2 Environmental Sustainabilty			4 *importance (5 high - 1 low)*
3 Architectural & Cultural value			2 *importance (5 high - 1 low)*
5 Optional Variables			
1 Reuse - GFA / UFA effeciency rate			(when unkown leave empty)
2 newly built - GFA / UFA effeciency rate			(when unkown leave empty)

Aspect			Criteria	Points (P)	Criteria	Points (P)
0. Function	Value	max Points	Offices		Student-/group (3+) accomodati	
1. Market						
1.1 Prospect market						
1 Population	1,3%	2	<0 = 0 =0 = 1 >0= 2	2	<0 = 0 =0 = 1 >0= 2	2
2 Offices	-1,7%	2	<0 = 0 =0 = 1 >0= 2	0	<0 = 2 =0 = 1 >0= 0	2
3 Residential	4,4%	2	<0 = 0 =0 = 1 >0= 1	1	<0 = 0 =0 = 1 >0= 2	2
4 Retail	5%	2	<0 = 0 =0 = 1 >0= 1	1	<0 = 0 =0 = 1 >0= 2	2
5 Hotel	0%	2	<0 = 0 =0 = 1 >0= 1	1	<0 = 0 =0 = 1 >0= 1	1

Fig 5.2.3 Parts of the WS aspects & criteria (own material)

B	Renovation / Transformation Potention			Current situation			
				Totaal	Market	Location	Building
				Weight	6	5	3
1. Renovation	Offices	1.	Offices	68%	40%	83%	96%
2. Transformation	Residential	1.	Student-/group (3+) accomodation	85%	80%	83%	100%
		2.	1 pax accomodations	80%	67%	83%	100%
		3.	2 pax accomodations	87%	80%	90%	96%
		6.	Family accomodations	79%	73%	77%	96%
		7.	Senior accomodations	85%	80%	83%	100%
	Hospitality	8.	Hotel	72%	53%	80%	96%
	non-resdential	9.	Retail, Food & Drinks	71%	53%	80%	93%
		10.	Educational	70%	53%	77%	93%

Fig 5.2.4 Part of the WS function & intervention sheet (own material)

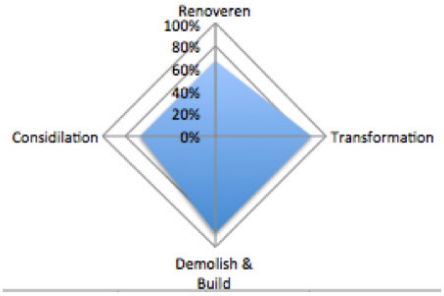


Fig 5.2.5 Diagram of the intervention strategy potential (own material)

The user uses the input to set the variables and gets his result on the output sheet. The model is arranged is several sheets. These sheets can be divided in types:
- Input sheet: This is where the user sets the project related variables
- Output sheet: This where a summary of steps is given which conclude in top three interventions.
- Worksheet (WS): A worksheet calculated or summarizes values.
- Database sheet (DB): A database sheet is a collection of values and information used in calculations. The database sheet is in fact a pre-set input sheet.
- Connection sheet (C): The connection sheet is programming tool. This sheet decreases the risk of errors during programming.
All the sheets are shortly elaborated. The complete sheets can be found in appendix 11.

5.3.1 INPUT SHEET

The input sheet is divided in 5 parts. Each part consist a couple of questions. Most of the questions are multiple-choice and work with a drop-down menu.

1. Market Input-The user fills in the ZIP code numbers of the project. Some of the neighbourhoods in Amsterdam have the same ZIP code numbers. Therefore the user selects the right neighbourhood in the dropdown menu corresponding to the ZIP code. In the Postcode Database the ZIP code is matched to the corresponding neighbourhood. All the market analysis is done by pre-set values stated in the market database.
2. Location Input-Most of the location analysis is done by pre-set values stated in the location database. Some of the aspects are on a more specific level and need to be filled in by the user.
3. Building Input- The building input is completely based on input by the user. In order to increase the user-friendliness, most of the variables are multiple-choice or easy to answer.
4. Ambition Input- The input for the ambitions is done by the Likert scale. The user quantifies the degree of importance in numbers. 5 reflects a high ambition and 1 a low ambition. The value given will later on be used as the weigh factor for the ambitions.
5. Optional Variables – Additive variables. The model uses pre-set variables for calculations. The user may specify these variables to get a more reliable result. Some user may not know these exact values and would use the average pre-set values.

5.3.2 WORKSHEET ASPECTS & CRITERIA – FUNCTION POTENTIAL

This sheet quantifies the function potential of each function. All veto and gradual criteria merged out of other models are set. Values for additive functions such as retail, food and drinks and educational are based on other sources or ratio. When a veto occurs, the function is eliminated. When a gradual criterion is market positive, a 2 is given, when neutral a 1 and when negative a 0. In order to determent a functions potential, the rewarded points are divided by the total amount of points.

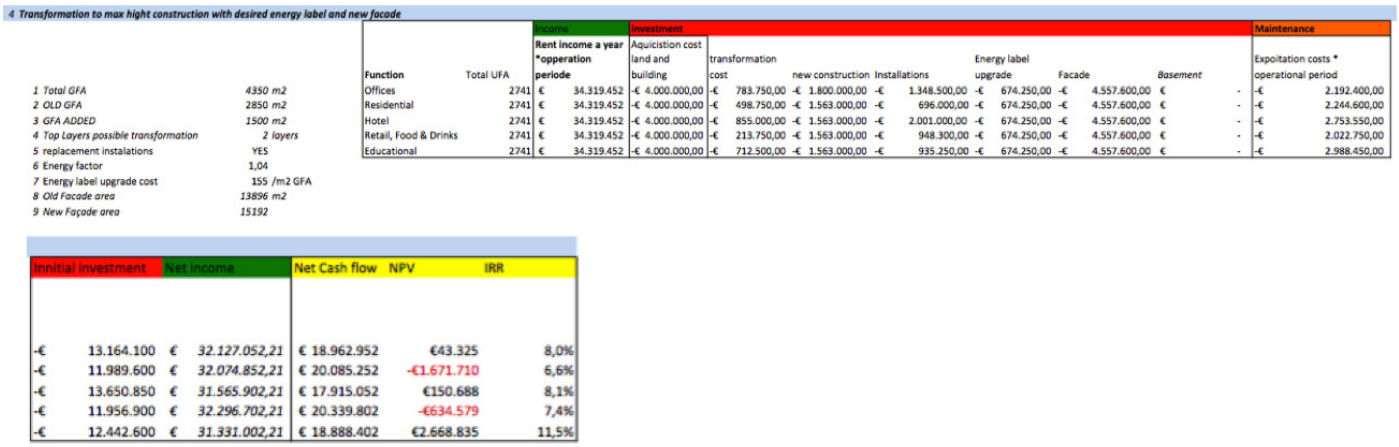
5.3.3 WORKSHEET FUNCTIONS & INTERVENTIONS

This worksheet has three functions (1) summarize the function potential, (2) combines this with several interventions and (3) reflects this to different intervention strategies. Four different interventions are compared. A deviation is created to compare different functions in combinations with a intervention strategy. Some criteria may not be applicable on some situations.
1. Function in current situation – All criteria
2. Renovation / Transformation with desired (A+ / A++) energy label – All criteria except installation and energy label related aspects.
3. Renovation / Transformation - All criteria except installation, energy label related aspects and façade related aspects.
4. Demolish & Build – Only market and location analysis.
At this point the model gives a interim result of the function that fits best for a specific intervention. The highest score of function in combination with each intervention is chosen and represent the intervention strategy potential. In order to determine the potential for intervention strategy demolish & build the complete building analysis is left out. When a veto occurs in the building analysis Demolish & Build may be the only option left.

5.3 SHEETS USED IN THE MODEL

Variable		Source
Total GFA	Total GFA as a result of the intervention.	Input user + added GFA
OLD GFA	The original GFA of the current situation	Input user
GFA added	Difference between old and total	Calculation with values
Top layers possible	Possible vertical expansion in layers	Input user
Basement possible	Possible vertical expansion in layers	Input user
Replacement installations	Replacement of installations needed	Input user or result 1) Out dated installation 2) Upgrade of energy label 3) Replacement by intervention
Energy factor	Increase of rent income by energy factor	Calculated in the energy worksheet
Energy label upgrade cost	Extra cost as a result of an energy label upgrade.	Calculated in the energy worksheet
Old façade area	The original façade are in the current situation	Calculation of input
New façade area	The area of the façade replacement	Result of specific intervention

Table 5.6: The financial aspects of each function (own material)



4 Transformation to max hight construction with desired energy label and new facade

1 Total GFA	*4350 m2*
2 OLD GFA	*2850 m2*
3 GFA ADDED	*1500 m2*
4 Top Layers possible transformation	*2 layers*
5 replacement instalations	YES
6 Energy factor	1,04
7 Energy label upgrade cost	155 /m2 GFA
8 Old Facade area	*13896 m2*
9 New Façade area	*15192*

		Income	Investment							Maintenance
Function	Total UFA	Rent income a year *opperation periode	Aquicistion cost land and building	transformation cost	new construction	Installations	Energy label upgrade	Facade	Basement	Expoitation costs * operational period
Offices	2741	€ 34.319.452	-€ 4.000.000,00	-€ 783.750,00	-€ 1.800.000,00	-€ 1.348.500,00	-€ 674.250,00	-€ 4.557.600,00	€ -	-€ 2.192.400,00
Residential	2741	€ 34.319.452	-€ 4.000.000,00	-€ 498.750,00	-€ 1.563.000,00	-€ 696.000,00	-€ 674.250,00	-€ 4.557.600,00	€ -	-€ 2.244.600,00
Hotel	2741	€ 34.319.452	-€ 4.000.000,00	-€ 855.000,00	-€ 1.563.000,00	-€ 2.001.000,00	-€ 674.250,00	-€ 4.557.600,00	€ -	-€ 2.753.550,00
Retail, Food & Drinks	2741	€ 34.319.452	-€ 4.000.000,00	-€ 213.750,00	-€ 1.563.000,00	-€ 948.300,00	-€ 674.250,00	-€ 4.557.600,00	€ -	-€ 2.022.750,00
Educational	2741	€ 34.319.452	-€ 4.000.000,00	-€ 712.500,00	-€ 1.563.000,00	-€ 935.250,00	-€ 674.250,00	-€ 4.557.600,00	€ -	-€ 2.988.450,00

Innitial investment	Net income	Net Cash flow	NPV	IRR
-€ 13.164.100	€ 32.127.052,21	€ 18.962.952	€43.325	8,0%
-€ 11.989.600	€ 32.074.852,21	€ 20.085.252	-€1.671.710	6,6%
-€ 13.650.850	€ 31.565.902,21	€ 17.915.052	€150.688	8,1%
-€ 11.956.900	€ 32.296.702,21	€ 20.339.802	-€634.579	7,4%
-€ 12.442.600	€ 31.331.002,21	€ 18.888.402	€2.668.835	11,5%

Fig 5.2.6 Part of the scenario worksheet (own material)

	Weight	5	4	2	Best Intervention	Score
	Intervention	Fiancial	Sustainability	Architectural		
1	Transformation with no intervention	6	1	1	36	16,6%
2	Transformation with desired energy label	4	3	1	34	15,7%
3	Transformation with desired energy label and new facade	1	6	3	35	16,1%
4	Transformation to max hight construction with desired energy label and new facade	2	5	3	36	16,6%
5	Demolish and build same building	5	2	3	39	18,0%
6	Demolish and build max height zoning plan	3	4	3	37	17,1%

Fig 5.2.7 Parts of the WS summary & ambitions (own material)

5.3.4 WORKSHEET SCENARIOS

Six different scenarios are used, the reuse related scenarios are additive to the previous scenario.
1. Renovation / Transformation with no intervention
2. Renovation / Transformation with desired energy label (A+/A++)
3. Renovation / Transformation with desired energy label (A+/A++) and new facade
4. Renovation / Transformation to max height allowed by the current construction with desired energy label (A+/A++) and new facade
5. Demolish & Build same building
6. Demolish & Build to max height allowed by zoning plan.

This worksheet calculates the financial aspects and results of each intervention. The scenarios are a combination of the financial aspect result of different functions, interventions, energy, and financial and architectural aspects. This sheet summarized all values and calculated the net income per scenario. This worksheet results in a summary of the financial aspects of each function. The GFA is used to calculate the construction cost, the UFA is used to calculate the income of rent. Variables used for the calculation are depending on the specific intervention.

STEP 1 - THE VARIABLES ARE USED FOR INTERMEDIATE CALCULATIONS.

General
- Total UFA: Result of the efficiency factor times the total GFA.

Income
- Total rent income: Annual rent income a year times the 30 years operational time. For the annual rent calculation, the average rent price for the chosen neighbourhood is used.

Investment
- Acquisition cost: Input
- Construction cost (excl. façade & installations): Extra construction cost as a result of an intervention. The costs of each specific intervention are stated in the financial database sheet.
- Demolition cost: Extra cost additive on the construction cost.
- Energy label upgrade: Extra cost as a result of an energy label upgrade.

Cost
- Exploitation cost: Annual cost for maintenance and exploitation of the building.

STEP 2 - THE RESULTS OF STEP 1 CONCLUDE INTERIM RESULTS

- Initial investment: Cost at the initial phase of the project t=0
- Net income: The total net income, result of the annual income and annual cost.

STEP 3 – VALUES AS FOR THE IRR CALCULATIONS

- Net Cash flow: Net cash flow of net income and cost.

STEP 4 – NPV AND IRR CALCULATIONS

The NPV and IRR calculations for each combination of functions are done in a separate sheet. In order to calculate the NPV and IRR excel need the net cash flow per operational year. The NPV and IRR calculated in this sheet is stated in the scenarios worksheet. The discount rate is set on

STEP 5 – SUMMARY OF VALUES

The values interrelated to each combination of functions and specific intervention strategies are summarized.

5.3.5 WORKSHEET ENERGY

This worksheet summarizes and calculates all values related to the energy aspects of a development and exploitation.
1. Energy factor – An increase of degrease of lease income
2. Energy upgrade cost – Additive construction cost
3. Initial environmental load – Related to the environmental sustainability
4. Annual environmental load – Related to the environmental sustainability

5.3.6 WORKSHEET SUMMARY & AMBITIONS

This worksheet summarizes all values used for the determination for the best three options. This sheet is a result of all previous sheets. In this sheet the ambition weight factor is applied. The worksheet matches the best combination of the specific interventions with:
1. Function
2. Financial profitability
3. Environmental sustainability
4. Architectural & Cultural value

A top six is made for each combination of specific intervention and the interrelated ambitions.
The ambition weigh factor multiplies the score of each ambition and result in a top three of best combinations.

5.3 SHEETS USED IN THE MODEL

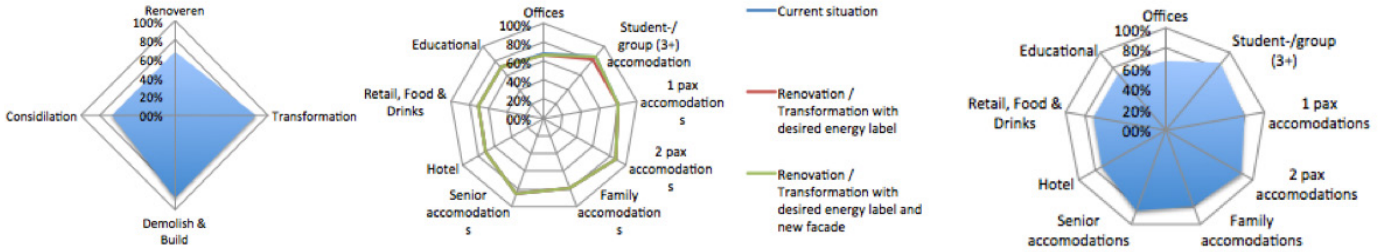


Fig 5.2.8 Output step1-3 (own material)

	Intervention	Score
1	Transformation with no intervention	16,6%
2	Transformation with desired energy label	15,7%
3	Transformation with desired energy label and new facade	16,1%
4	Transformation to max hight construction with desired energy label and new facade	16,6%
5	Demolish and build same building	18,0%
6	Demolish and build max height zoning plan	17,1%

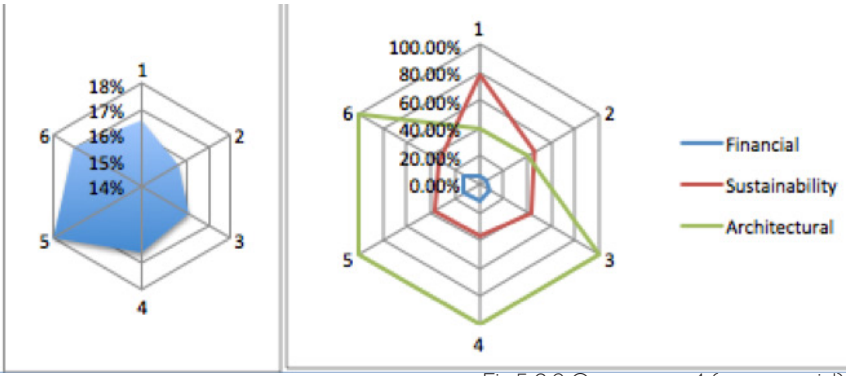


Fig 5.2.9 Output step 4 (own material)

Best Option			
Intervention	**5Demolish and build same building**		
General			
	Function	2 pax accomodations	
Financial			
	Innitial investment	-€	7.741.600
	Netto cashflow	€	21.825.513
	NPV	€	3.105.313
	IRR		12,3%
Sustainability			
	Energy label	A++	
Second best option			
Intervention	**6Demolish and build max height zoning plan**		
General			
	Function	2 pax accomodations	
Financial			
	Innitial investment	-€	6.302.197
	Netto cashflow	€	11.687.546
	NPV	€	415.393
	IRR		8,7%
Sustainability			
	Energy label	A++	
Third best option			
Intervention	**1Transformation with no intervention**		
General			
	Function	2 pax accomodations	
Financial			
	Innitial investment	-€	4.954.750
	Netto cashflow	€	15.120.650
	NPV	€	2.387.716
	IRR		13,2%
Sustainability			
	Energy label	C	

Fig 5.2.10 Output, final result (own material)

5.4 VALIDATION OF MODEL AND CASES

5.3.7 OUTPUT

The output sheet is a summary of steps done by the model. These steps may help the user to base his decision. The output sheet is divided in steps that will result in the final decision.
1. Intervention Potential – the score of each intervention is given.
2. Best function for reuse – the score of each function in combination with the re-use related interventions
3. Best function for Demolish & Build- the score of each function in combination with demolish & Build interventions
4. Best specific intervention – The score of each specific intervention is given.
5. Best options - A top 3 of the combination of all the values given.

The model concludes in a top three best options come with a short summary of important information. This top 3 is a result of previous quantifications and calculations.
The model states the best combination of
- Specific intervention
- Best function
- Financial aspects
- Aimed energy label

The interim results can be seen as a arguing for the final result. The user may also check the difference in score or potential to deviate from this result.

5.4.0 INTRODUCTION

In order to check the usability and scientific value of the model, the model is validated. The theoretical results of the model need to be checked in practise. The cases used in the empirical research are used for this validation. The model can be assumed accurate when the result of the model matches the decision made in practise. However a mismatch of results does not result in conduct in an unreliable model. The model is a very broad approach on a specific problem. The result given by the model is a combination of a function and an intervention strategy. The model uses the IRR to compare the financial profitability of each combination. The IRR formula used by Excel in the model is a simplification of the IRR formula and is cannot be seen a complete realistic value. The result of the model should be a realistic proposition for an intervention.

The results of the model can validated by the following questions:
1. Does the model give realistic results?
2. Does the results match with the actual transformation, if not why not?

The model gives several options and cannot be seen as true or false. The model can only be seen unusable or unreliable if the results are improbable. The results of the model may defer from the actual decision because of several factors:

- The market and location date included in the model are current values and these might deviate from values used at the time of these developments.
The data implemented in the database is up-to-date data, this data may defer from date available at the time of the redevelopment.
- The model is a simplified theoretical model and may therefore deviate.
The model is a broad quick-scan approach with limited access to information.
- Investors or developers may have also chosen for another intervention, for a several of reasons.
Investors or developers may have chosen a different strategy that fits better to their company philosophy or such. The ambitions chosen may defer from the actual ambitions.
- Other policies where decisive. A less likable intervention is adapted in an overall vision.
- The decision made can also be a result of a flaw of an involved actor(s).
- The new function is an equal combination of a set of functions.
The model cannot combine different functions; the function chosen is the main function.

The model is assumed to be accurate when the combination of a function and intervention is realistic. The cause of a defer needs to be found, when a result defers from the actual intervention.

5.4 VALIDATION OF MODEL AND CASES

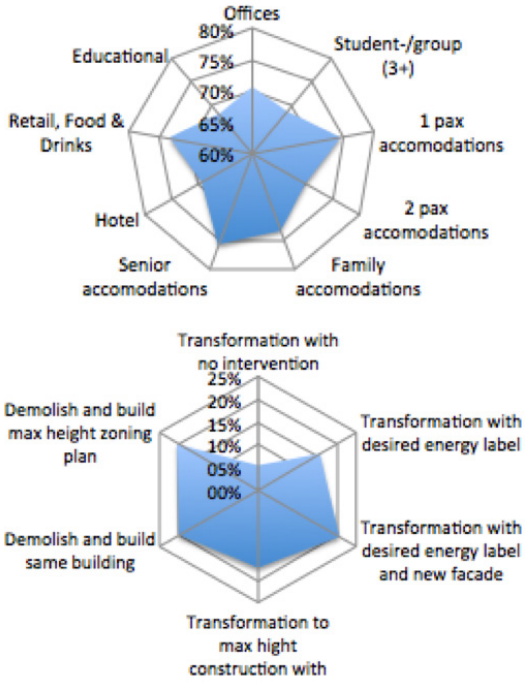


Fig 5.3.1 Function & intervention potential (own material)

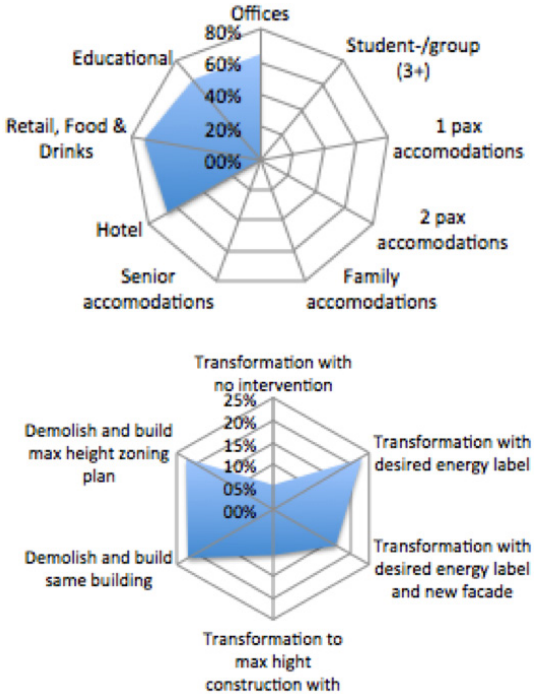


Fig 5.3.2 Function & intervention potential (own material)

Intervention	Transformation to desired energy label and replacement of the facade	Demolish & Build to max height allowed by zoning plan	Demolish & Build same building
Function	Senior accommodations	Senior accommodations	Senior accommodations
Initial investment	€16.403.400	€29.752.923	€23.377.402
Net cash flow	€10.448.697	€37.779.335	€22.135.883
NPV	€ 3.861.946	€ 936.536	€ 2.447.946
IRR	5,4%	8,3%	6,9%
Energy Label	A++	A++	A++

Table #: Selection of best options according to the model

Intervention	Transformation to desired energy label	Demolish & Build to max height allowed by zoning plan	Demolish & Build same building
Function	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks
Initial investment	€25.444.000	€53.864.969	€82.547.494
Net cash flow	€107.182.724	€60.369.547	€99.960.999
NPV	€23.833.914	€ 1.690.117	€ 550.393
IRR	16.4%	7,7%	8,1%
Energy Label	A+	A++	A++

Table 5.7: Selection of best options according to the model

5.4.1 OVERHOEK – ADAM TOWER

The actual specific transformation of the overhoeks tower was a Transformation/Renovation of the tower to desired energy label and new façade. The municipality decided that the overhoeks tower was an iconic building and should be preserved. The tender written was a tender to transform the building.

TARGET GROUP / USER

Two actors could use the model:
1. The municipality of Amsterdam was the initial actor in this project. They bought the overhoeks tower of Shell and decided the tower should be developed because of the architectural and cultural value. The municipality wanted to preserve the tower and its shape. The municipality could not demand this preservation if the tower could not make feasible in any way. It is likely to assume that the municipality knew that a newly built building would be more financial profitable, and therefore demanded a reuse of the tower.
2. Lingotto as developer of the model could have used the model to determine the specific intervention strategy and function.

ASSUMED AMBITION

- Financial profitability: 4
- Environmental Sustainability: 3
- Architectural & Cultural value: 5

INTER-RESULTS OF THE MODEL

1. Intervention Potential

Renovation:	67,4%
Transformation:	72,7%
Demolish & Build:	75,7 %

2. Best functions for reuse

(1) Senior apartments:	72,7%
(2) Retail, Food & Drinks:	71,8%
(3) One person apartments:	71,5%

3. Best functions for demolish & build

(1) Senior apartments:	75,7%
(2) One person apartments:	74,5%
(3) Retail, Food & Drinks:	73,3%

4. Best specific intervention with no ambition rate

(1/2) Transformation with desired energy label and new façade & Demolish and build to max height zoning plan
(3) Demolish & Build same building

BEST OPTIONS ACCORDING TO THE MODEL

A summary of the selection of best option is given in table #

ANALYSIS

The function potential is primarily based on market en location data. There is no market or general location data available for the exact location of the overhoeks tower. The area is currently in transition from industrial area to a city part. The model uses to market en location data of the neighbourhood Vogelbuurt, an old residential area for workers of the Royal shell company. The score of the different functions are more or less equal, making a combination of functions likable. The municipality of Amsterdam developed a policy for the overhoek area. The overhoeks tower is the first of five other towers developed in the area. The model is unable to consider future values. The model result is the actual specific intervention. This indicates with the correct information a reliable result given.

5.4.2 REMBRANDPARK GEBOUW – RAMADA-APOLO HOTEL

The buildings transformed from office buildings to a hotel in the tower and an educational function in the low-rise.
The building is localized next to a highway, which exclude any residential functions. The building has a bearing façade making a replacement of the façade impossible. Any major changes in the appearance of the building where prohibited by the architect.

TARGET GROUP / USER

The investor was left empty handed and hired Peak Development to find a solution for their vacancy problem.
The developer or investor could use the model. The goal of the investor is to gain a high financial profitability.

ASSUMED AMBITION

- Financial profitability: 5
- Environmental Sustainability: 3
- Architectural & Cultural value: 3

INTER-RESULTS OF THE MODEL

1. Intervention Potential

Renovation:	61,5%
Transformation:	71,1%
Demolish & Build:	72,6%

2. Best functions for reuse

(1) Retail, Food & Drinks:	71,1%
(2) Hotel:	64,9%
(3) Educational:	63,0%

3. Best functions for demolish & build

(1) Retail, Food & Drinks:	72,6%
(2) Hotel:	65,7%
(3) Educational:	64,6%

4. Best specific intervention with no ambition rate

(1) Transformation with desired energy label
(2) Demolish and build to max height zoning plan
(3) Demolish & Build same building

BEST OPTIONS ACCORDING TO THE MODEL

A summary of the selection of best option is given in table #

ANALYSIS

The result of the model is quite similar to the actual intervention strategy. According to the model the best function would be Retail, Food & Drinks followed by a hotel function and an educational function. A retail function in a high rise building would be inefficient so Peak development decided a hotel would fit best. The bearing façade could be a restriction for some transformational options, but it results in an open floor plan. The floor plan with the central core could easily house a hotel function. The low rise has an educational function.
The model concludes with three specific intervention options, transformation with an upgrade of the energy label, demolish and build with max height allowed by zoning plan and demolish and build a new building.
The results given by the model are all realistic possibilities and are in line with the actual decision made.

5.4 VALIDATION OF MODEL AND CASES

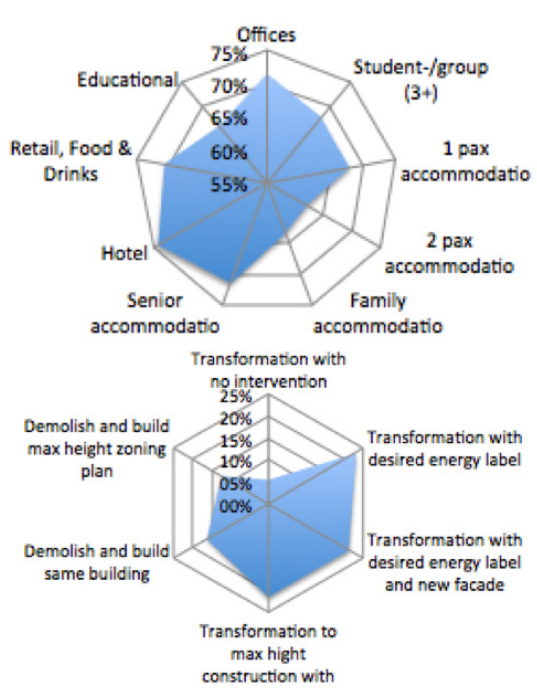


Fig 5.3.3 Function & intervention potential (own material)

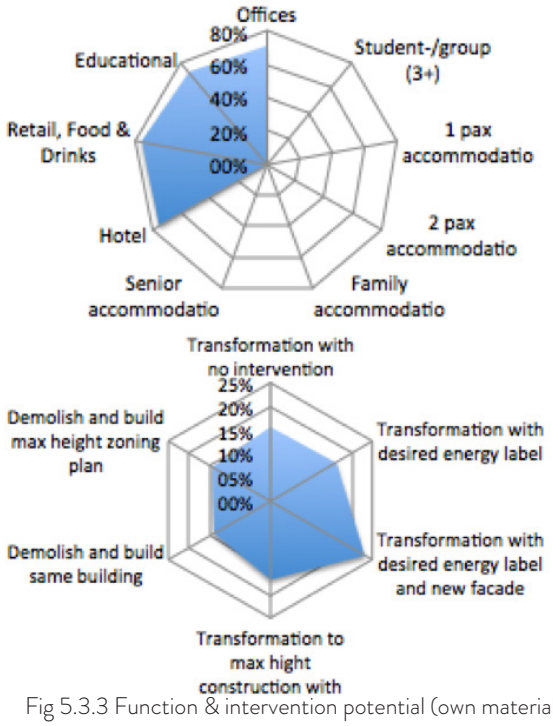


Fig 5.3.3 Function & intervention potential (own material)

Intervention	Transformation to desired energy label	Transformation to desired energy label and replacement of the facade	Transformation to max height allowed by construction, desired energy label and replacement of the facade
Function	Hotel	Hotel	Hotel
Initial investment	€31.737.500	€36.977.00	€58.425.472
Net cash flow	€73.247.923	€68.008.423	€89.827.492
NPV	€15.269.742	€ 10.045.565	€16.672.556
IRR	12,5%	11,9%	10,1%
Energy Label	A++	A++	A++

Intervention	Transformation to desired energy label and replacement of the facade	Transformation to max height allowed by construction, desired energy label and replacement of the facade	Transformation with desired energy label
Function	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks
Initial investment	€ 32.776.250	€ 37.099.731	€ 33.120.000
Net cash flow	€106.830.828	€112.829.222	€106.487.078
NPV	€ 22.961.726	€ 6.567.555	€ 14.496.157
IRR	14,9%	6,3%	12,4%
Energy Label	A++	A++	A++

Table 5.8: Selection of best options according to the model

5.4.3 BULL TOWERS – ARENA TOWERS

The Bull towers transformed from office building to the Arena towers with a hotel function. The façade was replaced and the low-rise was split from the high-rise and kept the office function. The Bull towers completed in 1990 did not meet the higher conveniences of new offices and where left vacant. The municipality of Amsterdam had an office related vision for the area. Peak found a leasing party, a hotel function, before the initial plan.

TARGET GROUP / USER

The investor was left empty handed and hired Peak Development to find a solution for their vacancy problem.
The developer or investor could use the model. The goal of the investor is to gain a high financial profitability.

ASSUMED AMBITION

- Financial profitability: 5
- Environmental Sustainability: 4
- Architectural & Cultural value: 4

INTER-RESULTS OF THE MODEL

1. Intervention Potential

Renovation:	69,1%
Transformation:	73,5%
Demolish & Build:	74,3%

2. Best functions for reuse

(1) Hotel:	73,5%
(2) Retail, Food & Drinks:	69,2%

(3) Office: 69,1%

3. Best functions for demolish & build

(1) Hotel:	74,3%
(2) Office:	71,4%
(3) Senior accommodations:	69,1%

4. Best specific intervention with no ambition rate

(1) Transformation with desired energy label
(2) Demolish and build to max height zoning plan
(3) Demolish & Build same building

BEST OPTIONS ACCORDING TO THE MODEL

A summary of the selection of best option is given in table #

ANALYSIS

The results of the model are more or less similar to the actual transformation. The top 3 functions are hotel, retail, food & drinks and an office function. According to the vision of the municipality of Amsterdam a business hotel or an office function would fit best. The score of retail, food & drinks function is nearly equal to the score of an office function. A hotel function was chosen for the high-rise and an office function for the low-rise.

The intervention chosen was a transformation to desired energy label and replacement of the façade. According to Peak Development(Walraven, 2015) a new façade was needed for a higher future value and was used as a marketing tool for the new function. The actual function and the function in the result are similar. The intervention is also quite similar therefore the model gave a realistic result.

5.4.4 GAK-GEBOUW – DE STUDIO

The GAK building is transformed to a residential building with primarily private student / starter apartments. The building was nominated for a monumental status. Therefore a transformation or renovation was obligated. The façade is replaced by a more transparent façade. The building in localized next to the A10 highway so a double façade is applied for noise reduction.

TARGET GROUP / USER

The investor was left empty handed and hired Peak Development to find a solution for their vacancy problem.
The developer or investor could use the model. The goal of the investor is to gain a high financial profitability.

ASSUMED AMBITION

- Financial profitability: 5
- Environmental Sustainability: 4
- Architectural & Cultural value: 4

INTER-RESULTS OF THE MODEL

1. Intervention Potential

Renovation:	67,4%
Transformation:	75,1%
Demolish & Build:	76,7%

2. Best functions for reuse

(1) Retail, Food & Drinks:	75,8%
(2) Hotel:	75,1%
(3) Educational:	70,6%

3. Best functions for demolish & build

(1) Retail, Food & Drinks:	76,7%
(2) Hotel:	74,5%
(3) Educational:	72,1%

4. Best specific intervention with no ambition rate

(1) Transformation to max height allowed by construction, desired energy label and replacement of the facade
(2) Transformation to max height allowed by construction, desired energy label and replacement of the facade
(3) Demolish & Build same building

BEST OPTIONS ACCORDING TO THE MODEL

A summary of the selection of best option is given in table #

ANALYSIS

The determined function is not in line with the actual function. The direct presents of a highway will result in exclusion by veto for any residential functions. This veto criterion can be reconsidered and possibly adapted in next version of the model. A Retail, food & drink function could still be possible in the GAK-building. The location has a good accessibility and the building could house a retail function, such as a discount shopping mall.
The determine intervention strategy matches the actual intervention. The chosen intervention was partly a result of the nomination of a monumental status; nevertheless, according the model this was a right decision.

5.4 VALIDATION OF MODEL AND CASES

Case	Function	Intervention
Adam tower	No, due to wrong market information.	Yes, in line with the actual intervention
Ramada hotel	Yes, both function where in the top 3 results	Yes, in line with the actual intervention
Arena towers	Yes, a combination of two functions listed as a top 3.	Yes, in line with the actual intervention
De Studio	No, due to veto-criteria no residential function where allowed in the building, due to the highway an exceedance of noise pollution was met. A double façade was applied to tackle this problem.	Yes, in line with the actual intervention

Table 5.9: Validation of the cases

5.4.5 CONCLUSION

VALIDATION

Answering the following questions does the validation of the model:

1. Are the results realistic?
2. Does the results match with the actual transformation, if not why not?

According to the result of the tests cases the model can assume to be realistic. Most of the results are more or less similar as the actual intervention. The final result of the model consists out of a top 3 combinations of a function and an intervention. The user can consider deferring from this result by choosing other combinations from the inter results. The difference in potentials are given in percentage, the deviation between different potential can be used to defer.

The inter results of the model give an impression of the potential of different functions or interventions. The model can be assumed to be quite accurate but it is still a simplified version of a decision making process. The model gives several options based on pre-set values and criteria.

REFLECTION

The model is a strongly simplified version of an actual decision process. The model is cannot be seen an accurate replacement of the process. The model has several restrictions that can cause defer in the result. More research, development and fine-tuning can result in a more accurate model.

Input - The main goal of the model was to give a set of realistic option for a vacant office building in Amsterdam. This option is a combination of function and intervention that result in an improvement of the current situation. The model could help to decline the current vacancy rate. The model needs to be user-friendly, useable for laymen without any precise knowledge of the situation. This second goal of the model is a more commercial then scientific goal. This second goal also is interrelated to the main restriction of the model. In order to increase the user-friendliness, the model makes use of pre-set values collected in databases. The uses cannot change these input to get a more accurate or up-to date result. The model should be annually updated to remain useful.

The information of the databases is on neighbourhood-combination level, this is the most specific information level used by OIS Amsterdam. A neighbourhood-combination is divided in several ZIP-code areas. Information per postcode could result in a more accurate result. A complete free input would result in a more accurate result but this is interrelated to a less user-friendly approach.

Mixed-use - The result of the model is a combination of one function and a related intervention. Most of the realized transformations result in a mixed-use or in a cleavage in building configuration. The program of all investigated cases are mixed-use or a cleavage of building configuration. The model is not able to mix different main function. The function proposed in the result can be seen as the main function of the building. This option could be processed in the design of the model.

Financial accuracy - The model is a quick-scan method to determine possible interventions for vacant office buildings. This intervention is a combination of function and specific interventions. The model is primarily based on potential and not on financial aspects of such an intervention. The financial aspect used in the model is to compare the financial profitability of different combinations. The determining financial values are used for this determination. The model leaves some values out of consideration. In order to gain more financial accuracy more criteria and calculations need to be adapted in the model. Due the limited amount of time a simplified version of the financial aspects is used.

Future Perspective & Master plan - The results of the model is primarily based on existing values and not on possible forecasts based on market analyses. Current developed projects, which influence the real estate stock, are left out of consideration.

The building can be a part of a new development vision a municipality, or a part of real estate configuration of the investor or owner. An investor can decide to invest more in one particular building instead of the complete are. This building can act as a catalyst or could house all facilities of the area.

Quantification of values - The values of soft ambition such as architectural and cultural values are very hard to quantify. Architectural value in this model is based on the personal reflection of this value. The architectural value can always be upgraded and the willingness to pay for this upgrade is reflected in this ambition.

Risk - No specific risk analyses are implemented in the model. The presence of risk may be a determination process.

Functions - The model compares five different main functions: offices, residential, hospitality, retail and educational functions. The residential function is subdivided in five specialized functions. In order to compare more functions, the amount of main functions and subdivision could be increased.

Sufficient data – The case The Base of Schiphol could not be checked in the model. The model uses pre-set market- and location data. The data used in the model for the determination of potential within the city of Amsterdam could not be found for Schiphol. More research is needed in order to implement the Schiphol Area

CONCLUSION & RECOMMENDATIONS | 6

6.1 CONCLUSION

The number of redevelopment projects of vacant office buildings in Amsterdam has raised in the last couple of years. This movement reduces the amount of vacant offices, but the vacancy rate within the region of Amsterdam is still too high. Redevelopment of usable vacant office buildings could be a response for the current mismatch in the Amsterdam real estate market. The transformation of the current oversupply of offices could be an answer to the undersupply of residential buildings. This research helps to determine the critical aspects involved in the decision-making process for certain intervention strategies. These aspects are quantified and linked into a comprehensive quick-scan decision support model for the determination of the potential of certain interventions strategies. The result of the model helps the user to map possible solutions for a current or future vacancy problem.

6.1.1 THEORETICAL & EMPIRICAL RESEARCH

The sub-questions should be answered as a combination of the theoretical and empirical research. If possible, the sub-questions are organized by categories and are answered as whole.

THE DUTCH REAL ESTATE MARKET

- What are the main principles of the Dutch Real Estate market?
- What types of vacancy are harmful for the Dutch real estate market?

The Dutch real estate market can be divided into the real estate space and the real estate asset market. The real estate space market consists of land and buildings. The real estate asset market reflects the cash-flow rights. A developer can develop a building in the space market and sell this with lease contracts as an asset to an investor. The total real estate market is a combination of the space and asset market. When an equation is met between those markets, the market price is equal to the replacement price. This equation is hard to realize and therefore the market is imbalanced. The price in the real estate market is elastic and depending on the supply, demand side and the location. The real estate market analysis can determine the current supply and demand on a location and therefore predict future demands. The real estate market can be seen as a continuous cycle, where recessions, recovery, expansion and contraction alternate. Vacancy is one of the results of an imbalanced market, but not all types of vacancy are signs for a bad market situation. The effective vacancy is a combination of structural and hidden/shadow vacancy. Structural vacancy is when a building is vacant for over three years. Shadow vacancy occurs when an owner or investors accept structural vacancy. By accepting this vacancy, the owner or investor will not counteract nor report the vacancy resulting in a hidden vacancy.
The value of real estate is therefore depending on the function it houses. This principle is called the highest and best use (HBU). HBU is based on the idea of maximum productivity. According to this theory, the market value of a building in depending on the function in it. The highest value of a building is depending on best use of it. Thus the value of a building in Amsterdam is depending on the function. The best fit or the best function chosen is depending on the market, the location of the building and the building characteristics. The HBU is physically possible, legally permissible, financially feasible, maximally productive (Carr et al., 2003, p. 114).

DETERMINATION OF INTERVENTION STRATEGIES

- What are the types of intervention strategies?
- What are the conventional specific interventions?

Vacancy has a direct financial impact on the owner of a building and the involved municipality. A vacant building will hardly generate income and will therefore always cost money. This will have a direct financial impact on the owner of a building. Vacancy brings problems of insecurity and social uncertainty and may give rise to criminality, which will lead to downgrading of the area. Both owner and municipality would try to encourage to resolve this vacancy problem. Several intervention strategies could be used to decrease the vacancy rate. When structural vacancy occur, an owner or investor could choose for a certain intervention strategy. One of the options is consolidation where the owner accepts the vacancy and wait for better times. The owner could also try to sell the building for the best price. These two intervention strategies will not directly diminish the vacancy rate. The main reason for vacancy is that the building will not meet the current demand or function. Intervention strategies that could tackle this problem are renovate or transform the current building. By renovating the building, the building could meet the current demands. By transforming the building, the building could meet the demands of other functions. When the building is not suitable for any of these interventions the owner could choose to demolish the old building and built another one.
Within the intervention strategies there are some common chosen specific interventions strategies. The different interventions are an addition to the main intervention.
The three most common chosen specific intervention strategies are (1) an upgrade of the energy label, (2) a replacement of the façade, (3) or addition of extra layers or a combination of those three.

DETERMINATION OF THE POTENTIAL OF AN INTERVENTION STRATEGY

- What aspect influences the potential for an intervention strategy?
- What aspects should be included in a decision support model?

The decision for an intervention strategy is based on a combination of involved aspects. In order to determine the best intervention strategy, the potential of all the possible combination of functions and specific interventions has to be determined. The best intervention strategy would address to gain market equilibrium. A decrease of oversupply and an increase of the undersupply would address to this market balance. Several aspects may be of great influence in this decision making process. External aspects or determinants influences the potential of a specific case. The companies ambition may influence the decision for a certain intervention strategy. The main determinants are the market, the technical and the functional aspects.
The potential for a certain function can be determined by the market, location and building aspect. The involved aspects result in function related criteria that are used in analyses. The analyses are based on gradual and veto criteria. A gradual criterion is used to determine the specific potential; a veto criterion can exclude a certain function. The determination of a function potential is based on a market, location and building analysis.
Market aspects are related to the current demand and supply in the real estate market. A higher demand for a certain function will result in a higher market potential for that function. Location as-

pects are deviated in gradual criteria and veto criteria. The gradual criteria influence the favourability of a situation thus resulting in a higher or lower potential. The veto related aspects could exclude a specific function and are primarily based on legalization preventing health hazards or as a result of a zoning plan. Building aspects are divided in gradual criteria and veto criteria. The gradual criteria relate to the usability of a building for a certain function. The exclusion by veto is possible by the Dutch building act or the condition of building physics. The combination of these analyses can determine the potential of a function in the current and in an adapted situation.

DECISION-MAKING POLICY

- What are the drivers of a business-strategy?
- Are the involved ambitions quantifiable?
- To what extend could a decision support model result in a solution?

The combination of the best possible function and the best appropriate specific intervention, with the highest potential has the best chance to succeed. Nevertheless, the owner, investor or developer may choose for another combination because it better fits their business strategy. This strategy of a real estate related company reflects the company's ambition.
The strategy is a combination of three main ambitions: the financial profitability, the environmental sustainability and the architectural & cultural value of a development. When the main goal of a business is to generate as much financial profitability, irrespectively of the environmental or architectural & cultural value, the decision is based on the financial aspects of the achievable interventions.
The ambition indicators can reflect each ambition.
The Financial profitability is measured by the Internal Rate of Return (IRR). The IRR is a common used metric for measuring the profitability of investments. In order to calculate the IRR the formula of Net Present Value is used. The IRR is the interest rate of each year during the total operational period of the asset. In order to calculate the NPV a discount rate is needed. The discount rate is the interest rate an investor demands for the investment. A positive NPV would result in a positive decision. The Financial profitability is quantified by the IRR of each scenario. The IRR is depending on the initial investment, net income, inflation and operational time.
An indicator for the environmental sustainability is the environmental load. The total environmental load can be divided into the annual environmental load and the initial environmental load. The annual environmental load is depending in the annual energy consumption of a building, while the initial environmental load reflects the load causes by the used of building material. The initial load is a one-time load causes by the construction of a building. Therefore, reuse of building components reduces the initial load of a development. While the annual load causes a far bigger impact on the total environmental load then the initial load. An energy sufficient building will result in less environmental load and a higher environmental sustainability. The environmental sustainability of a demolishment and newly built building strategy could be higher if a redevelopment of a vacant building cannot result a high-energy efficiency. In theory, every building transformation could lead to a high-energy sufficiency. The initial load is quantified by a construction intervention index, the annual load by the energy label.
The Architectural and cultural value of a building is a combination of the user -, future - and cultural value. These values are primarily based on users' experience and opinion. An opinion is a soft value and therefore hard to quantify. Nevertheless, the opinion about the potential architectural & cultural value of the owner or target is determinative for this value. The decision for conserving or replacing parts or the complete building for the improvement of this value can be expressed in a financial value. These stakeholders should thus be willing to pay for a better design, or a design with more value. Therefore, this method claims that a higher architectural and thus cultural value leads to a higher design, construction and rent price. Nevertheless a higher architectural value is not directly interrelated to higher costs (Groenendijk, 1991). The essence of Architectural and Cultural value cannot be expressed in a currency but it can be expressed in the willingness to pay when necessary. The essence of a good design, thus a higher architectural and cultural value, lays in user experience, building appearance, and future value. The architectural & cultural value is quantified by a list on values given as input by the user.

Uncertainty has to be communicated in the science engineering and policy-management interface. Walter (2003) has attempted to propose a tool for identifying and characterizing the potential uncertainty in model-based decision support, suggesting that uncertainty is a three dimensional concept defined by: the location in the analysis, the level of uncertainty, and the nature of the uncertainty.
In order to create a DSM concerning the real estate market the model should include a combination of different analyses.

Test	Determined by
Economic demand	Market analysis
Physically possibility	Building analysis
Legally permissible	Building & Location analysis
Financial feasibility	Scenario analysis
Maximal productivity	Combination of all above

6.1 CONCLUSION

"Architecture is too slow in its realisation to be a 'problem solver'" - Cedric Price

6.1.2 THE MODEL

There is need for a comprehensive user-friendly model. A general quick scan that helps to determine potential solutions for a vacant office building. The model is a simplified and quantified method of the decision-making process for intervention strategies. This model is based on the most critical aspects involved in this process.
These critical aspects are quantified and linked into a quick-scan decision support model resulting in a quick and simplified version of this decision-making process.
The decision for an intervention strategy is based on a combination of factors. The DSM is based on the potential for certain functions. Each potential is based on a market, location a building analysis. The DSM uses information collected out of existing models and literature. The model uses several steps to determine the potential for a vacant office building. The function determent is the best intervention according to criteria applicable to the market, the location and the building.
Nine different functions, six specific interventions and three ambitions are implemented in the decision support model. Fifty-four scenarios reflect the combinations of functions and specific intervention. The DSM determines the IRR, the environmental load and the potential architectural value of each scenario. These values are used as indicators of the possible ambitions of the user. The scenario with the highest potential and best reflection of the ambition is chosen as best intervention strategy for a vacant office building.
The results of the analyses in the model are depending on the input values. The market and location analyses are mainly based on pre-set values included in the model as databases. The use of databases should increase the user-friendliness of the model but can result in a less accurate result. Nevertheless an inaccurate input as a result of the incompetence of the user would lead to a complete usable result. The case The Base of Schiphol could not be checked in the model. The model uses pre-set market- and location data. The data used in the model for the determination of potential within the city of Amsterdam could not be found for Schiphol. More research is needed in order to implement the Schiphol Area.

According to the result of the tests cases, the model can assumed to be realistic. Most of the results are more or less similar to the actual intervention. The final result of the model consists of a top 3 combinations of a function and an intervention. The user can consider deferring from this result by choosing other combinations from the inter results. The difference in potentials are given in percentage, the deviation between different potential can be used to defer.
The inter results of the model give an impression of the potential of different functions or interventions. The model can be assumed to be quite accurate, but it is still a simplified version of a decision making process. The model gives several options based on pre-set values and criteria.

6.1.3 ANSWERING THE RESEARCH QUESTION

The underlying research question of this research is:

To what extent can a decision support model, based on simplified and quantified critical aspects, help in the decision making process for intervention strategies of vacant office buildings in Amsterdam?

The goal of a certain model is to help owners of vacant office buildings find a solution for their vacancy problem and thereby reduce the total vacancy rate. The solution for this vacancy problem would result in a certain intervention strategy. The decision for an intervention strategy is a consideration between the intervention potential of a building and the business strategy of the involved company. This decision-making process in this initial phase of a project is unique and very case specific. In order to give a perfectly accurate result this determination is depending on a lot of specific input. This perfectly accurate solution is not relevant for the decision in the initial phase.

The goal of the model is to basically compare different intervention strategies and match this to the users' ambition. In order to compare different interventions strategies each intervention potential has to be determent. This determination is done by a quick analysis based on the most critical aspect involved in the decision making process. In order to simplify this decision-making process, the critical aspects involved need to be determined and quantified. The users' strategy is reflected in the combination of three ambitions.

The model will not provide a perfectly accurate result; nevertheless, the result of the model may be decisive for the choice of any further investigation. The user-friendliness of the model eases the decision-making process in the initial phase. Investors and owners of vacant office buildings could now easily compare different intervention strategies and determine the best solution for their vacancy problem.

The model should help laymen to base their decision for a certain intervention strategy. The model is based on trends, characteristics, key figures and ambitions. The model excludes any future developments or policies. These future developments, such as master planning by the municipality or economic chances, are of great influence for the intervention potential of a specific case. The user can therefore not be a complete layman. In order to notice errors, caused by this flaw, the user should have a bit of feeling of the Dutch real estate market. The decision making process for an intervention strategy is based on a combination of a numerous of involved aspects, ambitions and future developments and vision. The model cannot imitate this complete decision making policy. The model can be used as a quick-scan tool to map the potential of different intervention strategies. The model is user-friendly and could help owners, investors and other actors in the initial phase of a project. The decision making process for a decision for an intervention strategy, is time consuming and can be seen as a difficult task. By easing this first step, it encourages actors to react and intervene when vacancy occurs.

6.2 RECOMMENDATIONS

6.2.1 RECOMMENDATIONS FOR FURTHER RESEARCH

THE SPECIFICATION OF THIS STUDY

Due to the limited amount of time, the model is specified on vacant office building in the region of Amsterdam. The model can in fact be elaborated to other regions and buildings types. The real estate market is location specific, so the model uses location specific values and criteria. In order to include more regions, more research is required on region related forces. The model could include more types of vacant buildings instead of only vacant office buildings. Due to several factors an over-supply of office occurred. Because of the market cycle this over-supply will eventually be diminished and vacancy in other building types will arise. Because of the current situation lots of research is done on vacant offices. When implementing on other building types, more research is required.

THE AMOUNT OF MODELS AND FACTORS IMPLEMENTED

The decision-making process for a certain intervention strategy is depending several aspects. In order to create a useful tool, a balance has to be found between the accurateness and user-friendliness. A model is always a simplified version of reality. The decision to do an extensive research about existing models was based on two factors. The first factor was to learn how to simplify and quantify values and still get an accurate and useful result. The second factor was to find the most critical and useful aspects within these models. The models where selected on aspects that would influence the decision-making process. In order to get a more accurate model, more models with the same specialization need to be compared and more specialization need to be added.

THE AMOUNT OF CASES AND INTERVIEWS IMPLEMENTED

The empirical research is based on five case studies and eleven expert interviews. The research would be more accurate if more cases and interviews where implemented. The main goal of the case studies was to find the most critical aspects within a redevelopment project. Besides redevelopment interventions, demolish & build interventions are implemented in the model. More research on the decision making factor between these intervention strategies would increase the reliability of the model. A part of the expert interviews was to validate the degree of importance of certain aspects. In order to get a more accurate outcome the number of expert interviews need to be increased.

THE AMOUNT OF SCENARIOS & MIXED USE

Nine different function and six specific interventions are implemented in the decision support model. Fifty-four scenarios reflect the combinations of functions and specific intervention. An increase of both functions and specific intervention would result in a more realistic usable model. A mix use of functions within a building would result in less risk for the owner and a higher liveability within the building. The option to mix certain functions should result in a more realistic result. The goal of the model is to map several solutions in the initial phase of a project; a too specific result could decrease the usability of the model. More research about the usability of this implementation is needed.

TEMPORARY USE

An investor, owner or developer may choose for consolidation when the implementation of an intervention strategy is unachievable,, because of financial or other aspect.. Temporary use can be used a tool to influence market or location forces and may act as a catalyst within an area. More research is needed to these values and the quantification of these values. Temporary use may act as a catalyst within an area, and may boost a development.

MORE POSSIBILITIES TO SPECIFY

The model is based on a certain amount of pre-set values as a result of assumptions and average values. The user can adjust some influential and critical values. The possibility to adjust all key values and other pre-set values would result in a more useable model.

6.2.2 RECOMMENDATIONS FOR PRACTISE

The decision-making process for the future function of a vacant office building mostly relay on gut-feeling and market perception. The decision-making process is based on in knowledge and experience of the developer and is compared with simplified values. The success of the intervention strategy is the result of the right decision for the developer. This does not mean that this intervention strategy is the best one chosen. An impartial model could map different options in the initial phase, helping the user to map different solutions of a different solution.

THE USABILITY AND GOAL OF AN ANALYSES OR MODEL

The decision-making process of a development case can be seen as a funnel process. The selection process in the initial phase of a development is done by an extreme simplified reflection of reality. This simplified version is usable because it meets the aimed goal. This process is unusable for other than the aimed purpose. Simplifying a determination process, by assumptions and average values, is acceptable when this does not devaluate the result of the process. The usability of a simplified model is related to the purpose of the model. The user should realize that every model is a simplified version of reality.

ONE INTEGRATED PROCESS

Investors and building owners should realize that the success of a (re)development project is depending on several aspects. The success of one of these aspects, for instant the financial profitability, is related to the success of all the other involved aspects. Transparency and early involvement of the aimed target group will contribute to a successful result.

THE REAL ESTATE MARKET MECHANISM

The supply and demand in the real estate market is related to the market equilibrium. The price for real estate is related to the supply and demand of a product at that moment. It is safe to assume that an undersupply of a certain real estate typology will lead to a high demand and thus a high price. Most actors will base their decision for a certain function on the mechanism, resulting in an extreme expansion of this function. At the moment of a balance market, an oversupply could occur as a result of the relatively long construction time. Actors should not mainly base their decision on this market mechanism.

DECREASE OF RISK

The real estate market is a constantly changing market where an imbalance market and a new market forces result in uncertain future-values. An investor or building owner should accept and anticipate to this uncertainty.
A multi-tenant building would require more effort in the initial phase of a project but will result in a less riskfull asset. A combination of a multi-tenant and a mix-functions should reduce the risk of an asset and should amplify the liveability within the building.

DETERMINATION OF POTENTIAL PROBLEMS

When actors are trying to find a solution of a problem, the problem already exists. Actors should anticipate to a potential problem by constantly determine the future value of a healthy asset. The lack of a quick response will result in financial losses.

ACCEPTANCE OF LOSSES

Investors and owners should accept potential decrease in value of their asset. The economical-crisis of 2008 thought us that when investors ignore a decreasement of book-value this will result in structural vacancy. By acceptance of this, relatively small, decrease of value, bigger losses can be avoided.

6.3 REFLECTION

6.3.1 RESEARCH METHODES

A qualitative and quantitative comparative design strategy have been used for this research, where literature, case studies and implementation are combined. The research can be divided in two parts.
The theoretical part is a comprehensive literature study. This research conducts in a theoretical framework used for this research. The empirical research is done to compare this theoretical knowledge with practice. What decisions factor in practice and were those choices the right ones? The empirical research evaluates the theoretical framework and concludes about the importance of relevant factors.

THEORETICAL RESEARCH

The theoretical research can be seen as a funnel process where the result is a specification of all involved theories. The first part of the theoretical research is generic literature study. The goal of the generic part of the literature is to form base for the research. Knowledge of general principles is essential for further research. The first specification made was to investigate the basic principles of adaptive reuse. The decision to start a more comprehensive research was result of the specification. The goal of this research is to determine critical aspects in the decision-making process for transformation. These aspects are involved before this decision is made. This research resulted in the conclusion that not all vacant building could be transformed. Secondly the conclusion was made that transformation would not necessarily result a reduction of construction cost or a higher sustainability.
The goal of the research was to decrease the vacancy rate. Excluding other intervention strategy than reuse related interventions would only partly address to this goal. The current situation is a favourable situation for transformations, what explains the current pro-transformation trend. The usability of transformation is depending on several aspects; a forced transformation would result in an unfeasible project.
Amsterdam congested and the demand for real estate keeps rising. The assumption was made that the need for real estate in Amsterdam will not decrease, especially within the borders of the highway. This assumption result in the conclusion that there will be always a feasible intervention strategy that reduces the current vacancy rate.
The focus to examine reuse-related critical aspects was widening to the focus of critical aspects involved in the decision-making process of intervention strategies.
The theoretical research resulted in a hypothetical list of potential critical aspects. The empirical research could test this theoretical knowledge to practical results.

EMPIRICAL RESEARCH

The criteria for the proposed cases where primarily based on the first research design. All cases where completed or nearly completed transformations. The result of the research could be more accurate by increasing the number of cases and by examination other intervention related cases. The first goal was to examine a larger amount of cases, but this goal was unrealistic due the amount of time. Not the cases but the expert interviews proved to be most valuable for this research. The over-simplified method, used by these actors, resulted in exclusion of certain potential interventions.
The actual intervention chosen is primarily based on the ambition of the involved actors. This is a contradiction to the hypotheses that the decision is a result of a combination of market, location and building analyses.

6.3.2 THE MODEL

The aimed model should distinguish itself from other models by the comprehensive approach. The result is a more comprehensive approach than any other existing models, but it is still restricted by the limited scenarios implemented. Addition of other functions and specific interventions would result in a more realistic model. Assumptions related to the quantifications of ambitions could be reconsidered. Especially soft values as sustainability and architectural & cultural value are hard to quantify and implement.
The most critical aspect during the decision-making process for intervention strategies, is the presence, or potential future presence, of an area development strategy. This aspect cannot be quantified and is therefore hard to implement.

6.3.3 SCIENTIFIC RELEVANCE

The goal of the research was to quantify the critical aspects involved in the decision-making process during the initial phase of a project. The decision for a certain intervention is based on a combination of different forces and ambitions. The research resulted in a simplified, but usable and accurate, approach for a complex decision-making process of determination of an intervention strategy. This simplified method could quickly determine the potential of a vacant office building. This would encourage actors to intervene when vacancy occurs.
Developers claim that their decision based on gut feeling can be justified because of their knowledge and experience. With constantly changing market forces a developer should reconsider the usefulness of this gut feeling. The research could help actors base their primarily decision on the most critical aspects involved. The model is primarily focused on adaptive reuse of vacant buildings; more research about other intervention strategies would result in an even more comprehensive result.
The results of this research could help students to understand the decision-making procedure concerning different intervention strategies for vacant buildings.

6.3.4 SOCIAL RELEVANCE

The social relevance is a result of the scientific relevance. The configuration of real estate and real estate itself forms spaces and contra spaces. It is safe to assume that real estate influences the liveability of our world. Real estate owners should be conscious of the effect of the real estate on society. Vacant building can lead to impoverishment, when a neighbourhood becomes impoverished, criminality may rise and people will feel unsafe resulting in a lower liveability. The result of the model should ease the decision-making process, resulting quicker decisions concerning structural vacant buildings.
The building industry is the most polluting industry. Reuse of material would decrease the amount of pollution. The model should avoid unnecessarily demolition of usable building configuration and recommend reuse when feasible. Besides the reuse of buildings or building materials, the land is reused for a new function.

6.3.5 PERSONAL PROCESS

Due to limited time the first research proposal was too short sighted. I kept too attached to this first idea, which resulted in an unnecessary amount of work in the early phase of my research. The goal of my research was to add useably and innovating knowledge. My research proposal became more realistic when I accepted that, due to lack time a thesis would not lead in ground breaking results.
I underestimated the importance of a clearly defined research proposal.
My primarily focus shifted from the aimed result, to the value of the personal learning process of this research.
I expected to discover the most critical knowledge during the literature study. The truth is that interviews gave for more insight in actual aspects. I overrated the value of the theoretical research and underestimated the value of the empirical research. This resulted in a delay of my research.
A lesson learned is that an alternation between the theoretical and empirical research would result in a more consistent result.
Overall I gained a lot of knowledge about the decision-making process of different actors. Where business strategy and not potential solution are decisive in the decision-making process.

6.3.6 REFLECTION ON HYPOTHESES AND THEORY

Due to my shoulder injury my graduation process was delayed. During my recovery period I already started my new job. After several months I started to work on my thesis again. During this period the real estate market situation improved. The vacancy within the city of Amsterdam diminished and new projects started to develop. The idea of the decision support model for intervention strategies was to help actors to react on vacancy. The model should diminish the chance of flaws and help actors to make the right decision. The oversupply and the diminishing demand for offices let to the extreme high vacancy rate. The vacancy rate was, partly, hidden because of the acceptance of the owners. Did the financial crisis of 2008 have any impact on the current real estate market? In other words, did we learn something of this crises?
After realization most developers sell the building as an asset and try to start a new development again. After this transaction the developer is not responsible for the building nor the possible vacancy in this building. Developers should always try to achieve to develop quality. Quality for the users, owners and other involved actors. The municipality should take a steering role within this process. They should always have a clear image of all the ongoing and future developments within the municipality. The municipality of Amsterdam set up some rules to diminish the vacancy risk. (1) New developments should always be preleased for at least 70%. (2) Deserted real estate should fulfill a new purpose and could not be left vacant. (3) the reason to start a new development, and redevelop exciting real estate, should be grounded. The municipality managed to get grip on new developments within the area and thereby grip on potential the over construction of new offices.
According to some sources the vacancy rate is diminished within the municipality of Amsterdam.
But what type of vacancy is diminished? Now the economy improves, companies are, again, willing to take unnecessary risks and sometimes accept vacancy within their portfolio. This will eventually lead to more hidden vacancy. The municipality tried to get grip on this movement. A new law obligates real estate owners to register vacancy within their portfolio. This is in my opinion too hard to supervise and therefore not a realistic approach. The municipality should take a more active role and team up with developers. For instance; developers could help the municipality to realize social or cultural programs, in return the municipality could help to improve the accessibility of a location.

All actors in the process should actively cooperate to achieve the common goal: **Realize a qualitatively urban plan which consist out of qualitatively real estate configurations which addresses to the quality of living.**

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APPENDICES | 8

APPENDIX 1; INTERVIEWEES

An interview with a developer: Peak development group
Peak Development founded in 2008, which undertakes fee-based property development as well as developing and managing its own projects, specializing particularly in advice on property redevelopment and transformation issues. Peak development is well known for some successfully redeveloped office buildings within the city of Amsterdam. Five of the twenty investigated cases where transformed by Peak Development.

An interview with a developer: Lingotto
Lingotto is a project developer based in Amsterdam and is known as a creative and innovative company. Lingotto has several successful transformations within their portfolio. According to Lingotto, this key of success is delivering creative, innovative and custom but realistic projects. Rethinking the current way of working, for and with a client results in efficient and innovative buildings.

An interview with a developer: AM
AM is part of royal BAM group, one of the biggest Dutch contractors. The aim of AM is to create and design inspiring and sustainable living environments. In order assure quality, AM tries to involve all stakeholders at an early stage of the project. The collaboration with governments, investors, housing corporations, public organisation and consumers resolve in qualitative projects.

An interview with a developer: G&S Vastgoed
G&S Vastgoed is a Real estate company that focuses on the Amsterdam Real Estate market. Their mission is to develop on a responsible, sustainable way with the focus on the user and owner of the projects. Their portfolio consists out of several big projects on the Zuid-As and smaller private projects.

An interview with a developer and asset manager: Panta Real Estate & Forerunners
Panta real estate is small private investing company. The company own assets all over the Netherlands and response to the changing real estate market. Panta evaluates every asset on transformation potential, even with no vacancy at all.

An interview with a manager sustainability: Volkerwessels
Volkerwessels is one of the biggest all-in developers in the Dutch and even international market. The company develops, built, own and exploit their projects. The company focuses on user-value and sustainable additions in their designs.

An interview with an Owner and Developer: Schiphol Real Estate
Schiphol Real Estate(SRE) is a 100% daughter company of the Schiphol Group. SRE is the developer, investor, administer, owner and exploiter of all the commercial real estate of Amsterdam Airport Schiphol, Rotterdam The Hague Airport, Flight Forum Eindhoven and Logistics Park en MXP Business Park Malpensa Airport Milaan. SRE has revenue of €220 million but has some vacancy problems. Because of the lack of direct competition on location SRE does not always feel the direct need to redevelop certain buildings. SRE works hard on their sustainable image, redevelopment of vacant offices can address to this goal. The Base is a transformation where three, partly, vacant offices where combined into one high-end office. The Base is now one of SRE prime locations.

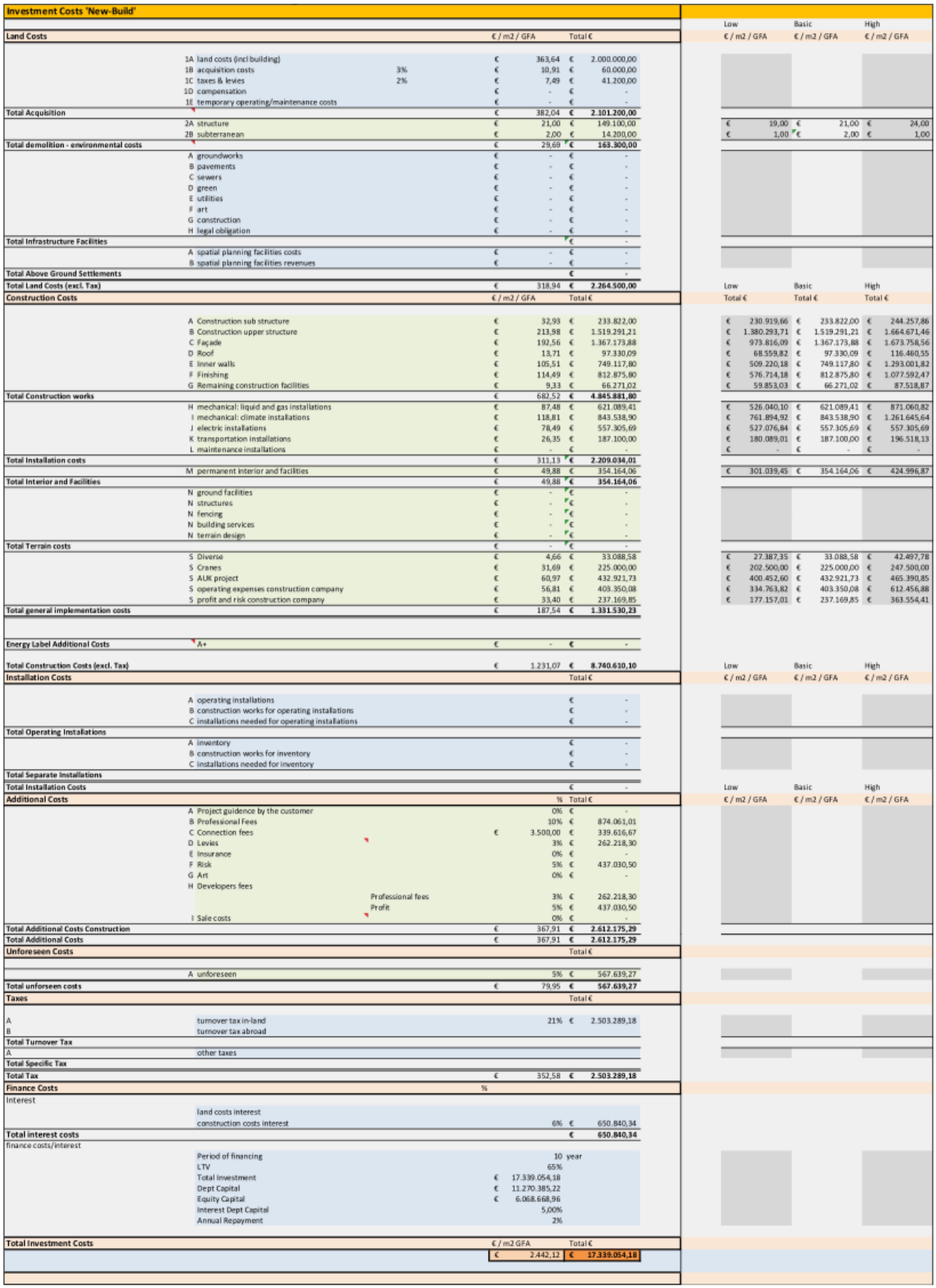
An interview with an Architect: 19 het Atelier Architects
19 het Atelier(19HA) is a mid-sized architectural company located in Zwolle. 19 HA is specialized in renovation of complete residential areas, and transformational designs are in their portfolio. Besides designing architectures are also branders or promoters of their own work. Architects can help to proof that transformation can be a success. Architectural companies are often consulted by developers or building owners about their portfolio. Based on their advice decisions about intervention strategies are made.

APPENDIX 2; TABLE FOR TRANSFORMATION POTENTIAL

Table 1: Criteria for low transformation potential (Geraedts & Van der Voordt, 2003)
(The more checkmarks, the higher the risk, the lower the transformation potential)

Aspect	Criterion	✓
Location		
Urban situation	Office on remote industrial zone Office in the middle of an office park Office in area defined as priority area for offices	
Land property	Land rent	
Vacancy	Vacancy more than one year Vacancy of surrounding buildings	
Character of urban situation	Location on or near city edge, ring roads Desolated area No greenery in the neighbourhood Social depreciation, vandalism Pollution; smell, noise, view	
Distance and quality of facilities	Shop for daily errand>1km Meeting place (café, snack bar, etc) >500m Bank/post-office>2km Basic medical facilities (doctor, pharmacy)>5km Sport facilities (fitness, swimming pool, sports park) >2km Educational facilities (nursery, school, university) >2km	
Accessibility by public transport	Distance to station >2km Distance to bus, metro, tram stop >1km	
Accessibility by car; parking	Many obstacles, limitations, poor flow Distance to parking place >250m <1parking place/100m2 dwelling realisable	
Building		
Year of construction	Building was built or renovated recently (3 years)	
Character of the building	Unrecognisable, non-eloquent Bad maintenance	
Extensibility	Not extensible horizontally Not extensible vertically	
Structure	Structure in technical bad condition Dense structural grid; <3,6m	
Dimensions	Net storey height <2,6m	
Façade	Façade openings not adaptable Impossible to create windows which can be opened manually Daylight entry <10% of the living area	
Entrance (building, dwelling)	Impossible to create a socially secure entrance Impossible to realise elevator in the building (if more than 4 floors) Distance from dwelling to stairs/elevator >50m Impossible to realise escape stairs as according to escape-demands.	
Installations	No or insufficient conduits realisable	
Environment	Noise level at the façade >50dB Sufficient isolation between dwellings impossible Sufficient isolation of façade impossible Presence of dangerous materials in construction No or little sunlight	

APPENDIX 3; LCC- MODEL - INVESTMENT COSTS SHEET



Investment Costs 'New-Build'											
								Low	Basic	High	
Land Costs				€ / m2 / GFA	Total €			€ / m2 / GFA	€ / m2 / GFA	€ / m2 / GFA	
	1A	land costs (incl building)		€ 363,64	€ 2.000.000,00						
	1B	acquisition costs	3%	€ 10,91	€ 60.000,00						
	1C	taxes & levies	2%	€ 7,49	€ 41.200,00						
	1D	compensation		€ -	€ -						
	1E	temporary operating/maintenance costs		€ -	€ -						
Total Acquisition				€ 382,04	€ 2.101.200,00						
	2A	structure		€ 21,00	€ 149.100,00			€ 19,00	€ 21,00	€ 24,00	
	2B	subterranean		€ 2,00	€ 14.200,00			€ 1,00	€ 2,00	€ 1,00	
Total demolition - environmental costs				€ 29,69	€ 163.300,00						
	A	groundworks		€ -	€ -						
	B	pavements		€ -	€ -						
	C	sewers		€ -	€ -						
	D	green		€ -	€ -						
	E	utilities		€ -	€ -						
	F	art		€ -	€ -						
	G	construction		€ -	€ -						
	H	legal obligation		€ -	€ -						
Total Infrastructure Facilities					€ -						
	A	spatial planning facilities costs		€ -	€ -						
	B	spatial planning facilities revenues		€ -	€ -						
Total Above Ground Settlements					€ -						
Total Land Costs (excl. Tax)				€ 318,94	€ 2.264.500,00			Low	Basic	High	
Construction Costs				€ / m2 / GFA	Total €			Total €	Total €	Total €	
	A	Construction sub structure		€ 32,93	€ 233.822,00			€ 230.919,66	€ 233.822,00	€ 244.257,86	
	B	Construction upper structure		€ 213,98	€ 1.519.291,21			€ 1.380.293,71	€ 1.519.291,21	€ 1.664.671,46	
	C	Façade		€ 192,56	€ 1.367.173,88			€ 973.816,09	€ 1.367.173,88	€ 1.673.758,56	
	D	Roof		€ 13,71	€ 97.330,09			€ 68.559,82	€ 97.330,09	€ 116.460,55	
	E	Inner walls		€ 105,51	€ 749.117,80			€ 509.220,18	€ 749.117,80	€ 1.293.001,82	
	F	Finishing		€ 114,49	€ 812.875,80			€ 576.714,18	€ 812.875,80	€ 1.077.592,47	
	G	Remaining construction facilities		€ 9,33	€ 66.271,02			€ 59.853,03	€ 66.271,02	€ 87.518,87	
Total Construction works				€ 682,52	€ 4.845.881,80						
	H	mechanical: liquid and gas installations		€ 87,48	€ 621.089,41			€ 526.040,10	€ 621.089,41	€ 871.060,82	
	I	mechanical: climate installations		€ 118,81	€ 843.538,90			€ 761.894,92	€ 843.538,90	€ 1.261.645,64	
	J	electric installations		€ 78,49	€ 557.305,69			€ 527.076,84	€ 557.305,69	€ 557.305,69	
	K	transportation installations		€ 26,35	€ 187.100,00			€ 180.089,01	€ 187.100,00	€ 196.518,13	
	L	maintenance installations		€ -	€ -			€ -	€ -	€ -	
Total Installation costs				€ 311,13	€ 2.209.034,01						
	M	permanent interior and facilities		€ 49,88	€ 354.164,06			€ 301.039,45	€ 354.164,06	€ 424.996,87	
Total Interior and Facilities				€ 49,88	€ 354.164,06						
	N	ground facilities		€ -	€ -						
	N	structures		€ -	€ -						
	N	fencing		€ -	€ -						
	N	building services		€ -	€ -						
	N	terrain design		€ -	€ -						
Total Terrain costs				€ -	€ -						
	S	Diverse		€ 4,66	€ 33.088,58			€ 27.387,35	€ 33.088,58	€ 42.497,78	
	S	Cranes		€ 31,69	€ 225.000,00			€ 202.500,00	€ 225.000,00	€ 247.500,00	
	S	ALIK project		€ 60,97	€ 432.921,73			€ 400.452,60	€ 432.921,73	€ 465.390,85	
	S	operating expenses construction company		€ 56,81	€ 403.350,08			€ 334.763,82	€ 403.350,08	€ 612.456,88	
	S	profit and risk construction company		€ 33,40	€ 237.169,85			€ 177.157,01	€ 237.169,85	€ 363.554,41	
Total general implementation costs				€ 187,54	€ 1.331.530,23						
Energy Label Additional Costs		A+		€ -	€ -						
Total Construction Costs (excl. Tax)				€ 1.231,07	€ 8.740.610,10			Low	Basic	High	
Installation Costs					Total €			€ / m2 / GFA	€ / m2 / GFA	€ / m2 / GFA	
	A	operating installations			€ -						
	B	construction works for operating installations			€ -						
	C	installations needed for operating installations			€ -						
Total Operating Installations					€ -						
	A	inventory			€ -						
	B	construction works for inventory			€ -						
	C	installations needed for inventory			€ -						
Total Separate Installations					€ -						
Total Installation Costs					€ -			Low	Basic	High	
Additional Costs					% Total €			€ / m2 / GFA	€ / m2 / GFA	€ / m2 / GFA	
	A	Project guidence by the customer			0% € -						
	B	Professional Fees			10% € 874.061,01						
	C	Connection fees		€ 3.500,00	€ 339.616,67						
	D	Levies			3% € 262.218,30						
	E	Insurance			0% € -						
	F	Risk			5% € 437.030,50						
	G	Art			0% € -						
	H	Developers fees									
			Professional fees		3% € 262.218,30						
			Profit		5% € 437.030,50						
	I	Sale costs			0% € -						
Total Additional Costs Construction				€ 367,91	€ 2.612.175,29						
Total Additional Costs				€ 367,91	€ 2.612.175,29						
Unforeseen Costs					Total €						
	A	unforeseen			5% € 567.639,27						
Total unforseen costs				€ 79,95	€ 567.639,27						
Taxes					Total €						
A		turnover tax in-land			21% € 2.503.289,18						
B		turnover tax abroad									
Total Turnover Tax											
A		other taxes									
Total Specific Tax											
Total Tax				€ 352,58	€ 2.503.289,18						
Finance Costs				%							
Interest											
		land costs interest									
		construction costs interest			6% € 650.840,34						
Total interest costs					€ 650.840,34						
finance costs/interest											
		Period of financing			10 year						
		LTV			65%						
		Total Investment		€ 17.339.054,18							
		Dept Capital		€ 11.270.385,22							
		Equity Capital		€ 6.068.668,96							
		Interest Dept Capital			5,00%						
		Annual Repayment			2%						
Total Investment Costs				€ / m2 GFA	Total €						
				€ 2.442,12	€ 17.339.054,18						

Program 'Transformation'

neral		
A old	5500	m2
tal GFA new	7100	m2
tal UFA new	5538	m2
ers of housing	9	
bition level	Basic	
paration period	4	Quarters
nstruction period	4	Quarters
using		
artment (UFA)	60	m2
ount	92	pc
A/GFA		78%
erventions		
ade	Replace structural façade (total co	
en/Closed ratio new	40%	
tdoor Space	No private outdoor space	
cess	No external access	
tallations	Replace	
ernal Walls	Replace	
	Replace	
el increase	D	
w energy label	C	
ditions		
ded GFA	1600	m2
ded Layers	2	
e of Addition	Topping	
or Height	3	m2

Program 'Demolition & New-build'

General		
Total GFA new	7100	m
Total UFA new	5822	m
Layers of housing	9	
Ambition level	*same as transformation*	
Width building	50	m
Length building	16	m
Height building	54,3	m
Floor Height (Ground Level)	6,2	m
Floor Height (upper levels)	6	m
Open/Closed Ratio façade	40%	
Preparation period	2	Q
Construction period	4	Q
Housing		
Apartment (UFA)	60	m
amount	97	p
UFA/GFA		8
Energy label	A+	
Structure		
No. Elevators	2	
No. Staircases	2	
Reference Project IGG		
	10211	

Sheet 3 Strategies input (Groot, 2014)

Input Benefits 'Transformation'

Rental Income	Default		Low		Basic		High		Own Input	
Housing	€	993,00	€	661,80	€	993,00	€	1.323,60		€ / apartment / mo
	€	16,55	€	11,03	€	16,55	€	22,06	€ -	€ / m2 UFA / month
Total GFA		7100		7100		7100		7100	7100	m2
Total UFA		5538		5538		5538		5538	5538	m2
Apartments		92								
Total Rental Income	€	91.653,90	€	61.084,14	€	91.653,90	€	122.168,28	€ -	€ / month
Energy Label premium / apartment / month (energy savings)		7,36								
Energy Label increase (point system)		20,28								
Rent per apartment / year	€	12.159,36								
Total Rental Income	**€**	**1.118.661,12**	**€ / year**							
BAR		**5,5%**								
WOZ-value / UFA	**€**	**3.684,65**								
WOZ-value Total Building	**€**	**20.339.293,09**								

Sheet 3 Benefits Input of Transformation (Groot, 2014)

Economic Variables	low	basic	high	Input model
Indexation				
Inflation (CPI)	1,1%	1,8%	2,5%	1,8%
Rent increase on top of CPI	0,0%	1,0%	5,0%	1,0%
Electricity	-5,0%	5,1%	23,0%	5,1%
Gas	-7,0%	8,1%	9,0%	8,1%
Construction Costs	-4,9%	0,3%	6,0%	0,3%
Other Variables				
Vacancy rate housing	0,0%	3,0%	10,0%	3,0%
Discount rate	3,5%	5,5%	6,5%	5,5%
Interest on Construction Costs	4,0%	5,0%	8,0%	5,0%
Interest on Dept Capital	4,0%	5,0%	7,0%	5,0%
LTV	30,0%	65,0%	85,0%	65,0%
Annual Repayment	0,0%	2,0%	6,0%	2,0%
Initial Yield / BAR (housing)	3,0%	5,5%	9,0%	6,0%
Exit Yield (housing)	3,0%	8,0%	10,0%	8,0%
Exit Yield (office)	0,0%	18,0%	20,0%	18,0%
Period of financing	10	yr		
Lifespan	30	yr		

Sheet 4 Economic Variables (Groot, 2014)

	Transformation	Demolition & New-build	Consolidation
ergy Label	C	A+	G
al Investment Costs	€ 21.603.491,23	€ 26.392.060,48	€ 2.408.281,5
estment Costs € / GFA	€ 1.799,99	€ 2.198,97	€ 200,6
al Operating Costs / year	€ -404.929,45	€ -528.623,35	€ -404.580,8
al Operating Costs (30 years)	€ -12.147.883,41	€ -15.858.700,49	€ -12.137.426,0
erating Costs / GFA / year	€ -33,74	€ -44,04	€ -33,7
erating Costs / GFA (30 years)	€ -1.012,15	€ -1.321,34	€ -1.011,2
io Operating / Investment	0,56	0,60	5,4
ential Value (GIY)	€ 21.665.670,07	€ 25.015.827,11	€ 7.001.166,6
ult (year 0)	€ 62.178,84	€ -1.376.233,37	€ 4.592.885,0
al Revenues / year	€ 1.098.372,05	€ 1.288.947,78	€ 13.650,5
al Revenues (30 years)	€ 32.951.161,56	€ 38.668.433,40	€ 409.516,9
venues € / GFA / year	€ 91,52	€ 107,39	€ 1,1
venues / GFA (30 years)	€ 2.745,47	€ 3.221,83	€ 34,1
idual value	€ 7.639.716,33	€ 10.287.621,25	€ 409.516,9
€ / GFA / year	€ -1,38	€ -5,22	€ -39,2
€ / GFA (30 years)	€ -41,33	€ -156,64	€ -1.177,8
V	€ -496.016,89	€ -1.880.016,17	€ -14.136.190,6
	5,38%	5,11%	N.
E	5,20%	5,00%	#DIV/

Summary Sheet (Groot, 20

APPENDIX 4:
TARGET-GROUPS PROFILES WITH DWELLING PREFERENCES FOR INNER-CITY TRANSFORMATION PROJECTS

Target group 1: Starters	**Target group 2: Starters**	**Target group 3: Young, two-income**
Young, low-income singles	Young, low-income singles	Young couples with two incomes
Shared accommodation	Semi-independent accommodation	
Location (dwelling environment)	**Location (dwelling environment)**	**Location (dwelling environment)**
1. Urban environment	1. Urban environment	1. Urban environment
2. Plenty of amenities	2. Plenty of amenities	2. Plenty of amenities
		3. Suburban (more space, green)
		4. Easily accessible by car
		5. Good parking facilities
Building (features of dwelling)	**Building (features of dwelling)**	**Building (features of dwelling)**
3. Unit in group of 3-7 occupants	3. Semi-independent unit with	6. Big luxury flat
4. Bedsit, average 22 m2	shared facilities	7. Own outside space (garden, etc.)
5. Shared sanitary facilities	4. Bedsit, average 22 m2	
1 shower/toilet per 4 units	5. Sanitary facilities for 2 persons	
6. Shared kitchen with table for meals	6. Kitchen for 2 persons	
7. Shared outside space (garden, etc.)	7. Shared outside space (garden, etc.)	
1.5 m2/unit	1.5 m2/unit	
8. Shared cycle storage	8. Shared cycle storage	
9. Shared washroom	9. Shared washroom	
10. Total 50 m2; useful floor area 35 m2	10. Total 50 m2; useful floor area 35 m2	
Costs	**Costs**	**Costs**
11. Max. rent 160 - 220 Euro	11. Max. rent 220 - 320 Euro	8. Max. rent 550 - 750 Euro
		9. ditto 750 - 1000 Euro for top flat
		10. Purchase 100,000 - 200,000 Euro
Target group 4: Senior citizens 55+	**Target group 5: Senior citizens 55+**	
Low to modal income	Above-modal income	
Location (dwelling environment)	**Location (dwelling environment)**	
1. Safe dwelling environment (social safety)	1. Safe dwelling environment (social safety)	
2. Shops, daily amenities and public trans-	2. Shops, daily amenities and public trans-	
port within walking distance (<500 m)	port within walking distance (<500 m)	
3. Urban environment	3. Easily accessible by car	
4. Suburban (more space, green)	4. Good parking facilities	
	5. Some like urban, some like suburban	
Building (features of dwelling)	**Building (features of dwelling)**	
5. Preferably not on ground floor	6. Preferably not on ground floor	
6. With lift in building	7. With lift in building	
8. Preferably not with internal staircase	8. Preferably not with internal staircase	
8. At least 3 rooms	9. Access via entrance hall, not via gallery	
9. Living room 25 - 30 m2; bedroom > 11.5 m	10. 4 - 5 rooms	
10. Direct link living room, bedroom, bathroom	11.Living room 30 - 40 m2; big kitchen	
11. Extra attention to acoustic insulation	12. Direct link living room, bedroom, bathroom	
12. Adaptable for disabled occupants	13. Amply sized bathroom	
	14. Balcony or roof garden 10 - 15 m2	
	15. Extra attention to acoustic insulation	
	16. Adaptable for disabled occupants	
Costs	**Costs**	
13. Max. rent 400 Euro	17. Rent 550 - 1100 Euro	
14. Purchase 75,000 - 110,000 Euro	18. ditto > 1100 Euro for top flat	
	19. Purchase 110,000 - 500,000 Euro	

APPENDIX 5; STEP1, 2A , 2B, 3, 4, 5 – RISK & OPPORTUNITY TOOL

Step 1

TRANSFORMATION POTENTIAL METER FOR OFFICE MARKET

STEP 1 QUICK SCAN: INITIAL ASSESSMENT USING VETO CRITERIA

General target-group-independent criteria

If one of the criteria is met (appraisal = Yes), the office building in question does not come into consideration for transformation to residential housing.
Step 2 (Feasibility scan) and further stages of assessment are then no longer necessary.

	ASPECT		VETO CRITERION	DATA SOURCE	Appraisal Yes	Appraisal No
MARKET						
1	Demand for housing	1	There is no demand for housing from local target groups	Estate agent/municipality		
LOCATION						
2	Urban location	2	Zoning plan does not permit modification	Zoning plan/munic. policy		
		3	Serious public health risk (pollution, noise, odour)	Estate agent or on-site inspection		
BUILDING						
3	Dimensions of skeleton	4	Free ceiling height < 2.60 m	Estate agent or on-site inspection		
ORGANISATION						
4	Backer for transformation plan	5	There is no enthusiastic, influential backer	Local investigation		
5	Internal veto criteria	6	Does not meet criteria for region/location/accessibility	Property developer		
	of property developer	7	Does not meet criteria on size and character of building	Property developer		
6	Owner/investor	8	Not willing to sell office building	Owner		

Step 2

STEP 2 FEASIBILITY SCAN USING GRADUAL CRITERIA

The total number of criteria met is a measure of the unsuitability of the building for transformation to residential accommodation.
If users of the meter regard one of the criteria as a veto it is moved to the Quick Scan of step 1, and vice versa.

LOCATION

	ASPECT		GRADUAL CRITERION	DATA SOURCE	Appraisal Yes	Appraisal No
FUNCTIONAL						
1	Urban location	1	Building in industrial estate or office park far from town cer	Town map		
		2	Building gets little or no sun	On-site inspection		
		3	View limited by other buildings on > 75% of floor area	On-site inspection		
2	Distance and quality of amenities	4	Shops for daily necessities > 1 km.	On-the-spot investigation		
	NB:	5	Neighbourhood meeting-place (square, park) > 500 m.	ditto		
	The quality of amenities can be described	6	Hotel/restaurant/snackbar > 500 m.	ditto		
	in terms of number, variety and level	7	Bank/Post Office > 2 km.	ditto		
	of services provided.	8	Basic medical facilities (group practice, health centre) > 5	ditto		
		9	Sports facilities (fitness club, swimming pool, sports park)	ditto		
		10	Education (from kindergarten to university) > 2 km.	ditto		
3	Public transport	11	Distance to railway station > 2 km.	Town map		
		12	Distance to bus/underground/tram > 1 km.	Map or transport services		
4	Accessibility by car and parking	13	Many obstacles; traffic congestion	On-the-spot investigation		
	Obstacles: narrowing of road, speed bumps,	14	Distance to parking sites > 250 m.	Inspection/new design		
	Congestion: 1-way traffic, no parking, tailback	15	<1 parking space/100 m2 road surface	Inspection/new design		
CULTURAL						
5	Tone of neighbourhood	16	Situated on or near edge of town (e.g. near motorway)	Map or estate agent		
	NB:	17	No other buildings in immediate vicinity	Map or estate agent		
	Assessment depends on target group, e.g.:	18	Dull environment	On-the-spot investigation		
	young people not in monofunctional neighbou	19	No green space in neighbourhood	On-the-spot investigation		
	55+ not on edge of town	20	Area has poor reputation/image; vandalism	Inspection and local press		
		21	Dangerous, noise or odour pollution (factories, trains, cars	On-the-spot investigation		
LEGAL						
6	Urban location	22	Noise load on façade > 50 dB (limit for offices 60dB)	Municipal authorities		
7	Ownership of ground	23	Leasehold	Estate agent		

Maximum possible (weighted) Location score = 23 x 5 = 115	Totaal number of Yes's for Location :		x
	Default weighting:	5	=
	Location Score :		A
	Maximum possible Location score (23x5):	115	

BUILDING						
ASPECT			GRADUAL CRITERION	DATA SOURCE	Appraisal	
FUNCTIONAL					Yes	No
1	Year of construction or renovation	1	Office building recently built (< 3 years)	Year of construction		
		2	Recently renovated as offices (< 3 years)	Year of renovation		
2	Vacancy	3	Some office space still in use	e.g. NEPROM		
		4	Building unoccupied < 3 years	ditto		
3	Features of new dwelling units	5	≤ 20 -person units (50 m2 each) can be made	≤ 1000 m2 useful area		
		6	Layouts suitable for local target groups cannot be implem	Design sketch		
4	Extendability	7	Not horizontally extendable (neighbouring buildings)	On-the-spot investigation		
		8	No extra storeys (pitched roof or insufficient load-bearing c	On-the-spot investigation		
		9	Basement cannot be built under building	Inspection and/or estate agent		
TECHNICAL						
5	Maintenance	10	Building poorly maintained/looks in poor condition	External visual inspection		
6	Dimensions of skeleton	11	Office depth < 10 m	Estate agent or inspection		
	Module of façade determines placing of walls	12	Module of support structure < 3.60 m	On-site or estate agent		
		13	Distance between floors > 6.00 m	On-site or estate agent		
7	Support structure (walls, pillars, floors)	14	Support structure is in poor/hazardous condition	On-site inspection		
8	Façade	15	Cannot be made to blend with surroundings or module > 5	On-site or estate agent		
	External spaces dependent on target group	16	Façade (or openings in façade) not adaptable	On-site inspection		
	Protected monuments: limits on adaptation	17	Windows cannot be reused/opened	Inspection/new design		
9	Installations	18	Impossible to install (sufficient) service ducts	Inspection/new design		
CULTURAL						
10	Character	19	No character in relation to surrounding buildings	On-site inspection		
	cf. Location, 'Tone of neighbourhood'	20	Impossible to create dwellings with an identity of their own	Inspection/new design		
11	Access (entrance hall/lifts/stairs)	21	Unsafe entrance, no clear overview of situation	Inspection/new design		
LEGAL						
12	Environment	22	Presence of large amounts of hazardous materials	On-site or municipality		
	Exposure to sunlight, air and noise	23	Acoustic insulation of floors < 4 dB	Inspection/new design		
	pollution, hazardous materials	24	Very poor thermal insulation of outer walls and/or roof	On-site or municipality		
		25	< 10% of floor area of new units gets incident daylight	On-site inspection		
13	*Requirements of Bouwbesluit (Dutch official r*	26	No lifts in building (> 4 storeys), no lifts can be installed	On-site or estate agent		
	and standards for the building industry)	27	No (emergency) stairways	Inspection/new design		
	concerning access and escape route	28	Distance of new unit from stairs and/or lift ≥ 50 m	Inspection/new design		
	Maximum possible (weighted) Building score = 28 x 3 = 84			Total number of Yes's for Building:		x
				Default weighting:	3	=
				Building score:		B
				Maximum possible Building score (28x3):	84	

Step 3

Table 7: Step 3. The total transformation-potential scores at Location and Building level are determined by multiplying the number of Yes's in the Appraisal column by the default weighting factor (5 for location and 3 for building); in the present example, score for location (A) + score for building (B) = 40 + 33 = 77

Total No. of Yes's (Location)	8 x	Total No. of Yes's (Building)	11 x
Default weighting	5	Default weighting	3
Score (Location)	40 (A)	Score (Building)	33 (B)
Max. possible score (23x5)	115	Max. possible score (28x3)	84

STEP 3: DETERMINATION OF TRANSFORMATION CLASS OF OFFICE BUILDING			
Transformation score Location + Building = 0 - 40	Transformation class 1: Excellent transformability	← Total Score A + B:	
Transformation score Location + Building = 41 - 80	Transformation class 2: Transformable	Maximum Score Location + Building	
Transformation score Location + Building = 81 - 120	Transformation class 3: Limited transformability	= 115 + 84 =	199
Transformation score Location + Building = 121-160	Transformation class 4: Very poor transformability		
Transformation score Location + Building = 161-199	Transformation class 5: Not transformable	→ TRANSFORMATION CLASS:	

Step 4

Type of construction project		Type of budget	Costs per unit	Costs per m^2 GFA
Transformation	Much demolition and modification	Acquisition budget for student unit	10,000 - 15,000	
		Residual budget for renovation costs	27,000 - 33,000	540 - 660
	Much reuse (including façade)	Acquisition budget for student unit	20,000 - 25,000	
		Residual budget for renovation costs	21,000 - 26,000	420 - 540
New construction		Student unit	36,000 - 39,000	720 - 780
		Social housing		890 - 970
		Luxury flat		1.100

1.The estimated range of total investment costs (acquisition and building costs) for the transformation of existing (office) buildings to student accommodation, per dwelling unit and per m2 of GFA, compared with the costs of comparable new buildings. The data are based on a large number of projects carried out by the housing association Stadswonen in Rotterdam, collected by De Vrij (2004) and indexed by us to 2006. All sums of money are in Euros.

Dwelling type and occupant	Monthly rent	Feasible investment per unit	Feasible investment per m^2 UFA	GFA / UFA ratio	Feasible investment per m2 GFA
Student's room	160 - 220	30,000 - 45,000	930 - 1,230	1.3 - 1.55	650 - 850
Studio	220 - 320	45,000 - 65,000	1,230 - 1,830	1.3 - 1.55	850 - 1,300
2 - 3-room unit for young couple	550 - 750	110,000 - 150,000	1,620 - 1,940	1.3 - 1.55	1,100 - 1,450
4-room unit for young couple	750 - 1000	150,000 - 200,000	1,620 - 2,150	1.3 - 1.55	1,100 - 1,600
3-room unit for senior citizens	400	75.000	790 - 1,010	1.3 - 1.55	500 - 800
4 - 5-room unit for senior citizens	550 - 1,100	110,000 - 220,000	1,100 - 2,150	1.3 - 1.55	700 - 1,600

2. The estimated ranges of feasible yields and investments for various target groups and types of accommodation, per dwelling unit, per m2 useful floor area (UFA) and per m2 gross floor area (GFA). An appropriate range of the ratio of UFA to GFA is also given. This is taken as 1.3 – 1.55 in all cases, since experience has shown that higher
values of this ratio make it more difficult to achieve financial feasibility for the project.

Dwelling type and occupant	Little modification		Much modification	
	Construction costs	Acquisition costs	Construction costs	Acquisition costs
Student's room	390 - 520	190 - 260	460 - 620	120 - 160
Studio	520 - 780	260 - 390	620 - 940	160 - 230
2 - 3-room unit for young couple	650 - 870	320 - 440	780 - 1040	190 - 260
4-room unit for young couple	650 - 970	320 - 480	780 - 1160	190 - 290
3-room unit for senior citizens	310 - 470	150 - 230	380 - 560	90 - 140
4 - 5-room unit for senior citizens	420 - 970	210 - 480	510 - 1160	120 - 290

3. The estimated ranges of the construction and acquisition costs incl. VAT per m2 GFA for various target groups and types of accommodation, depending on the amount of modification required. The data refer to various dwelling types handled by housing association Stadswonen, Rotterdam, in cases where relatively little and relatively much modification work is required. Reference date April 2006; source De Vrij (2004), processed by authors. The data indicate that the ratio of acquisition costs to construction costs is roughly 1:2 in projects where a relatively level o modification work is needed, and about 1:4 when a large amount of modification is expected.

Step 5

1. Checklist of risks at market and location level. Source De Vrij (2004), modified by authors

MARKET & LOCATION		Risk	Suggested solutions
1. Functional	1	Insufficient parking space	Depends on target group; discuss statutory parking provisions, consider underground parking
	2	No amenities	Provide small-scale amenities in building in cooperation with other parties
	3	No public transport	Consult public transport provider; work together with other parties
	4	Routing to dwelling is unclear	Analyse situation; if necessary, move main entrance or provide additional entrance
2. Technical	5	Odour pollution	Special insulation of façade(s) affected
	6	Noise pollution	Explore possibilities of exemption; extra façade insulation or create double-skin façade
3. Cultural	7	Neighbourhood has poor reputation or is unsafe	Neighbourhood improvement plan with other parties, with specific objectives to attract target group
4. Financial	8	Purchase price of dwelling units is too high	Boost financial yield by combining with (commercial) functions; revise design; aim at other target group
	9	Dwelling units are difficult to rent	Improve quality/price ratio; aim at other target group
	10	Extra facilities needed	Improve financial feasibility by incorporating commercial functions
5. Legal	11	Project may require changes in zoning plan or zoning procedure	Consult local authorities; check compliance with municipal policy
	12	Ownership of ground: leasehold	Bad for ground value appreciation; try to buy off leasehold
	13	Soil pollution	Get owner to obtain clean ground declaration; negotiate lower sales price in connection with soil improvement costs
	14	Limits on max. height of building (e.g. protected monument or air-traffic legislation)	Investigate possibilities of horizontal expansion

2. Checklist of risks at market and building level. Source De Vrij (2004), modified by author

BUILDING		Risk	Suggested solutions
1. Functional	1	Incorrect assessment of possibilities of building	Analyse design factors and key data incl. gross/net ratios; consider expansion possibilities (adding extra storeys)
	2	Office building too shallow	Modify layout of dwelling units; increase depth by adding new façade or foundation; external gallery
	3	Office building too deep	Modify layout of dwelling units; create interior courtyard to let in more daylight; centralise access
	4	No basement (e.g. for parking or storage)	Add basement (if foundation and access requirements allow this)
	5	Distance between floors too great	Create light mezzanine floors with light partition walls
	6	Windows cannot be opened	Replace (some of) the windows that cannot be opened, up to complete façade renovation
	7	Little scope for connecting walls to façade	Connect walls to (glass) panels, up to complete façade renovation
	8	No external space	Target-group-dependent; prefab (French) balconies; recess (part of) façade; roof gardens; inner courtyard with garden
	9	Not enough lifts/stairs (e.g. to meet statutory emergency evacuation requirements)	New lifts and/or stairs in building (e.g. in protected monument) or on outside wall
	10	Inadequate access	Analyse different access possibilities (entrance hall, gallery, central corridor, central access)
	11	Too few internal walls, poor quality internal walls	Modify existing internal walls or add new ones (bearing need for future flexibility in mind)
	12	Inadequate waterproofing in sanitary rooms	Give concrete or tiled floors waterproof finish; use prefab (plastic) sanitary units
2. Technical	13	Incorrect assessment of possibilities of structural situation	Analyse condition of building on site (with reference e.g. to design and condition of structure, finish, maintenance)
	14	Air-conditioning system inadequate	Replace or renew with requirements of dwelling units in mind; system should have individual controls for each dwelling, but possibly central supply
	15	Not enough piping and ducts	Add more (but remember to ensure fire separation between dwellings; may be possible to lay under existing floors)
	16	Inadequate water supply (residential accommodation needs more water than offices)	Expand supply (remember, must have individual controls and individual meters)
	17	Inadequate electrification	Expand (remember, must have individual controls and meters, central antenna system or cable, phone)
	18	Inadequate acoustic insulation between floors	Increase isolation by adding extra floor (concrete or floating) and/or insulating ceilings
	19	Inadequate thermal insulation of façade	Extra insulation on outside of façade or inside (in protected monuments); (remember, openings in
	20	Inadequate thermal insulation of openings in façades	Replace by double glazing; double window frame; double-skin façade (inside and outside)
	21	Inadequate thermal insulation of roof	Insulate existing roof (inside or outside); replace by new roof; combine with adding extra storeys
	22	Damp in building fabric	Analyse causes (structural damp, leakage, rising damp, condensation)
	23	Pointing in poor condition	Clear façade and repoint in part or completely
	24	Daylight/sunlight reaches < 10% of floor area	Use central corridors, extra internal spaces, oriel windows or bigger new windows to give more
	26	Support structure in poor/hazardous condition	Renovation (may need extra reinforcement, shotcrete, adhesive reinforcement, auxiliary
	27	Limited load-bearing capacity or poor foundations	Renovation (may need additional piles - steel piles, jack piles or pulse-driven piles, posssibly
	28	Load-bearing capacity not good enough for addition of extra storeys	Use light steel and/or wooden frame constructions for extra storeys

3. Cultural	29	Limitations due to protected monument status	Timely consultation with *Monumentenzorg* (Historic Buildings Council)
	30	Poor recognisability of building	Install new, more striking façade (or parts of façade); add balconies, new, more striking
	31	Poor recognisability of (main) entrance	Add e.g. canopy to increase impact, or move to other position
4. Financial	32	Difficult or impossible to acquire property	Purchase in steps: first leasehold, then freehold; joint purchase with others
	33	Big investments in initial phase (e.g. because of feasibility studies, extra	Financial feasibility study
	34	Poor financial feasibility (e.g. because project is too small)	Analyse expansion possibilities; combine with other (commercial) functions; apply for subsidies
	35	Risk of prolonged vacancy; dilapidation (e.g. due to long development	Limit time building stands empty by short-term rental; take measures to deter squatters
5. Legal	36	Presence of asbestos; removal in accordance with statutory	Negotiate lower sales price or demand asbestos-free declaration from seller before purchase goes
	37	Restrictions imposed by *Bouwbesluit* (Dutch official regulations and	Exemptions from requirements on outside space, ceiling height, access, incidence of daylight,
	38	Position about building permit is unclear	Timely consultation with local authorities about requirements and information to be provided
	39	Fire safety requirements not fully met	Timely consultation about requirements and information to be provided (access, escape routes

APPENDIX 6; LOCATIONS CHARACTERISTICS OF VACANT OFFICES

Location factor	Definition	Type	Detail scale	Data
Accessibility *proxies* 				
Car	Travel distance to nearest highway entrance by car	Distance	Building	Nationaal Wegenbestand
Train	Travel distance to nearest train station	Distance	Building	Nationaal Wegenbestand/NS
Tram	Travel distance to nearest tram stop	Distance	Building	Nationaal Wegenbestand
Bus	Relative distance to nearest bus stop	Distance	Building	Google Maps
Modality	Accessibility by type of transport	Category: (1) car, (2) car/public transport, (3) public transport, (4) public transport/bicycle, (5) bicycle, (6) bicycle/car, (7) car/ public transport/bicycle	Area	DTZ & Goudappel Coffeng
Urban fabric	Accessibility city centre within three orders	Category: (0) not accessible, (1) accessible	Building	City map
Facilities *proxies* 				
Parking	LFA per parking place	Ratio	Building	DTZ/In situ
Parking	Location	Category: (0) off-site, (1) on-site	Building	In situ
Catering	Number of restaurants or cafés within 500 meter	Quantity	Building	Locatus
Shops	Number of shops for daily necessities within 500 meter	Quantity	Building	Locatus
Public space *proxies* 				
Green	Usable public green	Square meter	Area	WistUdata
Type of public space	Nearest type of urban space	Category: (1) urban stroll ways, (2) main city space, (3) local city space, (4) secluded city space, (5) ceremonial city space, (6) deserted city space, (7) transport hubs, (8) green city space, (9) staged city space, (10) temporary city space, (11) aquatic city space, (12) waterfront city space, (13) city space for play and sport	Building	In situ
Assessment public space: protection	Protection against traffic, crime and sensory experiences nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 3-9 total	Building	In situ
Assessment public space: comfort	Comfort to walk, stand, sit, see, talk and play nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 6-18 total	Building	In situ
Assessment public space: enjoyment	Enjoyment of influence of scale, climate and sensory experiences nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 3-9 total	Building	In situ

Location factor	Definition	Type	Detail scale	Data
Prestige *proxies*				
Image rating	Opinion about the neighbourhood	Rating	Sub district	WistUdata
Safety	Percentage of inhabitants indicating a feeling of unsafety	Percentage	Sub district	WistUdata
Vandalism	Number of vandalism incidents	Index score	Area	WistUdata
Criminality	Number of incidents	Percentage	Area	WistUdata
Traffic problems	Percentage of inhabitants indicating a traffic problem	Percentage	Sub district	WistUdata
Public space problems	Percentage of inhabitants indicating a public space problem	Percentage	Sub district	WistUdata
Liveability	Satisfaction of inhabitants in relation to their direct living environment	Score per category: (1) very negative, (2) negative, (3) moderate, (4) moderately positive, (5) positive, (6) very positive and (7) excellent	Cluster	RIGO
Functionality *proxies*				
Housing	Housing within area	Average square meter	Area	WistUdata
Employment	Employment within area	Quantity	Area	WistUdata
Type	Type of office location	(1) historical, (2) pre-modern, (3) businesses/offices, (4) first generation office park, (5) second generation office park, (6) all-inclusive environment	Office area	In situ
Mix	Mix of functions	(1) monofunctional office area, (2) business district, (3) mixed environment high density, (4) mixed environment low density	Office area	Geografiek
Environment *proxies*				
Noise	Highest noise pollution train and car traffic	(1) < 55 dB, (2) 55-59 dB, (3) 60-64 dB, (4) 65-69 dB, (5) 70-74 dB, (6) ≥ 75 dB	Building	Municipality of Utrecht
Building factor	Definition	Type	Detail scale	Data
Building *proxies*				
Age	Year of construction	Category: (1) < 1945, (2) 1945-1959, (3) 1960-1669, (4) 1970-1979, (5) 1980-1989, (6) 1990-1999, (7) 2000-2012	Building	DTZ/BAG
Façade	Façade material	Category: (1) brick, (2) natural stone, (3) concrete, (4) glass, (5) metal, (6) composite (7) other	Building	In situ
Façade	Technical state maintenance façade	Category: (1) low, (2) medium, (3) high	Building	In situ

APPENDIX 7; EXTRACTED CRITERIA (own material)

Theme	Factor	Flloyd & Allen, 2002	Bonner, 2009	Remoy & Wilkinson, 2011	De Groot, 2014	Janz, 2012	Geraedts & van der Voordt, 2007	van Wingerden, 2013	Remo 2010
Market	Market segment	x	x	x	x	x	x		
	Real Estate segment	x		x	x				
	Vacancy rate	x	x	x	x	x	x	x	
	market analyses	x	x	x	x	x	x	x	
Technical	Building characteristics			x	x	x	x		
	Structural characteristics			x	x	x	x		
	Openable windows				x	x	x		
	Climatal characteristics			x	x	x	x		
	Age			x	x	x	x		
Functional	***Veto Criteria (list)***			x	x	x	x	x	
	Possibilities			x	x	x	x	x	
	Extensibility					x	x		
	Outdoor space				x	x	x		
	Increasement of windows				x	x	x		
	Location			x		x	x	x	
	Accessibility			x		x	x	x	
	Public Transport			x		x	x	x	
	City Centre					x	x	x	
	Facilities					x	x	x	
	Parking					x	x	x	
	Catering / meeting place					x	x	x	
	Shops					x	x	x	
	Bank / Post office					x	x	x	
	Medical					x	x	x	
	Educational facilities					x	x	x	
	Sport facilities					x	x	x	
	Public space			x		x	x	x	
	Green					x	x	x	
	Type of public space						x	x	
	Prestige			x		x	x	x	
	Image			x		x	x	x	
	Safety			x		x	x	x	
	Criminality & Vandalism			x		x	x	x	
	Traffic problems					x	x	x	
	Public space problems					x	x	x	
	Liveability					x	x	x	
	Functionality								
	Housing							x	
	Employment							x	
	Type of Location					x	x	x	
	Mixed use			x				x	
	Environment							x	
	Noise							x	
	Polution							x	
Cultural	Architectural highlights						x		
	Historical highlights						x	x	
	Part of a Masterplan						x		
Financial	Transfer of the building				x				

	Initial investment			x	x	x	x		
	Total invesment			x	x	x	x		
	Operational costs				x				
Legal aspects	Zoning plan			x		x	x	x	
	Health risk within building			x		x	x		
vironmental aspects	Energy label				x	x	x		
	BREEAM-NL certificate								
	Presence of dangerous materials					x	x		
	Greencalc+					x			

APPENDIX 8; FRAME WORK OR CASE STUDIES - CRITICAL FACTORS FOR INTERVENTION STRATEGIES

	Definition	Type and unit	Scale	Data Source	Literature study source
arket segment uilding	Different segments of usage and geographic boundries.	Category: - Class A: Highest rents per square meter due to their high-quality and/or superior location. - Class B: Desirable buildings but lacking on certain attributes. - Class C: Acceptable both physically and in amenities because of the cost-effective space to tenants who are not particularly image-conscious. - Class D: Very few amenities and poor locations and/or physical conditions.	Context	On-site inspection and OIS Amsterdam.	Floyd & Allen (2002)
te segment uilding	The type building after transformation.	Type of segment - Office - Lodging - Retail - Industrial - Residential - Argiculture	Building	On-site inspection	Floyd & Allen (2002)
rate (building) Current building	Vacancy rate = Vacant GFA/Total GFA	Ratio(%)	Building	OIS Amsterdam	Floyd & Allen (2002)
rate surroundings efore & after intervention	Vacancy rate = Vacant Buildings/ Total Building stock	Ratio(%)	Context	OIS Amsterdam	Floyd & Allen (2002)
for Offices	Is there demand for offices	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
for Loding	Is there demand for offices	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
for Retail	Is there demand for offices	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
for Industrial	Is there demand for offices	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
for Residential	Is there demand for offices	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
for Agriculture	Is there demand for Agriculture	Yes / No		OIS Amsterdam	Floyd & Allen (2002)
cal					
of Layers Current building	The number of usable layers within the building	Quantity (count of layers)	Building	Technical information	De Groot (2014)
demensions Current building	Building volume = Facade * Surface	Volume (m3)	Building	Technical information	De Groot (2014)
ht Current building	Height of the usable floor height.	measurement (m)	Building	Technical information	De Groot (2014)
	Type of structure and stabilization	Concrete, steel or wood with central core, stability walls or stabilty construction	Building	Technical information	De Groot (2014)
and staircases Current building	The numer of usable elevators and staircases	Quantity (count of esable elevators and staircases)	Building	Technical information	De Groot (2014)
l facade	Is it a bearing wall (Yes) or curtain wall (No)	Yes / No	Building	Technical information	De Groot (2014)
losed ratio Current building	The amount of open (windows) and closed (walls) within the facade	Ratio(%)	Building	Technical information	De Groot (2014)
aterial	Main facade material	Category (brick, natural stone, concrete, glass, metal, composite, other)		Technical information	Van Wingerden (2013)
e windows Current building	Is there a posibility to open the windows on every floor	Yes / No	Building	Technical information	De Groot (2014)
nstallations uilding	What is the age of the climate instalations	age (years)	Building	Technical information	De Groot (2014)
onal					
eria					
ht Current building	Floorheight >= 2.60 m	Yes / No (No = negative veto)	Building	Technical information	Geraedts & Voordt (2003)
uctural grid	grid >= 3,60 m	Yes / No (No = negative veto)	Building	Technical information	Geraedts & Voordt (2003)
entry Current building	Daylight entry >= 10% of the UFA	Yes / No (No = negative veto)	Building	On-site inspection	Geraedts & Voordt (2003)
les					
lity	horizontal extensible vertical extensible	Yes / No Yes / No	Building Building	On-site inspection	Geraedts & Voordt (2003)
space	Is there outdoor space?	Category (Yes terras, balcony, garden / No)	Building	Technical information	Geraedts & Voordt (2003+2007)
ment of windows	Possibility to increate windows the amount of windows			Technical information	
lity					Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest Airport	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest railway station	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest highway entrance	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest metro entrance	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest bus stop	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Distance to nearest tram stop	Distance (km)	Context	Map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Accessible by different types of transport	Category (car, car/public transport, public transport, public transport/bicycle, bicycle, bicycle/car, car/ public transport/bicycle)	Context	Map	Van Wingerden (2013)
re	Is the city centre accessible within the three orders of de Bois (2011)	Category (not accessible, accessible)	Context	Map	Van Wingerden (2013)
					Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	LFA / parking spacce	Ratio (%)	Context	Technical & building information	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Location of the parking area	Categorie (Off-site / on-site / both)	Context	Technical & building information	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
/ meeting place	Number of restaurants, cafés within 500 meter radius.	Quantity	Context	On-site inspection / map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	Number of shops for daily nessities within 500 meter radius.	Quantity	Context	On-site inspection / map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
st office	Number of Bank / Post offices for daily nessities within 500 meter radius.	Quantity		On-site inspection / map	Geraedts & Voordt (2003, 2007)
dical facilities	Number of Basic medical facilities for daily nessities within 500 meter radius.	Quantity		On-site inspection / map	Geraedts & Voordt (2003, 2007)
nal facilities	Number of Educational facilities for daily nessities within 500 meter radius.	Quantity		On-site inspection / map	Geraedts & Voordt (2003, 2007)
ilities	Number of Sport facilities for daily nessities within 500 meter radius.	Quantity		On-site inspection / map	Geraedts & Voordt (2003, 2007)
ace					Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
	The amount of green in the area	surface (m2)	Context	On-site inspection / map	Van Wingerden (2013) + Geraedts & Voordt (2003, 2007)
ublic space	Nearest type of urban space	Category (urban stroll ways, main city space, local city space, secluded city space, ceremonial city space, deserted city space, transport	Context	On-site inspection / map	Van Wingerden (2013)

nent public space: ion	Protection against traffic, crime and sensory experiences nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 3-9 total	Building	On-site inspection / map	Van Wingerden (2013)
nent public space:	Comfort to walk, stand, sit, see, talk and play nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 3-9 total	Building	On-site inspection / map	Van Wingerden (2013)
nent public space: ent	Enjoyment of influence of scale, climate and sensory experiences nearest urban space	Score per sub-category: (1) poor, (2) average and (3) good; between 3-9 total	Building	On-site inspection / map	Van Wingerden (2013)
e					
ating	Given in average grade, one till ten, given by users of the area.	Grade (1-10)	Context	On-site quenstionaire	Van Wingerden (2013)
	Given in average grade, one till ten, given by users of the area.	Grade (1-10)	Context	On-site quenstionaire	Van Wingerden (2013)
lity	Number of incidents	Index score	Context	OIS Amsterdam	Van Wingerden (2013)
m	Number of incidents	Index score	Context	OIS Amsterdam	Van Wingerden (2013)
problems	Given in average grade, one till ten, given by users of the area.	Grade (1-10)	Context	OIS Amsterdam	Van Wingerden (2013)
pace problems	Given in average grade, one till ten, given by users of the area.	Grade (1-10)	Context	OIS Amsterdam	Van Wingerden (2013)
ity	Given in average grade, one till ten, given by users of the area.	Grade (1-10)	Context	OIS Amsterdam	Van Wingerden (2013)
nality					Van Wingerden (2013)
g	The amount of housing in the area	Ratio (%)	Context	OIS Amsterdam	Van Wingerden (2013)
ment	The empoyment rare wihtin the area	Ratio (%)	Context	OIS Amsterdam	Van Wingerden (2013)
	Type of location	Categorie (historical, pre-modern, businesses/offices, first generation office park, second generation office park, allinclusive environment	Context	OIS Amsterdam	Van Wingerden (2013)
	Mix of functions wihtin the area	Categorie (monofunctional office area,business district, mixed environment high density, mixed environment low density	Context	OIS Amsterdam	Van Wingerden (2013)
ment					Van Wingerden (2013)
	Highest noise pollution within the area	Categorie (< 55 dB, 55-59 dB, 60-64 dB, 65-69 dB, 70-74 dB, ≥ 75 dB	Context	OIS Amsterdam	Van Wingerden (2013)
ral					
ctural highlights	Are there any architectural highlights within the building?	Yes / No	Building		Geraedts & Voordt (2003
a masterplan	Is the building part of bigger architectural masterplan with any architectural value?	Yes / No	Contex		Geraedts & Voordt (2003
cial					
r of the building	Was there a transfer between owner?	Yes /No + transfer cost(€)	Building		De Groot (2014)
r	Was there an external investor?	Yes /No	Building		De Groot (2014)
vestment	Wat was the initial investmet?	amount in euro (€)	Building		De Groot (2014)
vesment	Wat was the total investment?	amount in euro (€)	Building		De Groot (2014)
onal costs & Current building	What are the operational costs?	amount in euro (€)	Building		De Groot (2014)
aspects					
plan building	Zoning plan does not permit modification	Yes / No	Contex		Geraedts & Voordt (2003
risk building	Are there any healt risks	Yes / No	Contex		Geraedts & Voordt (2003
onmental aspects					
label	What is the energylabel given by Greencalc+	A++, A+, A, B, C, D, E, F, G	Building		De Groot (2014) + Jansz (
M-NL certificate	What is the given BREEAM-NL certificate?		Building		Own
e of dangerous ls & Current building	Are there any dangerous material in the building	Yes / No	Building		Geraedts & Voordt (2003

APPENDIX 9; A INTERVIEW TEMPLATE

Beste,
Allereerst bedankt voor het tijd vrij maken van dit interview. Ik heb contact met u opgenomen omdat u de grote rol heef gehad bij een van de projecten die ik onderzoek voor mijn scriptie.
Ik ben momenteel bezig met afstuderen op de Master Real Estate & Housing aan de TU Delft. Mijn afstudeer richting is "adaptive reuse". Ik doe onderzoek naar een Decision Support Model (DSM) dat zich richt op de verschillende interventie strategieën voor leegstaande kantoorgebouwen in Amsterdam en omgeving. Er wordt, mits mogelijk, gestuurd op transformatie. Ik wil binnen projecten ontdekken wat doorslaggevende factoren waren om voor een transformatie te gaan. Ik zou u eerst graag enkele vragen willen stellen over transformatie in het algemeen om vervolgens wat dieper in te gaan op het project. Afsluitend zou ik graag uw mening willen weten over de toepasbaarheid van een dergelijk Decision Support Model. Met het oog op de tijd zou ik het gesprek graag willen opnemen zodat ik dit later kan uitwerken. Binnen mijn verslag wil ik verschillende kritische factoren met elkaar vergelijken, mijn bedoeling is niet om verschillende bedrijven met elkaar te vergelijken, uw mening wordt daarom anoniem vermeld.

1. Hoelang bent u al werkzaam bij uw huidige bedrijf?

2. Hoelang werkt u al in uw huidige positie ?

3. Hoe bent u bij dit bedrijf terecht gekomen?

4. Wat is uw hoogst behaalde Diploma?

Bedankt voor het beantwoorden, ik zou u nu graag wat vragen willen stellen over transformatie in het algemeen.

5. Waarom wordt er de laatste tijd steeds vaker gekozen voor het transformeren van leegstaande gebouwen?

6. Denkt u dat de afgelopen crisis hier een grote rol in heeft gespeeld?

7. Duurzaamheid staat momenteel hoog in het vaandel, transformatie van leegstaande gebouwen wordt vaak, soms onterecht, gezien als een duurzame oplossing voor leegstand. Hoe denkt u hier over?

8. Transformatie en functie wisseling gaan over het algemeen samen, soms is de nieuwe functie in strijd met het bestemmingsplan. Staat, over het algemeen, de overheid bij transformatie sneller wijzigingen toe in het bestemmingsplan?

9. Is de overheid over het algemeen soepeler dan bij nieuwbouw of slopen en herbouwen?

10. Hoe wordt bij een leegstaand kantoorgebouw de keuze voor een bepaalde interventie strategie gemaakt?

11. Welke informatie is hiervoor nodig?

12. Welke kerngetallen worden er gebruikt?

13.Op welk moment in het proces wordt er transformatie overwogen?

14. Word er binnen dit proces gebruik gemaakt van een model of worden er beslissingen gemaakt vanuit bestaande kennis?

15. Hebben jullie zelf genoeg kennis in huis voor het bepalen van een interventie strategie of huren jullie een externe partij in?

16. Wordt deze keuze wel genoeg onderbouwd?

17. Welke factoren zijn doorslaggevend voor de keuze voor te transformeren?

18. Welke andere factoren hebben een grote invloed op die keuze ?

19. Bij een transformatie wordt er vaak gekozen voor een gevel vernieuwing. Waarom is dit volgens u?

20. Er zijn tal van andere mogelijkheden binnen een transformatie, welke factoren beïnvloeden deze keus?

21. Wanneer is een project in uw ogen een succes?

22. Kunnen bestaande bouwen zo getransformeerd worden dat ze even efficiënt zijn als nieuwbouw?

Nu volgt er een stuk over de verschillende aspecten en criteria binnen een transformatie project. Zou u per criteria kunnen aangeven in hoeverre het een rol heeft gespeeld binnen het gehele project. De schaal is 1(links) tot en met 5(rechts). Waarin 1 onbelangrijk is en 5 onmisbaar. Bij een 1 of 5 vraag ik u een bondige toelichting te geven onder aan het thema.
Ik heb deze aspecten en criteria geordend aan de hand van verschillende thema's binnen transformatie. De thema's zijn: markt aspecten, technische aspecten, functionele aspecten, culturele aspecten, financiële aspecten, wetgeving en milieu aspecten Ik ben hier opzoek naar de kritische factoren binnen het project.

Markt aspecten

1. Marktonderzoek (vraag & aanbod) huidige markt 00000
2. Leegstand in gebouw 00000
3. Leegstand in gebied 00000
4. Leegstand in gemeente 00000
5. Vastgoedsegment van het gebouw binnen zijn context 00000
6. Vastgoedsegment van de omgeving (Woningen/Horeca/Kantoren etc) 00000

Technische aspecten van het gebouw (eerste situatie en de mogelijkheid tot uitbreiding)

1. Diepte van de plattegrond (en mogelijkheid tot uitbreiding) 00000
2. Aantal liften en trappen 00000
3. Soort constructie 00000
4. Soort gevel 00000
5. Open/dicht ratio van de gevel 00000
6. Het aantal ramen 00000
7. Te openen ramen 00000
8. Klimaatinstallatie 00000
9. Leeftijd van het gebouw 00000

Functionele aspecten van de context (eerste situatie en de mogelijkheid tot uitbreiding)

1. Buitenruimte 00000
2. Bereikbaarheid in het algemeen 00000
3.Openbaar vervoer 00000
4. Fiets 00000
5. Auto 00000
6. Vliegveld 00000
7. De nabijheid van een stadcentrum 00000
8. De nabijheid van een winkelcentrum 00000
9. Parkeergelegenheid 00000
10. Eet- en drinkgelegenheid 00000
11. Sportfaciliteiten 00000
12. Kinderopvang 00000
13. Het image van de buurt 00000
14. Het image van het gebouw 00000
15. Veiligheid 00000
16. Criminaliteit en vandalisme 00000
17. Verkeersproblemen 00000
18. Werkloosheid 00000
19. Geluidsoverlast 00000
20. Vervuiling 00000

Culturele aspecten

1. Architectonische waarde 00000
2. Culturele waarde 00000
3. Deel van een groter stedenbouwkundig plan 00000

Financiële aspecten

1. Aankoop van het gebouw 00000
2. Initiële investering 00000
3. Totale investering 00000
4. Bouwkosten 00000
5. Onderhoudskosten 00000

Wetgeving

1. Bestemmingsplan 00000
2. Andere wetgeving 00000

Milieu aspecten

1. Energy label 00000
2. BREEAM-NL 00000
3. Green-calc+ 00000

4. Aanwezigheid van schadelijke stoffen 00000

Nu zou ik graag enkele vragen willen stelen over het proces van het project.

23. Waarom functioneerde het originele gebouw niet meer?

24. Waarom is er gekozen voor een transformatie en niet voor bijvoorbeeld slopen en nieuwbouw?

25. Wat was de beslissende factor voor transformatie en niet een andere interventie strategie.

26. Wat waren nog meer zwaarwegende factoren?

27. In hoeverre speelde aanpassingen van het uiterlijk van het gebouw een rol is het behaalde resultaat?

28. Zijn er erg grote tegenslagen geweest in het proces?

29. Is het resultaat een succes?

Dank u wel voor het beantwoorden van dit deel. Ik zou nu graag nog enkele vragen willen stellen over een Decision Support Model.

31. Denkt u dat een dergelijk DSM nuttig is?

32. Denkt u zelf ooit gebruik te maken van een dusdanig model?

33. Welke verschillende modellen zou u graag terug willen zien binnen een het DSM?(financieel/duurzaam/etc)

We zijn aangekomen bij de laatste vraag van het interview. Heeft u nog op- of aanmerkingen voor mijn onderzoek?

Ik dank u hartelijk voor uw tijd. Als u interesse heeft zou ik u op de hoogste kunnen stellen van de resultaten van mijn scriptie.
0 Ja, graag.
0 Nee, dank je.

Appendix 10; A summary made by de Groot (2014)of the interventions and values calculated by BBN Advisors (2012)

Omschrijving	Uitgangspunten
Kantoorgebouw in slechte staat (klein)	
Bouwjaar	1980 - 1989
Bruto oppervlakte	3.000 m^2 bvo
Bruto geveloppervlakte	1.700 m^2 bgo
Percentage gevel 'open'	35%
Aantal bouwlagen	2 lagen
Energielabel	G
Onderhoudsstaat	slecht
Aanwezige klimaatinstallaties	- natuurlijke ventilatie i.c.m. mechanische afzuiging (geen warmteterugwinning) - gasgestookte VR cv-ketel i.c.m. radiatoren - koeling d.m.v. splitunits
Aanwezige lichtinstallatie	- basis verlichting met verbruik van 16W/m^2
Aanwezige isolatie	- Rc-waarde gevel: 1,3 m^2K/W - U-waarde beglazing, dubbelglas : 3,3 W/m^2K
Technische (on)mogelijkheden	- spouw metselwerk gevel bereikbaar - dakrand voldoende hoog voor extra isolatie - hoge mate van scheiding casco/inbouw
Kantoorgebouw in slechte staat (groot)	
Bouwjaar	1980 - 1989
Bruto oppervlakte	18.000 m^2bvo
Bruto geveloppervlakte	7.200 m^2bgo
Percentage gevel 'open'	35%
Aantal bouwlagen	10 lagen
Energielabel	G
Onderhoudsstaat	slecht
Aanwezige klimaatinstallaties	- balans ventilatie (met hoge luchtrecirculatie) - gasgestookte VR cv-ketel i.c.m. radiatoren - compressiekoelmachine, luchtkoeling
Aanwezige lichtinstallatie	- basis verlichting met verbruik van 16W/m^2
Aanwezige isolatie	- Rc-waarde gevel: 1,3 m^2K/W - U-waarde beglazing, dubbelglas : 3,3 W/m^2K
Technische (on)mogelijkheden	- spouw metselwerk gevel bereikbaar - dakrand voldoende hoog voor extra isolatie - hoge mate van scheiding casco/inbouw

Omschrijving	Uitgangspunten
kantoorgebouw in redelijke staat (klein)	
Bouwjaar	1990 - 1999
Bruto oppervlakte	3.000 m^2bvo
Bruto geveloppervlakte	1.700 m^2bgo
Percentage gevel 'open'	35%
Aantal bouwlagen	2 lagen
Energielabel	D
Onderhoudsstaat	redelijk
Aanwezige klimaatinstallaties	- balans ventilatie (incl. warmteterugwinning) - gasgestookte HR cv-ketel i.c.m. radiatoren - compressiekoelmachine, luchtkoeling
Aanwezige lichtinstallatie	- basis verlichting met verbruik van 13W/m^2
Aanwezige isolatie	- Rc-waarde gevel: 2,5 m^2K/W - U-waarde beglazing, dubbelglas : 2,8 W/m^2K
Technische (on)mogelijkheden	- spouw metselwerk gevel bereikbaar - dakrand voldoende hoog voor extra isolatie - hoge mate van scheiding casco/inbouw
kantoorgebouw in redelijke staat (groot)	
Bouwjaar	1990 - 1999
Bruto oppervlakte	18.000 m^2 bvo
Bruto geveloppervlakte	7.200 m^2 bgo
Percentage gevel 'open'	35%
Aantal bouwlagen	10 lagen
Energielabel	D
Onderhoudsstaat	redelijk
Aanwezige klimaatinstallaties	- balans ventilatie (incl. warmteterugwinning) - gasgestookte HR cv-ketel i.c.m. inductie-units - compressiekoelmachine, lucht nakoeling
Aanwezige lichtinstallatie	- basis verlichting met verbruik van 13W/m^2
Aanwezige isolatie	- Rc-waarde gevel: 2,5 m^2K/W - U-waarde beglazing, dubbelglas : 2,8 W/m^2K
Technische (on)mogelijkheden	- spouw metselwerk gevel bereikbaar - dakrand voldoende hoog voor extra isolatie - hoge mate van scheiding casco/inbouw

Office before 1989 (3.000m2)				
Original Label	G	Interventions needed:	Costs Involved / m2 GFA	
New Label	E	Improve facade and roof insulation, replace windows with HR++ glazing	€	45,00
	D	the above + HR107 boiler	€	50,00
	C	the above + energy efficient lighting, daylight control, motion sensors	€	100,00
	B	the above + adding balanced ventilation system with heat recovery system	€	200,00
	A	the above + PV-cells (400m2)	€	230,00
	A+	the above + thermal energy storage installation incl. climate ceilings	€	350,00

Office before 1989 (18.000m2)				
Original Label	G	Interventions needed:	Costs Involved / m2 GFA	
New Label	E	apply improved heat recovery system	€	15,00
	D	insulation, replace windows with HR++ glazing	€	30,00
	C	the above + HR10 boiler	€	35,00
	B	the above + energy efficient lighting, daylight control, and motion sensors	€	80,00
	A	the above + PV-cells (1.500m2)	€	100,00
	A+	the above + thermal energy storage installation incl. climate ceilings	€	220,00

Office 1990-1990 (3.000m2)				
Original Label	D	Interventions needed:	Costs Involved / m2 GFA	
New Label	C	replace windows with HR++ glazing, improved roof insulation	€	45,00
	B	the above + HR107 boiler, improved heat recovery system	€	55,00
	A	the above + energy efficient lighting, daylight control and motion sensors	€	110,00
	A+	the above + thermal energy storage installation incl. climate ceilings	€	230,00
	A++	the above + PV-cells (400m2)	€	260,00

Office 1990-1990 (18.000m2)				
Original Label	D	Interventions needed:	Costs Involved / m2 GFA	
New Label	C	replace windows with HR++ glazing	€	10,00
	B	the above + HR107 boiler, improved heat recovery system	€	20,00
	A	the above + energy efficient lighting, daylight control and motion sensors	€	70,00
	A+	the above + thermal energy storage installation in combination with induction-units	€	105,00
	A++	the above + PV-cells (1.500m2)	€	125,00

APPENDIX 11 - DEMOLISHMENT AND CONSTRUCTION COST (Huls, 2016)

Construction costs

Intervention	Function	Intervention	Price	
Renovation	Office	Construction ex. Installation	€ 275	/m2 GFA
		Façade Replacement	€ 350	/m2 Facade
Transformation		Installation	€ 310	/m2 GFA
	Residential	Construction ex. Installation	€ 175	/m2 GFA
		Façade Replacement	€ 300	/m2 Facade
		Installation	€ 160	/m2 GFA
	Hotel	Construction ex. Installation	€ 300	/m2 GFA
		Façade Replacement	€ 300	/m2 Facade
		Installation	€ 460	/m2 GFA
	Retail, food & Drinks	Construction ex. Installation	€ 75	/m2 GFA
		Façade Replacement	€ 300	/m2 Facade
		Installation	€ 218	/m2 GFA
	Educational	Construction ex. Installation	€ 250	/m2 GFA
		Façade Replacement	€ 300	/m2 Facade
		Installation	€ 215	/m2 GFA
Newly built	Office	Total construction cost	€ 1200	/m2 GFA
	Residential	Total construction cost	€ 1042	/m2 GFA
	Hotel	Total construction cost	€ 1350	/m2 GFA
	Retail, food & Drinks	Total construction cost	€ 1786	/m2 GFA
	Educational	Total construction cost	€ 1218	/m2 GFA

Demolishment costs

Intervention	Price	
Completely	€ 23	/m2 GFA
Keep Casco	€ 25	/m2 GFA
Clean	€ 8	/m2 GFA

APPENDIX 12 A – THE RENTAL PRICES ACCORDING TO THE APPRECIATION SYSTEM FOR NON-LIBERATED HOUSING (Groot, 2014, p. 100)

Maximale huurprijsgrenzen voor zelfstandige woningen per 1 juli 2013

punten	bedrag	punten	bedrag	punten	bedrag	punten	bedrag	punten	bedrag
40	188,05	82	386,37	124	603,10	166	819,81	208	1036,53
41	192,76	83	391,53	125	608,26	167	824,97	209	1041,69
42	197,45	84	396,67	126	613,41	168	830,12	210	1046,88
43	202,15	85	401,85	127	618,57	169	835,31	211	1052,01
44	206,84	86	407,01	128	623,76	170	840,45	212	1057,17
45	211,54	87	412,16	129	628,88	171	845,61	213	1062,34
46	216,26	88	417,32	130	634,06	172	850,77	214	1067,49
47	220,95	89	422,48	131	639,21	173	855,94	215	1072,65
48	225,66	90	427,65	132	644,37	174	861,08	216	1077,82
49	230,36	91	432,81	133	649,54	175	866,25	217	1082,98
50	235,06	92	437,96	134	654,69	176	871,41	218	1088,12
51	239,73	93	443,13	135	659,86	177	876,56	219	1093,29
52	244,46	94	448,28	136	665,00	178	881,74	220	1098,47
53	249,15	95	453,44	137	670,18	179	886,90	221	1103,60
54	253,85	96	458,61	138	675,34	180	892,03	222	1108,77
55	258,56	97	463,77	139	680,48	181	897,22	223	1113,94
56	263,27	98	468,92	140	685,65	182	902,37	224	1119,10
57	267,93	99	474,10	141	690,83	183	907,53	225	1124,24
58	272,64	100	479,24	142	695,95	184	912,67	226	1129,42
59	277,36	101	484,40	143	701,12	185	917,86	227	1134,58
60	282,06	102	489,56	144	706,30	186	923,02	228	1139,73
61	286,74	103	494,73	145	711,46	187	928,17	229	1144,90
62	291,46	104	499,89	146	716,60	188	933,34	230	1150,05
63	296,15	105	505,03	147	721,78	189	938,50	231	1155,20
64	300,84	106	510,22	148	726,92	190	943,65	232	1160,39
65	305,55	107	515,37	149	732,10	191	948,83	233	1165,54
66	310,26	108	520,51	150	737,24	192	953,97	234	1170,69
67	314,96	109	525,69	151	742,41	193	959,13	235	1175,85
68	319,65	110	530,84	152	747,57	194	964,31	236	1181,02
69	324,34	111	536,01	153	752,73	195	969,46	237	1186,18
70	329,04	112	541,17	154	757,89	196	974,60	238	1191,32
71	333,74	113	546,32	155	763,04	197	979,76	239	1196,50
72	338,45	114	551,50	156	768,20	198	984,94	240	1201,65
73	343,14	115	556,65	157	773,39	199	990,09	241	1206,82
74	347,85	116	561,81	158	778,51	200	995,25	242	1211,97
75	352,55	117	566,96	159	783,70	201	1000,41	243	1217,13
76	357,25	118	572,12	160	788,84	202	1005,58	244	1222,30
77	361,94	119	577,28	161	794,01	203	1010,74	245	1227,46
78	366,66	120	582,45	162	799,18	204	1015,89	246	1232,61
79	371,35	121	587,61	163	804,32	205	1021,05	247	1237,75
80	376,06	122	592,78	164	809,48	206	1026,21	248	1242,95
81	381,20	123	597,93	165	814,65	207	1031,39	249	1248,09
								250	1253,24

APPENDIX 13 – Sheets DSM

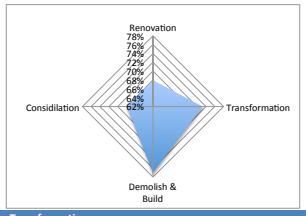
1. Input
2. Output
3. WS – Aspeccts & Criteria
4. WS - Functions & Interventions
5. WS – Summary & Ambition
6. WS – Energy
7. WS – IRR calculations
8. WS – Scenarios
9. DB – Financial

Left out of Appendices
Connectsheet DB-Postcode DB-Market DB -Location-
apenn§

1 Market		Value	
Area			
1	ZIP code numbers	1055	
2	Select the neighbourhood	LANDLUST	
2 Location			
Site			
1	None or bad insolation	< 50%	of time
2	Bad view at 75% of GVA	NO	*Yes / No*
3	Next to highway	NO	*Yes / No*
4	Other buildings in direct context	YES	*Yes / No*
Accessibility			
1	Distance to Bus/tram/metro	0,5	*km*
Facilities			
1	Distance to parkingspots	10	m
2	Number of parkingspots in direct area	120	spots
4	Distance to relaxation or recreation	<0,5	km
Legal			
1	Noise pollution on facade	<60 dB	
2	Ownership of land	Leased	Owned / Leased
3	Health hazards or pollutions	NO	*Yes / No*
4	Zoning plan alow changes/can be changed	YES	*Yes / No*
5	Max height in zoning plan	45	m
	Max number of layers	*13*	*Layers*
3 Building			
3.1 *general*			
1	Construction or last renovation Year	1961 - 1970	*Year of completi*
2	Gross Floor Area (total)	4000	*m2*
3	Gross Floor Area (ground floor)	6388	*m2*
	Gross Floor Area (elevation floor)	*-217,1*	*m2*
4	Number of Layers	12	*Layers*
5	± Length building	155	*m*
6	± Width building	30	*m*
	± Height building	*43,75*	*m (# layers * ceili*
3.1 *vacancy*			
1	Total vacancy	YES	*Yes / No*
2	Duration of total vacancy	>3	*Year*
3.2 *structure*			
1	Floor Height (ground floor)	8,00	*m*
2	Floor height (elevation floors)	3,25	*m*
3	smalles usable floorwidth	8	*m*
4	Min 1 usable area of min. 11m2 and 3 wide	YES	*Yes / No*
5	Structure	Steel frame	Type
7	Condition structure	Good	*Good / Bad*
8	Grid structure	4	*m*
9	Possibility horizontal expansion	YES	*Yes / No*
10	Possibility vertical expansion (top)	1	*layers*
11	Possibility vertical expansion (basement)	YES	*Yes / No*
12	Possibility to add balconies e.o.	YES	*Yes / No*
13	Elevators	10	*number of*
14	Possibility to add elevators	NO	*Yes / No*
15	Staircases	5	*number of stairc*
16	possibility to add staircases	YES	*Yes / No*
3.3 *skin (facade & roof)*			
1	Grid of the facade	>5,40	
2	Open/Closed ratio	60 - 90 %	*%*
3	Open able windows	NO	*Yes / No*
4	Windows are sufficient and reusable	NO	*Yes / No*
5	Condition facade	Bad	*Good / Bad*
7	Condition roof	Good	*Good / Bad*
3.4 *installations*			
1	Age of the installations	2001 - 2010	*Year*
		2001 - 2010	*year, when unkc*
3.5 *financial*			
2	Aquicistion cost land and building	€ 10.000.000	*cost (if internall*
3.6 *Energy*			
1	Energy label	UNKOWN	*label*
		F	*when unkown la*
3.7 *Architectural & Cultural value*			
1	Own/strong identity in context	YES	*Yes / No*
2	Out-dated appearance	YES	*Yes / No*
3	Decayed appearance	YES	*Yes / No*
4	Representable appearance	NO	*Yes / No*
5	Good recognizable entrance	YES	*Yes / No*
4 Ambition			
1	Financial Profitability		5
2	Environmental Sustainabilty		4
3	Architectural & Cultural value		4
5 Optional Variables			
1	Reuse - GFA / UFA effeciency rate		(when unkown
2	newly built - GFA / UFA effeciency rate		(when unkown
3	Inflation	1%	(when unkown
4	Discount rate		(when unkown

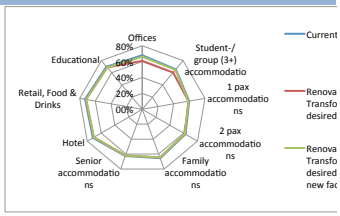
A Intervention Potential

	intervention	Score
1.	Renovation	67,9%
2.	Transformation	73,2%
3.	Demolish & Build	77,0%
4.	Considilation	67,9%



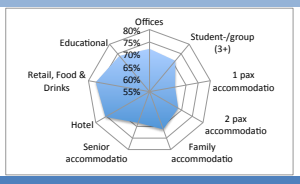
B Best function for Renovation or Transformation

Intervention	sub-category		Function	Current situation	Renovation / Transformation with desired energy label	Renovation / Transformation with desired energy label and new facade
1. Renovation	Offices	1.	Offices	67,9%	61,0%	66,0%
2. Transformation	Residential	1.	Student-/group (3+) accommodation	65,4%	60,5%	64,6%
		2.	1 pax accommodations	59,7%	58,9%	58,9%
		3.	2 pax accommodations	62,6%	61,8%	61,8%
		6.	Family accommodations	65,4%	64,6%	64,6%
		7.	Senior accommodations	62,6%	61,8%	61,8%
	Hospitality	8.	Hotel	71,7%	70,5%	70,5%
	non-resdential	9.	Retail, Food & Drinks	73,2%	72,0%	72,0%
		10.	Educational	70,1%	68,9%	68,9%



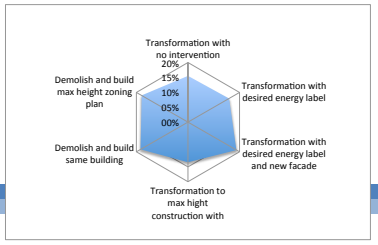
C Best function for Demolish & Build

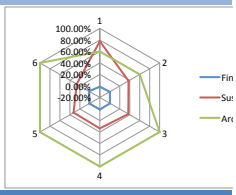
sub-category		Function	Score
Offices	1.	Offices	72,3%
	3.	Student-/group (3+) accommodation	71,3%
Residential	4.	1 pax accommodations	65,6%
	5.	2 pax accommodations	68,5%
	6.	Family accommodations	71,3%
	7.	Senior accommodations	68,5%
Hospitality	8.	Hotel	75,5%
non-resdential	9.	Retail, Food & Drinks	77,0%
	10.	Educational	73,8%



D Best specific intervention

sub-category		Intervention	Score
Current situation	1	Transformation with no intervention	15,5%
Renovation / Transformation with desired energy label	2	Transformation with desired energy label	15,9%
Renovation / Transformation with desired energy label and new facade	3	Transformation with desired energy label and new facade	18,8%
0	4	Transformation to max hight construction with desired energy label and new facade	13,5%
	5	Demolish and build same building	18,4%
	6	Demolish and build max height zoning plan	18,0%





D Best option

Best Option			
Intervention	3Transformation with desired energy label and new facade		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	16.648.250
	Netto cashflow	-€	2.687.542
	NPV	-€	9.306.451
	IRR		-0,2%
Sustainability			
	Energy label	A++	

Second best option			
Intervention	5Demolish and build same building		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	17.660.920
	Netto cashflow	€	355.634
	NPV	-€	8.419.579
	IRR		1,1%
Sustainability			
	Energy label	A++	

4			
Intervention	6Demolish and build max height zoning plan		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	17.496.764
	Netto cashflow	€	129.044
	NPV	-€	8.442.492
	IRR		1,0%
Sustainability			
	Energy label	A++	

Aspect	Value		max Points	
0. Function				
1. Market				
1.1 *Prospect market*				
1 Population	5,0%	2015 - 2020		10
2 Offices	8,5%	2013-2016		10
3 Residential	4,8%	2015 - 2035		10
4 Retail	0%	2012-2013		10
5 Hotel	14%	2014-2015		10
1.3 *Office market*				
1 working rate	4041	2015		10
1.4 Residential				
1 Students	5%	Ratio in 2015		10
2 1 pax	45%	Ratio in 2015		
3 2 pax	23%	Ratio in 2015		
4 family	25%	Ratio in 2015		
5 Senior	3%	Ratio in 2015		
1.5 *Non-Residential*				
1 **Hotel**				
2 **Retail,Food & Drink**				
6 residents with net income +110%	2053			5
4 **Education**				
TOTAL				75
SCORE				
2. Location				
2.1 *Representation & Image*				
1 Real estate typology	Sterk stedelijk		3	12
2 Social image	105	leefbaarheids index	1	4
3 Livability	99	leefbaarheids index	1	4
4 green recreational context	5,3%	of soil use	2	8
5 Safety	71%	feel safe	1	4
				0
2.2 *Facilities*				0
1 Supermarket	0,3	distance to in km	1	3
2 Facilities	108,1	amount	2	0
3 Restaurants	0,2	distance to in km	1	3
4 Eduacation	0,3	distance to in km		0
6 Healthcare	0,4	distance to in km	1	2
7 Recreation	<0,5	distance to in km		0
8 Childcare	0,3	distance to in km		0
2.3 *Accessibility*				0
1 Train	2,2	distance to in km	2	10
2 Bus/tram/metro	0,5	distance to in km	1	5
3 Car	0,9	distance to highway	2	8
4 Parking	10	distance in to in m	1	5
5 Parking	6,8	satisfaction	2	10
5 Parking	120		1	5
2.4 *Site*				0
1 None or bad insolation	50%		1	3
2 Bad view at 75% of GVA	NO		1	3
3 Next to highway	NO		1	3
4 Other buildings in direct context	YES		1	3
2.5 *Legal*				0
1 Noise polution on facade	<60 dB		1	3
2 Ownership of land	Leased		1	3
3 Zoningplan alow changes	YES		1	5
4 Health hazzards	NO		1	5
TOTAL				111
SCORE				
3. Building				
3.1 *general information*				
1 Construction Year	1961 - 1970		1	2
2 Gross Floor Area (total)	4000	m2		
3 Net Floor Area (GFA/UFA ratio)	2520	m2	1	3
4 Gross Floor Area (ground floor)	6388	m2		
5 Gross Floor Area (elevation floor)	-217,0909091	m2		
6 Number of Layers	12	Layers		
7 ± Width building	30	m	1	3
3.2 *vacancy*				
1 Total vacancy	YES		1	4
2 Duration of total vacancy	>3		1	4
3.3 *construction*				
1 Floor Height (ground floor)	8	m	2	8
2 Floor height (elevation floors)	3,25	m	2	8
3 smalles usable floorwidth	8	m	1	4
4 One usable area of min. 11m2 and 3	YES		1	4
5 Condition structure	Good		1	4
6 Structure	Steel frame	type	1	4
8 Grid construction	4	m	1	4
9 Possibility horizontal expansion	YES		1	3
10 Possibility vertical expansion	1		1	3

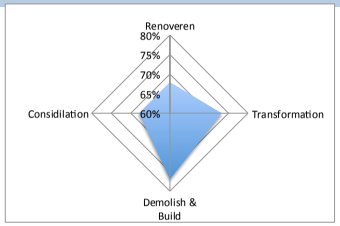
Aspect	Criteria Offices	Points (P)	WEIGHT POINT	Criteria Student-/group (3+) accommodation	Points (P)	WEIGHT POINT	Criteria 1 pax accommodations	Points (P)	WEIGHT POINT
1 Population	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10
2 Offices	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 2 =0 = 1 >0= 0	0	0	<0 = 2 =0 = 1 >0= 0	0	0
3 Residential	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10
4 Retail	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 2	1	5	<0 = 0 =0 = 1 >0= 2	1	5
5 Hotel	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 1	1	5
1 working rate	< aver. = 0 => aver = 2	0	0	< aver. = 0 => aver = 1	0		< aver. = 0 => aver = 1	0	
1 Students			0	<av.= 0 =av.=1 >av.=2	2	10			
2 1 pax							<av.= 0 =av.=1 >av.=2	0	
6 residents with net income +110%	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5
TOTAL			40			45			35
SCORE			53%			60%			47%
1 Real estate typology	Zeer sterk st=0 Sterk st=1 st=2 else=3	1	4	Zeer sterk st=3 Sterk st=2 st=1 else=0	2	8	Zeer sterk st=3 Sterk st=2 st=1 else=0	2	8
2 Social image	<aver.=1 =>aver.=1	1	4	<aver.=0 =>aver.=1	1	4	<aver.=0 =>aver.=1	1	4
3 Livability	<aver.=1 =>aver.=1	1	4	<aver.=0 =>aver.=1	0	0	<aver.=0 =>aver.=1	0	0
4 green recreational context	<aver.=0 =aver.=1 >aver. =1	0	0	<aver.=0 =aver.=1 >aver. =1	0	0	<aver.=0 =aver.=1 >aver. =1	0	0
5 Safety	<50% = 0 >=50% = 1	1	4	<65% = 0 >=65 = 1	1	4	<70% = 0 >=70 = 1	1	4
			0			0			0
2.2 Facilities			0			0			0
1 Supermarket	> 0,5km =1 <0,5 km=1	1	3	> 1km =0 <1km=1	1	3	> 1km =0 <1km=1	1	3
2 Facilities	<aver.=0 =aver.=1 >aver. =1	1	0	<aver.=0 =aver.=1 >aver. =2	2	0	<aver.=0 =aver.=1 >aver. =2	2	0
3 Restaurants	> 0,5 km =1 < 0,5 km=1	1	3	> 0,5 km =1 < 0,5 km=1	1	3	> 0,5 km =1 < 0,5 km=1	1	3
4 Eduacation	> 2 km =1 < 2 km=1	1	2	> 2 km =0 < 2 km=1	1	2	> 2 km =0 < 2 km=1	1	2
6 Healthcare	> 1km =1 <1km=1	1	2	> 1km =0 <1km=1	1	2	> 1km =0 <1km=1	1	2
7 Recreation	<0,5=1 >0,5=0	1	3	<0,5=1 >0,5=0	1	3	<0,5=1 >0,5=0	1	3
8 Childcare			0			0			0
2.3 Accessibility			0			0			0
1 Train	> 2 km =0 0,5 - 2 km=1 <0,5 km =2	0	0	> 2km =0 <2km=1	0	0	> 2km =0 <2km=1	0	0
2 Bus/tram/metro	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5
3 Car	> 2km =0 2-4 km=1 <2km =2	2	8	> 5km =0 2-5 km=1 <2km =1	1	4	> 2km =0 2-4 km=1 <2km =1	1	4
4 Parking	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5
5 Parking	<aver.=0 =aver.=1 >aver. =2	2	10	<aver.=0 =aver.=1 >aver. =1	1	5	<aver.=0 =aver.=1 >aver. =1	1	5
5 Parking	<=1pp /200m2GFA=0 >=1pp /200m2GFA=1	1	5	<=1pp /200m2GFA=1 >=1pp /200m2GFA=1	1	5	<=1pp /200m2GFA=1 >=1pp /200m2GFA=1	1	5
2.4 Site			0			0			0
1 None or bad insolation	< 50% =1 >50% =0	1	3	< 70% =1 >70% =0	1	3	< 70% =1 >70% =0	1	3
2 Bad view at 75% of GVA	Yes=0 No=1	1	3	Yes=0 No=1	1	3	Yes=0 No=1	1	3
3 Next to highway	Yes=0 No=1	1	3	Yes=VETO No=1	1	3	Yes=VETO No=1	1	3
4 Other buildings in direct context	Yes=1 No=0	1	3	Yes=1 No=0	1	3	Yes=1 No=0	1	3
2.5 Legal			0			0			0
1 Noise polution on facade	<60=1 >60=0	1	3	<50= >50=0	0	0	<50= >50=0	0	0
2 Ownership of land	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0
3 Zoningplan alow changes	No =1 Yes= 1	1	5	NO=VETO Yes=1	1	5	NO=VETO Yes=1	1	5
4 Health hazzards	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5
TOTAL			87			75			75
SCORE			78%			68%			68%
1 Construction Year	1960-1980 =0 else = 1	0	0	2014-2016 = 0 else = 1	1	2	2014-2016 = 0 else = 1	1	2
2 Gross Floor Area (total)			0			0			0
3 Net Floor Area (GFA/UFA ratio)	<1000= 1 >= 1000 =1	1	3	possibility to fit 20 dwel. No=0 Yes = 1	1	3	possibility to fit 20 dwel. No=0 Yes = 1	1	3
4 Gross Floor Area (ground floor)			0			0			0
5 Gross Floor Area (elevation floor)			0			0			0
6 Number of Layers			0			0			0
7 ± Width building	> 10 =1 <10 =1	1	3	> 10 =0 <10 =1	1	3	> 10 =0 <10 =1	1	3
3.2 vacancy			0			0			0
1 Total vacancy	NO=1 YES=1	1	4	NO=0 YES=1	1	4	NO=0 YES=1	1	4
2 Duration of total vacancy	> 3=0 < 3=1	0	0	< 3=0 > 3=1	0	0	< 3=0 > 3=1	0	0
3.3 construction			0			0			0
1 Floor Height (ground floor)	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8
2 Floor height (elevation floors)	<2,10 = VETO 2,10-2,30=1 2,30-2,69 = 2 >2,70 = 1 >=6 =0	1	4	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0
3 smalles usable floorwidth	<1,70 = VETO	1	4	<1,70 = VETO	1	4	<1,70 = VETO	1	4
4 One usable area of min. 11m2 and 3	NO=1 YES=1	1	4	NO=VETO YES=1	1	4	NO=VETO YES=1	1	4
5 Condition structure	Bad=VETO Good=1	1	4	Bad=VETO Good=1	1	4	Bad=VETO Good=1	1	4
6 Structure	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4
8 Grid construction	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4
9 Possibility horizontal expansion	NO=1 YES=1	1	3	NO=0 YES=1	1	3	NO=0 YES=1	1	3
10 Possibility vertical expansion	NO=1 YES=1	1	3	NO=0 YES=1	1	3	NO=0 YES=1	1	3

Aspect	Criteria 2 pax accommodations	Points (P)	WEIGHT POINT	Criteria Family accommodations	Points (P)	WEIGHT POINT	Criteria Senior accommodations	Points (P)	WEIGHT POINT
1 Population	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10
2 Offices	<0 = 2 =0 = 1 >0= 0	0	0	<0 = 2 =0 = 1 >0= 0	0	0	<0 = 2 =0 = 1 >0= 0	0	0
3 Residential	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10
4 Retail	<0 = 0 =0 = 1 >0= 2	1	5	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 2	1	5
5 Hotel	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 1	1	5
1 working rate	< aver. = 0 => aver = 1	0		< aver. = 0 => aver = 1	0		< aver. = 0 => aver = 1	0	
3 2 pax	<av.= 0 =av.=1 >av.=2	0							
4 family				<av.= 0 =av.=1 >av.=2	2	10			
5 Senior							<av.= 0 =av.=1 >av.=2	0	
6 residents with net income +110%	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5
TOTAL			35			45			35
SCORE			47%			60%			47%
1 Real estate typology	Zeer sterk st=3 Sterk st=2 st=1 else=0	2	8	Zeer sterk st=1 Sterk st=3 st=2 else=0	3	12	Zeer sterk st=1 Sterk st=3 st=2 else=0	3	12
2 Social image	<aver.=0 =>aver.=1	1	4	<aver.=0 =>aver.=1	1	4	<aver.=0 =>aver.=1	1	4
3 Livability	<aver.=0 =>aver.=1	0	0	<aver.=0 =>aver.=1	0	0	<aver.=0 =>aver.=1	0	0
4 green recreational context	<aver.=0 =aver.=1 >aver. =1	0	0	<aver.=0 =aver.=1 >aver. =2	0	0	<aver.=0 =aver.=1 >aver. =2	0	0
5 Safety	<70% = 0 >=70 = 1	1	4	<75% = 0 >=75 = 1	0	0	<85% = 0 >=85 = 1	0	0
			0			0			0
2.2 Facilities			0			0			0
1 Supermarket	> 1km =0 <1km=1	1	3	> 1km =0 <1km=1	1	3	> 1km =0 <1km=1	1	3
2 Facilities	<aver.=0 =aver.=1 >aver. =2	2	0	<aver.=0 =aver.=1 >aver. =1	1	0	<aver.=0 =aver.=1 >aver. =2	1	0
3 Restaurants	> 0,5 km =1 < 0,5 km=1	1	3	> 0,5 km =1 < 0,5 km=1	1	3	> 0,5 km =1 < 0,5 km=1	1	3
4 Eduacation	> 2 km =0 < 2 km=1	1	2	> 2 km =0 < 2 km=1	1	2	> 2 km =0 < 2 km=1	1	2
6 Healthcare	> 1km =0 <1km=1	1	2	> 1km =0 <1km=1	1	2	> 0,5km =0 <0,5 km=1	1	2
7 Recreation	<0,5=1 >0,5=0	1	3	<0,5=1 >0,5=0	1	3	<0,5=1 >0,5=0	1	3
8 Childcare			0			0			0
2.3 Accessibility			0			0			0
1 Train	> 2km =0 <2km=1	0	0	> 2km =0 <2km=1	0	0	> 2 km =0 0,5 - 2 km=1 <0,5 km =2	0	0
2 Bus/tram/metro	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5
3 Car	> 2km =0 2-4 km=1 <2km =2	2	8	> 2km =0 2-4 km=1 <2km =1	1	4	> 2km =0 2-4 km=1 <2km =2	2	8
4 Parking	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5
5 Parking	<aver.=0 =aver.=1 >aver. =2	2	10	<aver.=0 =aver.=1 >aver. =1	1	5	<aver.=0 =aver.=1 >aver. =2	2	10
5 Parking	<=1pp /200m2GFA=1 >=1pp /200m2GFA=1	1	5	<=1pp /200m2GFA=1 >=1pp /200m2GFA=1	1	5	<=1pp /200m2GFA=1 >=1pp /200m2GFA=1	1	5
2.4 Site			0			0			0
1 None or bad insolation	< 70% =1 >70% =0	1	3	< 70% =1 >70% =0	1	3	< 70% =1 >70% =0	1	3
2 Bad view at 75% of GVA	Yes=0 No=1	1	3	Yes=0 No=1	1	3	Yes=0 No=1	1	3
3 Next to highway	Yes=VETO No=1	1	3	Yes=VETO No=1	1	3	Yes=VETO No=1	1	3
4 Other buildings in direct context	Yes=1 No=0	1	3	Yes=1 No=0	1	3	Yes=1 No=0	1	3
2.5 Legal			0			0			0
1 Noise polution on facade	<50= >50=0	0	0	<50= >50=0	0	0	<50= >50=0	0	0
2 Ownership of land	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0
3 Zoningplan alow changes	NO=VETO Yes=1	1	5	NO=VETO Yes=1	1	5	NO=VETO Yes=1	1	5
4 Health hazzards	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5
TOTAL			84			75			84
SCORE			76%			68%			76%
1 Construction Year	2014-2016 = 0 else = 1	1	2	2014-2016 = 0 else = 1	1	2	2014-2016 = 0 else = 1	1	2
2 Gross Floor Area (total)			0			0			0
3 Net Floor Area (GFA/UFA ratio)	possibility to fit 20 dwel. No=0 Yes = 1	1	3	possibility to fit 20 dwel. No=0 Yes = 1	1	3	<1000= 0 >= 1000 =1	1	3
4 Gross Floor Area (ground floor)			0			0			0
5 Gross Floor Area (elevation floor)			0			0			0
6 Number of Layers			0			0			0
7 ± Width building	> 10 =0 <10 =1	1	3	> 10 =0 <10 =1	1	3	> 10 =0 <10 =1	1	3
3.2 vacancy			0			0			0
1 Total vacancy	NO=0 YES=1	1	4	NO=0 YES=1	1	4	NO=0 YES=1	1	4
2 Duration of total vacancy	< 3=0 > 3=1	0	0	< 3=0 > 3=1	0	0	< 3=0 > 3=1	0	0
3.3 construction			0			0			0
1 Floor Height (ground floor)	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8
2 Floor height (elevation floors)	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0
3 smalles usable floorwidth	<1,70 = VETO	1	4	<1,70 = VETO	1	4	<1,70 = VETO	1	4
4 One usable area of min. 11m2 and 3	NO=VETO YES=1	1	4	NO=VETO YES=1	1	4	NO=VETO YES=1	1	4
5 Condition structure	Bad=VETO Good=1	1	4	Bad=VETO Good=1	1	4	Bad=VETO Good=1	1	4
6 Structure	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4
8 Grid construction	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4
9 Possibility horizontal expansion	NO=0 YES=1	1	3	NO=0 YES=1	1	3	NO=0 YES=1	1	3
10 Possibility vertical expansion	NO=0 YES=1	1	3	NO=0 YES=1	1	3	NO=0 YES=1	1	3

Aspect	Criteria Hotel	Points (P)	WEIGHT POINT	Criteria Retail, Food & Drinks	Points (P)	WEIGHT POINT	Criteria Educational	Points (P)	WEIGHT POINT
1 Population	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 1	2	10	<0 = 1 =0 = 1 >0= 1	1	5
2 Offices	<0 = 1 =0 = 1 >0= 1	1	5	<0 = 1 =0 = 1 >0= 1	1	5	<0 = 1 =0 = 1 >0= 1	1	5
3 Residential	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 2	2	10
4 Retail	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 2	1	5	<0 = 0 =0 = 1 >0= 1	1	5
5 Hotel	<0 = 0 =0 = 1 >0= 2	2	10	<0 = 0 =0 = 1 >0= 1	1	5	<0 = 0 =0 = 1 >0= 1	1	5
1 working rate	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5
5 Senior					2	10		1	5
6 residents with net income +110%	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5	< aver. = 1 => aver = 1	1	5
TOTAL			45			55			45
SCORE			60%			73%			60%
1 Real estate typology	Zeer sterk st=1 Sterk st=3 st=2 else=0	3	12	Zeer sterk st=3 Sterk st=2 st=1 else=0	2	8	Zeer sterk st=1 Sterk st=3 st=2 else=0	3	12
2 Social image	<aver.=1 =>aver.=1	1	4	<aver.=0 =>aver.=1	1	4	<aver.=1 =>aver.=1	1	4
3 Livability	<aver.=1 =>aver.=1	1	4	<aver.=0 =>aver.=1	0	0	<aver.=1 =>aver.=1	1	4
4 green recreational context	<aver.=0 =aver.=1 >aver. =1	0	0	<aver.=0 =aver.=1 >aver. =1	0	0	<aver.=0 =aver.=1 >aver. =1	0	0
5 Safety	<70% = 0 >=70 = 1	1	4	<70% = 0 >=70 = 1	1	4	<70% = 0 >=70 = 1	1	4
			0			0			0
2.2 Facilities			0			0			0
1 Supermarket	> 1km =0 <1km=1	1	3	> 1km =0 <1km=1	1	3	> 1km =0 <1km=1	1	3
2 Facilities	<aver.=0 =aver.=1 >aver. =1	1	0	<aver.=0 =aver.=1 >aver. =2	2	0	<aver.=0 =aver.=1 >aver. =1	1	0
3 Restaurants	> 0,5 km =1 < 0,5 km=1	1	3	> 0,5 km =1 < 0,5 km=1	1	3	> 1 km =1 < 1 km=1	1	3
4 Eduacation	> 2 km =1 < 2 km=1	1	2	> 2 km =1 < 2 km=1	1	2	> 2 km =0 < 2 km=1	1	2
6 Healthcare	> 1km =1 <1km=1	1	2	> 1km =0 <1km=1	1	2	> 1km =1 <1km=1	1	2
7 Recreation	> 1km =0 <1km=1	0	0	> 1km =0 <1km=1	0	0	> 1km =0 <1km=1	0	0
8 Childcare			0			0			0
2.3 Accessibility			0			0			0
1 Train	> 2km =0 <2km=1	0	0	> 2 km =0 0,5 - 2 km=1 <0,5 km =2	0	0	> 2 km =0 0,5 - 2 km=1 <0,5 km =2	0	0
2 Bus/tram/metro	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5	> 1 km =0 <0,5 km =2	1	5
3 Car	> 2km =0 2-4 km=1 <2km =1	1	4	> 2km =0 2-4 km=1 <2km =1	1	4	> 2km =0 2-4 km=1 <2km =1	1	4
4 Parking	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5	> 250m =0 <250m=1	1	5
5 Parking	<aver.=0 =aver.=1 >aver. =2	2	10	<aver.=0 =aver.=1 >aver. =1	1	5	<aver.=0 =aver.=1 >aver. =1	1	5
5 Parking	<=1pp /200m2GFA=1 >=1pp	1	5	<=1pp /200m2GFA=0 >=1pp /200m2GFA=1	1	5	<=1pp /200m2GFA=0 >=1pp	1	5
2.4 Site			0			0			0
1 None or bad insolation	< 80% =1 >80% =0	1	3	< 90% =1 >90% =0	1	3	< 50% =1 >50% =0	1	3
2 Bad view at 75% of GVA	Yes=0 No=1	1	3	Yes=0 No=1	1	3	Yes=0 No=1	1	3
3 Next to highway	Yes=0 No=1	1	3	Yes=0 No=1	1	3	Yes=0 No=1	1	3
4 Other buildings in direct context	Yes=1 No=0	1	3	Yes=1 No=0	1	3	Yes=1 No=0	1	3
2.5 Legal			0			0			0
1 Noise polution on facade	<60=1 >60=0	1	3	<60=1 >60=0	1	3	<60=1 >60=0	1	3
2 Ownership of land	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0	Leased=0 Owned=1	0	0
3 Zoningplan alow changes	NO=VETO Yes=1	1	5	NO=VETO Yes=1	1	5	NO=VETO Yes=1	1	5
4 Health hazzards	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5	No= 1 Yes= veto	1	5
TOTAL			88			75			83
SCORE			79%			68%			75%
1 Construction Year	2014-2016 = 0 else = 1	1	2	2014-2016 = 0 else = 1	1	2	2014-2016 = 0 else = 1	1	2
2 Gross Floor Area (total)			0			0			0
3 Net Floor Area (GFA/UFA ratio)	<1000= 1 >= 1000 =1	1	3	<1000= 1 >= 1000 =1	1	3	<1000= 1 >= 1000 =1	1	3
4 Gross Floor Area (ground floor)			0			0			0
5 Gross Floor Area (elevation floor)			0			0			0
6 Number of Layers			0			0			0
7 ± Width building	> 10 =1 <10 =1	1	3	> 10 =1 <10 =1	1	3	> 10 =1 <10 =1	1	3
3.2 vacancy			0			0			0
1 Total vacancy	NO=0 YES=1	1	4	NO=0 YES=1	1	4	NO=0 YES=1	1	4
2 Duration of total vacancy	< 3=0 > 3=1	0	0	< 3=0 > 3=1	0	0	< 3=0 > 3=1	0	0
3.3 construction			0			0			0
1 Floor Height (ground floor)	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8
2 Floor height (elevation floors)	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	0	0	<2,10 = VETO 2,10-2,95 = 1 2,60-5,95 = 2 >=6 =0	2	8	<2,10 = VETO 2,10-2,59 = 1 >2,60 = 2	2	8
3 smalles usable floorwidth	<1,70 = VETO	1	4	<1,70 = VETO	1	4	<1,70 = VETO	1	4
4 One usable area of min. 11m2 and 3	NO=0 YES=1	1	4	NO=0 YES=1	1	4	NO=1 YES=1	1	4
5 Condition structure	Bad=VETO Good=1	1	4	Bad=VETO Good=1	1	4	Bad=VETO Good= 1	1	4
6 Structure	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4	Bearing facade =0 Else= 1	1	4
8 Grid construction	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4	<3,6 = 0 >3,6 = 1	1	4
9 Possibility horizontal expansion	NO=1 YES=1	1	3	NO=1 YES=1	1	3	NO=1 YES=1	1	3
10 Possibility vertical expansion	NO=1 YES=1	1	3	NO=1 YES=1	1	3	NO=1 YES=1	1	3

Aspect	Weigh Factor (experts)	Bron	criteria uit	weging uit
1 Population	5	OIS AMSTERDAM	Ratio	Ratio
2 Offices	5	OIS AMSTERDAM	Ratio	Ratio
3 Residential	5	OIS AMSTERDAM	Ratio	Ratio
4 Retail	5		Ratio	Ratio
5 Hotel	5	OIS AMSTERDAM	Ratio	Ratio
1 working rate	5	OIS AMSTERDAM	Geltner	Ratio
1 Students	5	OIS AMSTERDAM	Ratio	Ratio
2 1 pax	5	OIS AMSTERDAM	Ratio	Ratio
3 2 pax	5	OIS AMSTERDAM	Ratio	Ratio
4 family	5	OIS AMSTERDAM	Ratio	Ratio
5 Senior	5	OIS AMSTERDAM	Ratio	Ratio
6 residents with net income +110%	5	OIS Amsterdam	Geltner	Ratio
1 Real estate typology	4	drimble.nl	Transformatiepotentiemeter	idem
2 Social image	4	OIS	Transformatiepotentiemeter	idem
3 Livability	4			
4 green recreational context	4	OIS AMSTERDAM	Transformatiepotentiemeter	idem
5 Safety	4	OIS AMSTERDAM	Transformatiepotentiemeter	idem + ratio
1 Supermarket	3	CBS	Transformatiepotentiemeter	idem +leegstandrisicometer ratio
2 Facilities		CBS	Transformatiepotentiemeter	idem + ratio
3 Restaurants	3	CBS	Transformatiepotentiemeter	
4 Eduacation	2			
6 Healthcare	2	OIS AMSTERDAM	Transformatiepotentiemeter	idem
7 Recreation	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer ratio
8 Childcare	2			
1 Train	5	CBS	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
2 Bus/tram/metro	5			
3 Car	4	CBS	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
4 Parking	5	INPUT	Transformatiepotentiemeter	idem + ratio
5 Parking	5	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
5 Parking	5		leegstandrisicometer	Nota parkeernormen 2013
1 None or bad insolation	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
2 Bad view at 75% of GVA	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
3 Next to highway	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
4 Other buildings in direct context	3	INPUT	Transformatiepotentiemeter	idem + ratio
1 Noise polution on facade	3	INPUT	Transformatiepotentiemeter	idem + ratio
2 Ownership of land	3	INPUT	Transformatiepotentiemeter	idem + ratio
3 Zoningplan alow changes	5	Input user	Transformatiepotentiemeter	idem
4 Health hazzards	5	Input user	Transformatiepotentiemeter	idem
1 Construction Year	2	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
2 Gross Floor Area (total)	3			
3 Net Floor Area (GFA/UFA ratio)	3	INPUT	Transformatiepotentiemeter minimale gebruiksruimte uit NEN	idem + ratio
4 Gross Floor Area (ground floor)	3			
5 Gross Floor Area (elevation floor)	3			
6 Number of Layers	3			
7 ± Width building	3	INPUT	Transformatiepotentiemeter	idem
1 Total vacancy	4	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
2 Duration of total vacancy	4	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
1 Floor Height (ground floor)	4		Bouwbesluit	idem
2 Floor height (elevation floors)	4		Bouwbesluit	idem
3 smalles usable floorwidth	4	INPUT	Bouwbesluit	idem
4 One usable area of min. 11m2 and 3	4	INPUT	Bouwbesluit	idem
5 Condition structure	4	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
6 Structure	4	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
8 Grid construction	4	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
9 Possibility horizontal expansion	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio
10 Possibility vertical expansion	3	INPUT	Transformatiepotentiemeter	idem +leegstandrisicometer + ratio

	Best intervention	With same facade	With desired den	With new facade
Renoveren	68%	**68%**	**61%**	**66%**
Transformation	73%	**73%**	**72%**	**72%**
Demolish & Build	77%	**77%**		
Considilation	68%	**68%**		



ion Potention

	Current situation			
	Totaal	Market	Location	Building
	Weight	6	5	3
Offices	**68%**	53%	78%	80%
Student-/group (3+) accommodation	**65%**	60%	68%	73%
1 pax accommodations	**60%**	47%	68%	73%
2 pax accommodations	**63%**	47%	76%	73%
Family accommodations	**65%**	60%	68%	73%
Senior accommodations	**63%**	47%	76%	73%
Hotel	**72%**	60%	79%	83%
Retail, Food & Drinks	**73%**	73%	68%	83%
Educational	**70%**	60%	75%	83%

	totaal	market	Location	Building
	Weight	6	5	3
Offices	**72%**	53%	78%	100%
Student-/group (3+) accommodation	**71%**	60%	68%	100%
1 pax accommodations	**66%**	47%	68%	100%
2 pax accommodations	**68%**	47%	76%	100%
Family accommodations	**71%**	60%	68%	100%
Senior accommodations	**68%**	47%	76%	100%
Hotel	**75%**	60%	79%	100%
Retail, Food & Drinks	**77%**	73%	68%	100%
Educational	**74%**	60%	75%	100%

Renovation / Transformation with desired energy label			
Totaal	Market	Location	Building
Weight	6	5	3
61%	53%	78%	48%
60%	60%	68%	50%
59%	47%	68%	69%
62%	47%	76%	69%
65%	60%	68%	69%
62%	47%	76%	69%
70%	60%	79%	77%
72%	73%	68%	77%
69%	60%	75%	77%

Renovation / Transformation with desired energy label an			
Totaal	Market	Location	Building
Weight	6	5	3
66%	53%	78%	71%
65%	60%	68%	69%
59%	47%	68%	69%
62%	47%	76%	69%
65%	60%	68%	69%
62%	47%	76%	69%
70%	60%	79%	77%
72%	73%	68%	77%
69%	60%	75%	77%

Summary								
General	Intervention	Cosidilation	Renovation or transformati	Renovation or transformati	Renovation or transformat	Demolish & build	Demolish & build	
			1	2	3	4	5	6
	Specific intervention	Transformation with no intervention	Transformation with desired energy label	Transformation with desired energy label and new facade	Transformation to max hight construction with desired energy label and new facade	Demolish and build same building	Demolish and build max height zoning plan	
Function								
	Best percentage	73%	72%	72%	72%	77%	77%	
	Beste function	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks	Retail, Food & Drinks	
Financial								
	Initial investment	-€11.172.000	-€12.312.000	-€16.648.250	-€20.971.731	-€17.660.920	-€17.496.764	
	Netto cashflow	€1.695.604	€1.648.708	-€2.687.542	€3.310.851	€355.634	€129.044	
	NPV	-€4.817.473	-€6.201.601	-€9.306.451	-€13.767.216	-€8.419.579	-€8.442.492	
	IRR	**1,78%**	**0,68%**	**-0,17%**	**-1,50%**	**1,07%**	**0,98%**	
		6	3	2	1	5	4	
Sustainability								
	Energy label	F	A+	A++	A++	A++	A++	
	annual load factor	1	0,36	0,24	0,24	0,24	0,24	
	Innitial load	0,00	0,24	0,40	0,78	0,98	0,97	
	Index total load	**0,7750**	**0,3262**	**0,2631**	**0,3374**	**0,3758**	**0,3732**	
		1	5	6	4	2	3	
Arhitectural & Cultural								
Own/strong identity in context	YES	1	1					
Outdated appearance	YES	0	0					
Decayded appearance	YES	0	0					
Representable appearance	NO	1	1					
Good recognizable entrance	YES	1	1	1	1			
		3	3	1	1	0	0	
		60%	60%	100%	100%	100%	100%	
		1	1	3	3	3	3	

Meting				
	Financial	Sustainability	Architectural	
	-1,50%	0,775	60%	1
	-0,17%	0,376	60%	2
	0,68%	0,373	100%	3
	0,98%	0,337	100%	4
	1,07%	0,326	100%	5
	1,78%	0,263	100%	6
		2,451		

	Weight		5	4	4	Best Intervention	Score
	Intervention	Fiancial	Sustainability	Architectural			
1	Transformation with no intervention		6	1	1	**38**	15,5%
2	Transformation with desired energy label		3	5	1	**39**	15,9%
3	Transformation with desired energy label and new facade		2	6	3	**46**	18,8%
4	Transformation to max hight construction with desired energy label and new facade		1	4	3	**33**	13,5%
5	Demolish and build same building		5	2	3	**45**	18,4%
6	Demolish and build max height zoning plan		4	3	3	**44**	18,0%

Beste interventie	Score	Interventie nummer	Interventie
1	46	3	Transformation with desired energy label and new facade
2	45	5	Demolish and build same building
3	44	6	Demolish and build max height zoning plan

Best Option			
Intervention	**3Transformation with desired energy label and new facade**		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	16.648.250,00
	Netto cashflow	-€	2.687.542,21
	NPV	-€	9.306.451,31
	IRR		**-0,17%**
Sustainability			
	Energy label	A++	

Second best option			
Intervention	**5Demolish and build same building**		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	17.660.919,70
	Netto cashflow	€	355.634,11
	NPV	-€	8.419.578,61
	IRR		**1,07%**
Sustainability			
	Energy label	A++	

Third best option			
Intervention	**6Demolish and build max height zoning plan**		
General			
	Function	Retail, Food & Drinks	
Financial			
	Initial investment	-€	17.496.763,75
	Netto cashflow	€	129.044,15
	NPV	-€	8.442.491,67
	IRR		**0,98%**
Sustainability			
	Energy label	A++	

ENERGY DATA	Label UPGRADE COSTS to A++	Label UPGRADE COSTS for the max achievable label for transformation without replacement of the façade.	Energy Factor current label	Energy factor A++	Energy factor for the max achievable label for transformation without replacement of the façade.	Annual load . Energy index factor. For trans/ren without façade replacement	Annual load . Energy index factor. Current energy label	Annual load . Energy index factor. A++	Initial load ratio	Anual load ratio
	#N/A	285	*0,974*	1,05	1,04	1,51	4,2	1	19,50%	77,5%

current label	F
max achievable label for transformation without replacement of the façade.	A+

Upgrade cost		285			
		Small offices	*Large offices 18*	**average**	
<1989	G	€ -	0	€ -	**Price to upgrade / m2 GFA**
	F	€ -	0	€ -	
	E	€ 45,00	€ 15,00	€ 30,00	€ 285
	D	€ 50,00	€ 30,00	€ 40,00	
	C	€ 100,00	€ 35,00	€ 67,50	
	B	€ 200,00	€ 80,00	€ 140,00	
	A	€ 230,00	€ 100,00	€ 165,00	
	A+	€ 350,00	€ 220,00	€ 285,00	
>1990	D	€ -		€ -	**Price to upgrade / m2 GFA**
	C	€ 45,00	€ 10,00	€ 27,50	#N/A
	B	€ 55,00	€ 20,00	€ 37,50	
	A	€ 110,00	€ 70,00	€ 90,00	
	A+	€ 230,00	€ 105,00	€ 167,50	
	A++	€ 260,00	€ 125,00	€ 192,50	

Jelle de Groot

Incresement of investment costs (BBN kosten-en-opbrengsten-energielabels-bij-kantoorrenovaties 2012)

Energy Label related Point system	Label	point system	rent incr. /m2/month	Energy factor	Annual load Index cost savings
	G	0	-15 -€ 42,90	0,97	5
	F	1	-14 -€ 40,04	0,97	4,2
	E	5	-10 -€ 28,60	0,98	3,83
	D	11	-4 -€ 11,44	0,99	3,45
	C	15	0 € -	1,00	3,08
	B	28	13 € 37,18	1,02	2,78
	A	32	17 € 48,62	1,03	2,2
	A+	36	21 € 60,06	1,04	1,51
	A++	40	25 € 71,50	1,05	1

Energy costs	€ 2,86	(jelle de groot p.102)
Rentprice	€ 1.543	m2/month
Aver. Label Amsterdam	C	http://www.energielabelatlas.nl/

Annual load

Annual load ratio	77,5%
Intervetion without façade	1,51
Current label	4,2
Desired A++ label	1

Initial Load/annual load		**Intervention**	**GFA (m2)**	**Façade m2**	**Supporting structure**	**Structural detailing**	**Built-in components**	**Finish**	**Paving**	**Sub**	**Factor**
19,50%		Old situation	4000	16187,5	59,50%	15,90%	11,50%	12,90%	0,40%	Total	
					0,00	0,00	0,00	0,00	0	0,00	
	1	Transformation with no intervention	0	0							**0,00**
	2	Transformation with desired energy label	0	0	0,00	0,00	0,12	0,13	0	0,24	**0,24**
	3	Transformation with desired energy label and new facade	0	16187,5	0,00	0,16	0,12	0,13	0	0,40	**0,40**
	4	Transformation to max hight construction with desired energy label and new facade	2957	16650	0,44	0,16	0,09	0,10	0	0,78	**0,78**
	5	Demolish and build same building	3899	16187,5	0,58	0,16	0,11	0,13	0,004	0,98	**0,98**
	6	Demolish and build max height zoning plan	3815	16650	0,57	0,16	0,11	0,12	0,004	0,97	**0,97**

Label	A++	A+	A	B	C	D	E	F	G	
G	5,00	3,31	2,27	1,80	1,62	1,45	1,31	1,19	1,00	
F	4,20	2,78	1,91	1,51	1,36	1,22	1,10	1,00	0,84	
E	3,83	2,54	1,74	1,38	1,24	1,11	1,00	0,91	0,77	
D	3,45	2,28	1,57	1,24	1,12	1,00	0,90	0,82	0,69	
C	3,08	2,04	1,40	1,11	1,00	0,89	0,80	0,73	0,62	
B	2,78	1,84	1,26	1,00	0,90	0,81	0,73	0,66	0,56	
A	2,20	1,46	1,00	0,79	0,71	0,64	0,57	0,52	0,44	
A+	1,51	1,00	0,69	0,54	0,49	0,44	0,39	0,36	0,30	
A++	1,00	0,66	0,45	0,36	0,32	0,29	0,26	0,24	0,20	

Discount Rate	6,50%																																							
Inflation	1,0%	1						2						3						4						5						6							
		Transformation with no intervention						Transformation with desired energy label						Transformation with desired energy label and new facade						Transformation to max hight construction with desired energy label and new fac						Demolish and build same building						Demolish and build max height zoning plan							
		Offices		Residential		Hotel		Retail, Food & D		Educational		Offices		Residential		Hotel		Retail, Food & Dr		Educational		Offices		Residential		Hotel		Retail, Food & E		Educational		Offices		Residential		Hotel		Retail, Food & I		Educational	
Year	Date																																							
0	01/01/16	-€	12.340.000	-€	11.340.000	-€	11.340.000	-€	11.340.000	-€	11.340.000	-€	13.480.000	-€	12.480.000	-€	14.180.000	-€	12.312.000	-€	13.000.000	-€	17.816.250	-€	16.816.250	-€	18.516.250	-€	16.648.250	-€	17.336.250	-€	22.879.083	€	20.968.202	-€	23.555.424	-€	20.971.731	-€	21.650.859	-€	15.375.816	#########	-€	15.960.740	-€	17.660.920	-€	15.446.007	-€	15.261.219	-€	14.658.462	-€	15.833.458	-€	17.496.764	-€	15.329.888
1	01/01/17	€	362.355	€	513.824	€	406.520	€	428.920	€	252.044	€	394.237	€	394.237	€	394.237	€	394.237	€	394.237	€	394.237	€	557.067	€	442.957	€	465.357	€	277.550	€	685.717	€	968.936	€	770.458	€	809.419	€	482.757	€	512.858	€	717.396	€	578.715	€	600.552	€	373.397	€	501.735	€	701.837	€	566.163	€	587.527	€	365.299
2	01/01/18	€	365.979	€	518.962	€	410.585	€	433.209	€	254.565	€	398.180	€	398.180	€	398.180	€	398.180	€	398.180	€	398.180	€	562.638	€	447.386	€	470.010	€	280.325	€	692.575	€	978.625	€	778.163	€	817.514	€	487.584	€	517.987	€	724.570	€	584.502	€	606.557	€	377.131	€	506.753	€	708.856	€	571.825	€	593.402	€	368.952
3	01/01/19	€	369.638	€	524.152	€	414.691	€	437.541	€	257.110	€	402.161	€	402.161	€	402.161	€	402.161	€	402.161	€	402.161	€	568.264	€	451.860	€	474.711	€	283.129	€	699.500	€	988.411	€	785.944	€	825.689	€	492.460	€	523.167	€	731.816	€	590.347	€	612.623	€	380.903	€	511.820	€	715.944	€	577.543	€	599.336	€	372.642
4	01/01/20	€	373.335	€	529.393	€	418.838	€	441.917	€	259.681	€	406.183	€	406.183	€	406.183	€	406.183	€	406.183	€	406.183	€	573.947	€	456.379	€	479.458	€	285.960	€	706.495	€	998.296	€	793.804	€	833.946	€	497.385	€	528.398	€	739.134	€	596.250	€	618.749	€	384.712	€	516.938	€	723.104	€	583.319	€	605.330	€	376.368
5	01/01/21	€	377.068	€	534.687	€	423.026	€	446.336	€	262.278	€	410.245	€	410.245	€	410.245	€	410.245	€	410.245	€	410.245	€	579.686	€	460.943	€	484.252	€	288.819	€	713.560	€	1.008.279	€	801.742	€	842.285	€	502.359	€	533.682	€	746.525	€	602.213	€	624.937	€	388.559	€	522.108	€	730.335	€	589.152	€	611.383	€	380.132
6	01/01/22	€	380.839	€	540.034	€	427.257	€	450.799	€	264.901	€	414.347	€	414.347	€	414.347	€	414.347	€	414.347	€	414.347	€	585.483	€	465.552	€	489.095	€	291.708	€	720.696	€	1.018.361	€	809.759	€	850.708	€	507.382	€	539.019	€	753.991	€	608.235	€	631.186	€	392.444	€	527.329	€	737.638	€	595.043	€	617.497	€	383.933
7	01/01/23	€	384.647	€	545.435	€	431.529	€	455.307	€	267.550	€	418.491	€	418.491	€	418.491	€	418.491	€	418.491	€	418.491	€	591.338	€	470.208	€	493.986	€	294.625	€	727.903	€	1.028.545	€	817.857	€	859.215	€	512.456	€	544.409	€	761.531	€	614.317	€	637.498	€	396.369	€	532.602	€	745.014	€	600.994	€	623.672	€	387.772
8	01/01/24	€	388.494	€	550.889	€	435.845	€	459.860	€	270.225	€	422.676	€	422.676	€	422.676	€	422.676	€	422.676	€	422.676	€	597.251	€	474.910	€	498.926	€	297.571	€	735.182	€	1.038.830	€	826.035	€	867.807	€	517.581	€	549.853	€	769.146	€	620.460	€	643.873	€	400.332	€	537.928	€	752.465	€	607.004	€	629.908	€	391.650
9	01/01/25	€	392.379	€	556.398	€	440.203	€	464.459	€	272.928	€	426.903	€	426.903	€	426.903	€	426.903	€	426.903	€	426.903	€	603.224	€	479.659	€	503.915	€	300.547	€	742.534	€	1.049.219	€	834.296	€	876.485	€	522.756	€	555.352	€	776.837	€	626.665	€	650.312	€	404.336	€	543.307	€	759.989	€	613.074	€	636.207	€	395.567
10	01/01/26	€	396.302	€	561.962	€	444.605	€	469.104	€	275.657	€	431.172	€	431.172	€	431.172	€	431.172	€	431.172	€	431.172	€	609.256	€	484.455	€	508.954	€	303.552	€	749.959	€	1.059.711	€	842.639	€	885.250	€	527.984	€	560.905	€	784.606	€	632.932	€	656.815	€	408.379	€	548.740	€	767.589	€	619.205	€	642.570	€	399.522
11	01/01/27	€	400.265	€	567.581	€	449.051	€	473.795	€	278.413	€	435.483	€	435.483	€	435.483	€	435.483	€	435.483	€	435.483	€	615.349	€	489.300	€	514.044	€	306.588	€	757.459	€	1.070.308	€	851.065	€	894.103	€	533.264	€	566.515	€	792.452	€	639.261	€	663.383	€	412.463	€	554.228	€	775.265	€	625.397	€	648.995	€	403.517
12	01/01/28	€	404.268	€	573.257	€	453.542	€	478.533	€	281.198	€	439.838	€	439.838	€	439.838	€	439.838	€	439.838	€	439.838	€	621.502	€	494.193	€	519.184	€	309.654	€	765.033	€	1.081.011	€	859.576	€	903.044	€	538.597	€	572.180	€	800.376	€	645.654	€	670.017	€	416.588	€	559.770	€	783.018	€	631.651	€	655.485	€	407.553
13	01/01/29	€	408.311	€	578.990	€	458.077	€	483.318	€	284.010	€	444.236	€	444.236	€	444.236	€	444.236	€	444.236	€	444.236	€	627.717	€	499.135	€	524.376	€	312.750	€	772.684	€	1.091.821	€	868.171	€	912.074	€	543.982	€	577.901	€	808.380	€	652.110	€	676.717	€	420.753	€	565.368	€	790.848	€	637.967	€	662.040	€	411.628
14	01/01/30	€	412.394	€	584.780	€	462.658	€	488.151	€	286.850	€	448.679	€	448.679	€	448.679	€	448.679	€	448.679	€	448.679	€	633.994	€	504.126	€	529.620	€	315.878	€	780.410	€	1.102.739	€	876.853	€	921.195	€	549.422	€	583.680	€	816.464	€	658.631	€	683.484	€	424.961	€	571.022	€	798.756	€	644.347	€	668.660	€	415.744
15	01/01/31	€	416.518	€	590.627	€	467.284	€	493.033	€	289.718	€	453.166	€	453.166	€	453.166	€	453.166	€	453.166	€	453.166	€	640.334	€	509.168	€	534.916	€	319.036	€	788.214	€	1.113.767	€	885.622	€	930.407	€	554.917	€	589.517	€	824.629	€	665.218	€	690.319	€	429.211	€	576.732	€	806.744	€	650.790	€	675.347	€	419.902
16	01/01/32	€	420.683	€	596.534	€	471.957	€	497.963	€	292.615	€	457.697	€	457.697	€	457.697	€	457.697	€	457.697	€	457.697	€	646.738	€	514.259	€	540.265	€	322.227	€	796.097	€	1.124.904	€	894.478	€	939.711	€	560.466	€	595.412	€	832.875	€	671.870	€	697.222	€	433.503	€	582.499	€	814.811	€	657.298	€	682.101	€	424.101
17	01/01/33	€	424.890	€	602.499	€	476.677	€	502.943	€	295.542	€	462.274	€	462.274	€	462.274	€	462.274	€	462.274	€	462.274	€	653.205	€	519.402	€	545.668	€	325.449	€	804.058	€	1.136.154	€	903.423	€	949.108	€	566.070	€	601.367	€	841.204	€	678.588	€	704.194	€	437.838	€	588.324	€	822.959	€	663.871	€	688.922	€	428.342
18	01/01/34	€	429.139	€	608.524	€	481.444	€	507.972	€	298.497	€	466.897	€	466.897	€	466.897	€	466.897	€	466.897	€	466.897	€	659.737	€	524.596	€	551.124	€	328.704	€	812.098	€	1.147.515	€	912.457	€	958.599	€	571.731	€	607.380	€	849.616	€	685.374	€	711.236	€	442.216	€	594.207	€	831.189	€	670.510	€	695.811	€	432.625
19	01/01/35	€	433.430	€	614.609	€	486.258	€	513.052	€	301.482	€	471.566	€	471.566	€	471.566	€	471.566	€	471.566	€	471.566	€	666.335	€	529.842	€	556.636	€	331.991	€	820.219	€	1.158.990	€	921.581	€	968.185	€	577.448	€	613.454	€	858.112	€	692.228	€	718.349	€	446.638	€	600.149	€	839.501	€	677.215	€	702.769	€	436.952
20	01/01/36	€	437.764	€	620.755	€	491.121	€	518.182	€	304.497	€	476.282	€	476.282	€	476.282	€	476.282	€	476.282	€	476.282	€	672.998	€	535.140	€	562.202	€	335.310	€	828.421	€	1.170.580	€	930.797	€	977.867	€	583.223	€	619.589	€	866.693	€	699.150	€	725.532	€	451.105	€	606.151	€	847.896	€	683.987	€	709.797	€	441.321
21	01/01/37	€	442.142	€	626.963	€	496.032	€	523.364	€	307.542	€	481.044	€	481.044	€	481.044	€	481.044	€	481.044	€	481.044	€	679.728	€	540.492	€	567.824	€	338.664	€	836.706	€	1.182.286	€	940.105	€	987.646	€	589.055	€	625.784	€	875.360	€	706.142	€	732.787	€	455.616	€	612.212	€	856.375	€	690.827	€	716.895	€	445.734
22	01/01/38	€	446.564	€	633.233	€	500.992	€	528.598	€	310.617	€	485.855	€	485.855	€	485.855	€	485.855	€	485.855	€	485.855	€	686.525	€	545.897	€	573.502	€	342.050	€	845.073	€	1.194.109	€	949.506	€	997.522	€	594.946	€	632.042	€	884.113	€	713.203	€	740.115	€	460.172	€	618.334	€	864.939	€	697.735	€	724.063	€	450.192
23	01/01/39	€	451.029	€	639.565	€	506.002	€	533.884	€	313.723	€	490.713	€	490.713	€	490.713	€	490.713	€	490.713	€	490.713	€	693.390	€	551.356	€	579.237	€	345.471	€	853.523	€	1.206.050	€	959.001	€	1.007.497	€	600.895	€	638.363	€	892.955	€	720.335	€	747.516	€	464.774	€	624.518	€	873.588	€	704.713	€	731.304	€	454.694
24	01/01/40	€	455.539	€	645.961	€	511.062	€	539.223	€	316.861	€	495.621	€	495.621	€	495.621	€	495.621	€	495.621	€	495.621	€	700.324	€	556.869	€	585.030	€	348.925	€	862.059	€	1.218.110	€	968.591	€	1.017.572	€	606.904	€	644.746	€	901.884	€	727.539	€	754.992	€	469.421	€	630.763	€	882.324	€	711.760	€	738.617	€	459.240
25	01/01/41	€	460.095	€	652.420	€	516.173	€	544.615	€	320.029	€	500.577	€	500.577	€	500.577	€	500.577	€	500.577	€	500.577	€	707.328	€	562.438	€	590.880	€	352.415	€	870.679	€	1.230.291	€	978.277	€	1.027.748	€	612.973	€	651.194	€	910.903	€	734.814	€	762.541	€	474.116	€	637.071	€	891.147	€	718.877	€	746.003	€	463.833
26	01/01/42	€	464.696	€	658.944	€	521.334	€	550.061	€	323.229	€	505.583	€	505.583	€	505.583	€	505.583	€	505.583	€	505.583	€	714.401	€	568.062	€	596.789	€	355.939	€	879.386	€	1.242.594	€	988.060	€	1.038.025	€	619.103	€	657.706	€	920.012	€	742.162	€	770.167	€	478.857	€	643.441	€	900.059	€	726.066	€	753.463	€	468.471
27	01/01/43	€	469.343	€	665.534	€	526.548	€	555.561	€	326.462	€	510.638	€	510.638	€	510.638	€	510.638	€	510.638	€	510.638	€	721.545	€	573.743	€	602.756	€	359.498	€	888.180	€	1.255.020	€	997.941	€	1.048.406	€	625.294	€	664.283	€	929.212	€	749.584	€	777.869	€	483.645	€	649.876	€	909.059	€	733.327	€	760.998	€	473.156
28	01/01/44	€	474.036	€	672.189	€	531.813	€	561.117	€	329.726	€	515.745	€	515.745	€	515.745	€	515.745	€	515.745	€	515.745	€	728.760	€	579.480	€	608.784	€	363.093	€	897.062	€	1.267.571	€	1.007.920	€	1.058.890	€	631.547	€	670.926	€	938.504	€	757.080	€	785.647	€	488.482	€	656.375	€	918.150	€	740.660	€	768.608	€	477.887
29	01/01/45	€	478.777	€	678.911	€	537.131	€	566.728	€	333.024	€	520.902	€	520.902	€	520.902	€	520.902	€	520.902	€	520.902	€	736.048	€	585.275	€	614.872	€	366.724	€	906.032	€	1.280.246	€	1.017.999	€	1.069.479	€	637.862	€	677.635	€	947.889	€	764.650	€	793.504	€	493.367	€	662.938	€	927.331	€	748.067	€	776.294	€	482.666
30	01/01/46	€	483.564	€	685.700	€	542.503	€	572.396	€	336.354	€	526.111	€	526.111	€	526.111	€	526.111	€	526.111	€	526.111	€	743.408	€	591.128	€	621.021	€	370.391	€	915.093	€	1.293.049	€	1.028.179	€	1.080.173	€	644.241	€	684.411	€	957.368	€	772.297	€	801.439	€	498.300	€	669.568	€	936.605	€	755.547	€	784.057	€	487.493
IRR			0,1%		3,1%		1,4%		1,8%		-1,5%		0,1%		0,6%		-0,2%		0,7%		0,3%		-1,5%		0,9%		-1,1%		-0,2%		-3,3%		0,3%		3,2%		0,8%		1,9%		-1,5%		0,9%		3,6%		1,5%		1,1%		-1,0%		0,8%		3,5%		1,4%		1,0%		-1,1%	
NPV		-€	6.661.274,59	-€	3.663.354,45	#########		-€	4.817.473,23	-€	7.221.791,62	-€	7.298.314,67	-€	6.359.347,54	-€	7.955.591,67	-€	8.201.601,06	-€	6.847.610,45	#########		-€	8.217.558,04	-€	11.364.930,49	-€	9.305.451,31	#########		#########		-€	6.517.474,81	#########		#########		-€	13.767.215,76	#########		#########		#########		#########		#########		#########		#########		#########		#########		#########		#########	
Netto Cash flo		€	264.483	€	6.533.312	€	2.800.758	€	3.579.940	-€	2.572.674	€	233.502	€	1.233.502	-€	466.498	€	1.401.502	€	713.502	€	4.102.748	€	2.561.272	-€	3.108.041	-€	460.860	-€	7.681.709	€	973.522	€	12.736.127	€	3.244.872	€	7.183.836	-€	4.858.215	€	2.463.901	#########	€	4.169.785	€	3.229.209	-€	2.457.421	€	2.191.587	€	9.754.873	€	3.860.474	€	2.940.297	-€	2.623.001	

	1 Transformation with no intervention				2 Transformation with desired energy label				3 Transformation with desired energy label and new facade				4 Transformation to max hight construction with desired energy label and new facade				5 Demolish and build same building				6 Demolish and build max height zoning			
	Innitial invesment	Net Cashflow	NPV	IRR	Innitial invesment	Net Cashflow	NPV	IRR	Innitial invesment	Net Cashflow	NPV	IRR	Innitial invesment	Net Cashflow	NPV	IRR	Innitial invesment	Net Cashflow	NPV	IRR	Innitial invesment	Net Cashflow	NPV	IRR
s	-€12.340.000	€ 1.469.347	-€ 6.661.275	0,1%	-€ 13.480.000	-€ 1.652.881	-€ 7.298.315	0,1%	-€ 17.816.250	-€ 5.989.131	-€ 11.369.911	-1,5%	-€ 22.879.083	€ 2.307.561	-€ 6.517.475	3,2%	-€ 15.375.816	€ 9.930	-€ 7.465.981	0,9%	-€ 15.261.219	-€ 209.162	-€ 7.509.576	
nt-/group (3+) accommodation	-€11.340.000	€ 4.074.720	-€ 3.663.354	3,1%	-€ 12.480.000	€ 4.232.016	-€ 6.359.348	0,6%	-€ 16.816.250	-€ 104.234	-€ 8.217.558	0,9%	-€ 20.968.202	€ 8.099.874	-€ 11.644.749	0,8%	-€ 14.759.695	€ 6.762.194	-€ 4.107.129	3,6%	-€ 14.658.462	€ 6.396.658	-€ 4.223.571	
accommodations	-€11.340.000	€ 4.074.720	-€ 3.663.354	3,1%	-€ 12.480.000	€ 4.232.016	-€ 6.359.348	0,6%	-€ 16.816.250	-€ 104.234	-€ 8.217.558	0,9%	-€ 20.968.202	€ 8.099.874	-€ 11.644.749	0,8%	-€ 14.759.695	€ 6.762.194	-€ 4.107.129	3,6%	-€ 14.658.462	€ 6.396.658	-€ 4.223.571	
accommodations	-€11.340.000	€ 4.074.720	-€ 3.663.354	3,1%	-€ 12.480.000	€ 4.232.016	-€ 6.359.348	0,6%	-€ 16.816.250	-€ 104.234	-€ 8.217.558	0,9%	-€ 20.968.202	€ 8.099.874	-€ 11.644.749	0,8%	-€ 14.759.695	€ 6.762.194	-€ 4.107.129	3,6%	-€ 14.658.462	€ 6.396.658	-€ 4.223.571	
r accommodations	-€11.340.000	€ 4.074.720	-€ 3.663.354	3,1%	-€ 12.480.000	€ 4.232.016	-€ 6.359.348	0,6%	-€ 16.816.250	-€ 104.234	-€ 8.217.558	0,9%	-€ 20.968.202	€ 8.099.874	-€ 11.644.749	0,8%	-€ 14.759.695	€ 6.762.194	-€ 4.107.129	3,6%	-€ 14.658.462	€ 6.396.658	-€ 4.223.571	
' accommodations	-€11.340.000	€ 4.074.720	-€ 3.663.354	3,1%	-€ 12.480.000	€ 4.232.016	-€ 6.359.348	0,6%	-€ 16.816.250	-€ 104.234	-€ 8.217.558	0,9%	-€ 20.968.202	€ 8.099.874	-€ 11.644.749	0,8%	-€ 14.759.695	€ 6.762.194	-€ 4.107.129	3,6%	-€ 14.658.462	€ 6.396.658	-€ 4.223.571	
	-€13.040.000	-€ 844.396	-€ 5.121.962	1,4%	-€ 14.180.000	-€ 891.292	-€ 7.955.592	-0,2%	-€ 18.516.250	-€ 5.227.542	-€ 11.364.930	-1,1%	-€ 23.555.424	-€ 441.686	-€ 8.689.134	1,9%	-€ 15.960.740	€ 1.400.699	-€ 7.120.004	1,5%	-€ 15.833.458	€ 1.151.443	-€ 7.171.102	
Food & Drinks	-€11.172.000	€ 1.695.604	-€ 4.817.473	1,8%	-€ 12.312.000	€ 1.648.708	-€ 6.201.601	0,7%	-€ 16.648.250	-€ 2.687.542	-€ 9.306.451	-0,2%	-€ 20.971.731	€ 3.310.851	-€ 13.767.216	-1,5%	-€ 17.660.920	€ 355.634	-€ 8.419.579	1,1%	-€ 17.496.764	€ 129.044	-€ 8.442.492	
tional	-€11.340.000	€ 4.074.720	-€ 7.221.792	-1,5%	-€ 13.000.000	-€ 4.673.505	-€ 6.847.610	0,3%	-€ 17.336.250	-€ 9.009.755	-€ 12.505.367	-3,3%	-€ 21.650.859	€ 7.168.154	-€ 7.465.981	0,9%	-€ 15.446.007	-€ 4.244.086	-€ 9.427.613	-1,0%	-€ 15.329.888	-€ 4.370.917	-€ 9.428.664	

transformatie is een factor (0,63/0,82=0,77 minder efficient dan nieuwbouw.

UFA	
	63%
Y BUILD	81%

www.vastgoedkennis.nl/docs/MSRE08/Wortmann.pdf

transformatie is een factor (0,63/0,82=0,77 minder efficient dan nieuwbouw.

	Transformation	Newly build
offices	63%	81%
residential	63%	81%
hotel	63%	81%
retail, food & drinks	63%	81%
educational	63%	81%

tion with no intervention

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	construction cost (excl. Facade & installations)	Installations	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IRR	
SF	4000	m2	Offices	2520	€ 12.886.653	-€ 10.000.000	-€ 1.100.000	-€ 1.240.000	-€ 2.016.000	-€ 12.340.000	€ *10.870.653*	-€ 1.469.347	-€6.661.275	0,1%	
t layers	12	layers	Residential	2520	€ 17.478.720	-€ 10.000.000	-€ 700.000	-€ 640.000	-€ 2.064.000	-€ 11.340.000	€ *15.414.720*	€ 4.074.720	-€3.663.354	3,1%	
Closed Ratio	60 - 90	% %	Hotel	2520	€ 14.727.604	-€ 10.000.000	-€ 1.200.000	-€ 1.840.000	-€ 2.532.000	-€ 13.040.000	€ *12.195.604*	€ 844.396	-€5.121.962	1,4%	*If instalations are older than 16 years replacement is needed*
ement instalations	*NO*		Retail, Food & Drinks	2520	€ 14.727.604	-€ 10.000.000	-€ 300.000	-€ 872.000	-€ 1.860.000	-€ 11.172.000	€ *12.867.604*	€ 1.695.604	-€4.817.473	1,8%	*If elevators are older than 16 years replacement is needed*
r factor	0,97		Educational	2520	€ 10.309.323	-€ 10.000.000	-€ 1.000.000	-€ 860.000	-€ 2.748.000	-€ 11.860.000	€ 7.561.323	-€ 4.298.677	-€7.221.792	-1,5%	

*GFA=(extra lagen * elevationsfloors)+(Basement*Groundfloor)*

tion with desired energy label

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	construction cost (excl. Facade & installations)	Installations	Energy label upgrade	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IRR	
SFA	4000	m2	Offices	2520	€ 13.843.119	###########	-€ 1.100.000,00	-€ 1.240.000,00	-€ 1.140.000,00	-€ 2.016.000,00	-€ 13.480.000	€ *11.827.119,31*	-€ 1.652.881	-€7.298.315	0,1%	
t layers	12	layers	Residential	2520	€ 18.776.016	###########	-€ 700.000,00	-€ 640.000,00	-€ 1.140.000,00	-€ 2.064.000,00	-€ 12.480.000	€ *16.712.016,00*	€ 4.232.016	-€6.359.348	0,6%	
ement instalations	*NO*		Hotel	2520	€ 15.820.708	###########	-€ 1.200.000,00	-€ 1.840.000,00	-€ 1.140.000,00	-€ 2.532.000,00	-€ 14.180.000	€ *13.288.707,79*	-€ 891.292	-€7.955.592	-0,2%	
r factor	0,97		Retail, Food & Drinks	2520	€ 15.820.708	###########	-€ 300.000,00	-€ 872.000,00	-€ 1.140.000,00	-€ 1.860.000,00	-€ 12.312.000	€ *13.960.707,79*	€ 1.648.708	-€6.201.601	0,7%	
l label upgrade cost	285	/m2 GFA	Educational	2520	€ 11.074.495	###########	-€ 1.000.000,00	-€ 860.000,00	-€ 1.140.000,00	-€ 2.748.000,00	-€ 13.000.000	€ *8.326.495,45*	-€ 4.673.505	-€6.847.610	-0,3%	

tion with desired energy label and new facade

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	construction cost (excl. Facade & installations)	Installations	Energy label upgrade with facade	Facade	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IRR	
SFA	4000	m2	Offices	2520	€ 13.843.119	###########	-€ 1.100.000,00	-€ 1.240.000,00	-€ 620.000,00	-€ 4.856.250,00	-€ 2.016.000,00	-€ 17.816.250	€ *11.827.119,31*	-€ 5.989.131	-€11.369.911	-1,5%	
ement instalations	*NO*		Residential	2520	€ 18.776.016	###########	-€ 700.000,00	-€ 640.000,00	-€ 620.000,00	-€ 4.856.250,00	-€ 2.064.000,00	-€ 16.816.250	€ *16.712.016,00*	€ 104.234	-€8.217.558	0,9%	
r factor	1,05		Hotel	2520	€ 15.820.708	###########	-€ 1.200.000,00	-€ 1.840.000,00	-€ 620.000,00	-€ 4.856.250,00	-€ 2.532.000,00	-€ 18.516.250	€ *13.288.707,79*	-€ 5.227.542	-€11.364.930	-1,1%	
l label upgrade cost	155	/m2 GFA	Retail, Food & Drinks	2520	€ 15.820.708	###########	-€ 300.000,00	-€ 872.000,00	-€ 620.000,00	-€ 4.856.250,00	-€ 1.860.000,00	-€ 16.648.250	€ *13.960.707,79*	-€ 2.687.542	-€9.306.451	-0,2%	
cade area	*16187,5*	*m2*	Educational	2520	€ 11.074.495	###########	-€ 1.000.000,00	-€ 860.000,00	-€ 620.000,00	-€ 4.856.250,00	-€ 2.748.000,00	-€ 17.336.250	€ *8.326.495,45*	-€ 9.009.755	-€12.505.367	-3,3%	

tion to max hight construction with desired energy label and new facade

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	transformation cost	new construction	Installations	Energy label upgrade	Facade	Basement	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IRR	
SFA	6957	*m2*	Offices	4383	€ 24.078.055	###########	-€ 1.100.000,00	-€ 3.548.888,89	-€ 2.156.796,30	-€ 1.078.398,15	-€ 4.995.000,00	€ -	-€ 3.506.533,33	-€ 22.879.083	€ *20.571.521,88*	-€ 2.307.561	-€6.517.475	3,2%	*If instalations are older than 16 years replaceme*	
FA	4000	*m2*	Residential	4383	€ 32.658.098	###########	-€ 700.000,00	-€ 3.081.618,52	-€ 1.113.185,19	-€ 1.078.398,15	-€ 4.995.000,00	€ -	-€ 3.590.022,22	-€ 20.968.202	€ *29.068.075,98*	€ 8.099.874	-€11.644.749	0,8%	*If elevators are older than 16 years replacement*	
DDED	2957	*m2*	Hotel	4383	€ 27.517.777	###########	-€ 1.200.000,00	-€ 3.081.618,52	-€ 3.200.407,41	-€ 1.078.398,15	-€ 4.995.000,00	€ -	-€ 4.404.038,89	-€ 23.555.424	€ *23.113.738,50*	-€ 441.686	-€8.689.134	1,9%		
yers possible transformation	*0,462962963*	*layers*	Retail, Food & Drinks	4383	€ 27.517.777	###########	-€ 300.000,00	-€ 3.081.618,52	-€ 1.516.714,81	-€ 1.078.398,15	-€ 4.995.000,00	€ -	-€ 3.235.194,44	-€ 20.971.731	€ *24.282.582,94*	€ 3.310.851	-€13.767.216	-1,5%		
			Educational	4383	€ 19.262.444	###########	-€ 1.000.000,00	-€ 3.081.618,52	-€ 1.495.842,59	-€ 1.078.398,15	-€ 4.995.000,00	€ -	-€ 4.779.738,89	-€ 21.650.859	€ *14.482.705,28*	-€ 7.168.154	-€7.465.981	0,9%	*GFA=(extra lagen * elevationsfloors)+(Basement*	
ement instalations	YES																			
ement Elevator	YES																		*wat de constructie toelaat en bi*	
r factor	1,05																		*one layer*	
l label upgrade cost	155	/m2 GFA																	*If layers added or instalations ar*	
cade area	*16187,5*	*m2*																		
ocade area	*16650*																			

nd build same building

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	construction cost	Demolision cost	Energy label upgrade	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IRR	
SFA	3899	*m2*	Offices	3159	€ 17.351.092	###########	-€ 4.679.393,94	-€ 92.000,00	-€ 604.421,72	-€ 1.965.345,45	-€ 15.375.816	€ *15.385.746,14*	€ 9.930	-€7.465.981	0,9%	
A	4000	*m2*	Residential	3159	€ 23.534.029	###########	-€ 4.063.273,74	-€ 92.000,00	-€ 604.421,72	-€ 2.012.139,39	-€ 14.759.695	€ *21.521.889,75*	€ 6.762.194	-€4.107.129	3,6%	
DDED	-101	*m2*	Hotel	3159	€ 19.829.819	###########	-€ 5.264.318,18	-€ 92.000,00	-€ 604.421,72	-€ 2.468.380,30	-€ 15.960.740	€ *17.361.438,66*	€ 1.400.699	-€7.120.004	1,5%	
yers possible transformation	*0,462962963*	*layers*	Retail, Food & Drinks	3159	€ 19.829.819	###########	-€ 6.964.497,98	-€ 92.000,00	-€ 604.421,72	-€ 1.813.265,15	-€ 17.660.920	€ *18.016.553,81*	€ 355.634	-€8.419.579	1,1%	
ent possible transformation	*1*	*layers*	Educational	3159	€ 13.880.873	###########	-€ 4.749.584,85	-€ 92.000,00	-€ 604.421,72	-€ 2.678.953,03	-€ 15.446.007	€ *11.201.920,24*	€ 4.244.086	-€9.427.613	-1,0%	
ement instalations	YES															
ement Elevator	YES															
r factor	1,05															
l label upgrade cost	155	/m2 GFA														

nd build max height zoning plan

			Function	Total UFA	Income: Rent income a year *opperation periode	Investment: Aquicistion cost land and building	construction cost	Demolision cost	Energy label upgrade	Maintenance: Expoitation costs * operational period	Innitial investment	Net income	Net Cashflow	NPV	IR	
SFA	3815	*m2*	Offices	3090	€ 16.974.778	###########	-€ 4.577.906,49	-€ 92.000,00	-€ 591.312,92	-€ 1.922.720,73	-€ 15.261.219	€ *15.052.057,61*	-€ 209.162	-€7.509.576	0,8%	
A	4000	*m2*	Residential	3090	€ 23.023.619	###########	-€ 3.975.148,81	-€ 92.000,00	-€ 591.312,92	-€ 1.968.499,79	-€ 14.658.462	€ *21.055.119,56*	€ 6.396.658	-€4.223.571	3,5%	
DDED	3815	*m2*	Hotel	3090	€ 19.399.747	###########	-€ 5.150.144,81	-€ 92.000,00	-€ 591.312,92	-€ 2.414.845,68	-€ 15.833.458	€ *16.984.901,00*	€ 1.151.443	-€7.171.102	1,4%	
yers possible due zoningplan	*13*	*layers*	Retail, Food & Drinks	3090	€ 19.399.747	###########	-€ 6.813.450,83	-€ 92.000,00	-€ 591.312,92	-€ 1.773.938,77	-€ 17.496.764	€ *17.625.807,90*	€ 129.044	-€8.442.492	1,0%	
ent possible transformation	*1*	*layers*	Educational	3090	€ 13.579.823	###########	-€ 4.646.575,09	-€ 92.000,00	-€ 591.312,92	-€ 2.620.851,47	-€ 15.329.888	€ *10.958.971,20*	€ 4.370.917	-€9.428.664	-1,1%	

A General

3	Discount rate	7,5%	http://heijmans.nl/media/filer_public/fb/07/fb0749e2-0e02-4b8b-964d-dac16e

B Benefits

1 Rent Prices

		Rent Income /m2/ Month UFA	Rent income /m2/ Year UFA	Current energy label (Rent income /m2/ Year UFA)* current Energy factor	Rent Income /m2/opperational years UFA	Desired energy label (Rent income /m2/ Year UFA)* desired Energy factor	Rent Income /m2/opperational years UFA * Rent increasement
1	Offices		€ 175	€ 170	€5.114	€ 183	€5.493
2	residential	€ 20	€ 237	€ 231	€6.936	€ 248	€7.451
7	Hotel		€ 205	€ 200	€5.990	€ 215	€6.435
8	Retail, Food & Drink		€ 200	€ 195	€5.844	€ 209	€6.278
9	Educational		€ 140	€ 136	€4.091	€ 146	€4.395

2 Sell Prices

		Income /m2/ when sale UFA
1	Offices	
2	residential	€ 2.965,00
7	Hotel	
8	Retail, Food & Drink	
9	Educational	

C Costs Construtions

1 Renovation

1.1 Construction costs

1	Offices	€ 275	/m2 GFA	excl. installaties

1.2 Additions

1	New Elevator	€ 55.000	/ piece	voor 3 stopplaatsen; extra stopplaatsen € 5000/stk
2	New staircase	€ 7.500	/ piece	per etage
3	Facade replacement	€ 350	/ m2 Facade	

2 Transformation (zonder gevel)

2.1 construction costs

2	Residential	€ 175	/m2 GFA	excl. installaties
3	Hotel	€ 300	/m2 GFA	excl. installaties
4	Retail, Food & Drinks	€ 75	/m2 GFA	excl. installaties
6	Educational	€ 250	/m2 GFA	excl. installaties

2.2 Additions (HET TOEVOEGEN IN EEN BESTAAND GEBOUW)

1	extra Elevator	€ 70.000	/ piece	voor 3 stopplaatsen; incl. schacht; extra stopplaatsen € 5000/stk
2	extra staircase	€ 6.000	/ piece	per etage
3	Facade replacement	€ 300	/ m2 Facade	

3 Newly Built

3.1 construction costs (TOTAL)

1	Offices	€ 1.200	/m2 GFA	gemiddeld kosten kantoorcomplex volgens kengetallenkompas Bouwkosten 20
2	Residential	€ 1.042	/m2 GFA	gemiddelde kosten apprtementenblok volgens kengetallenkompas Bouwkoste
3	Hotel	€ 1.350	/m2 GFA	gemiddelde kosten hotel volgens kengetallenkompas Bouwkosten 2014
5	Retail, Food & Drinks	€ 1.786	/m2 GFA	gemiddeldekosten winkels en horeca volgens kengetallenkompas Bouwkosten 2
6	Educational	€ 1.218	/m2 GFA	gemiddelde kosten onderwijs instelling volgens kengetallenkompas Bouwkoste

3.2 Intallation costs (IS PART OF CONSTRUCTION COSTS)

1	Offices	€ 310	/m2 GFA	gemiddeld kosten kantoorcomplex volgens kengetallenkompas Installaties 2013
2	Residential	€ 160	/m2 GFA	gemiddelde kosten apprtementenblok volgens kengetallenkompas Installaties 2
3	Hotel	€ 460	/m2 GFA	gemiddelde kosten hotel volgens kengetallenkompas Installaties 2013
5	Retail, Food & Drinks	€ 218	/m2 GFA	gemiddeldekosten winkels en horeca volgens kengetallenkompas Installaties 20
6	Educational	€ 215	/m2 GFA	gemiddelde kosten onderwijs instelling volgens kengetallenkompas Installaties 2

2.2 Additions (KOSTEN VAN EEN EXTRA LIFT JA OF NEE)

1	Elevator	€ 46.800	/ piece	gemiddelde prijs volgens kengetallenkompas Installaties 2013
	extra costs	€ 8.850,00	/ level	gemiddelde prijs volgens kengetallenkompas Installaties 2013
2	Staircase	€ 6.000	/ piece	dit varieert van € 5.000 (eenvoudige trap in appartementencomplex) tot € 15.0
	extra costs	€ 6.000,00	/ level	
3.	Basement		/m2 GFA	

4. Demolish office building

1	Completely	€ 23	/m2 GFA	gemiddeld kosten kantoorcomplex volgens kengetallenkompas Bouwkosten 20
2	keep foundation	€ 21	/m2 GFA	gemiddelde kosten apprtementenblok volgens kengetallenkompas Bouwkoste
3	keep Casco	€ 25	/m2 GFA	gemiddelde kosten hotel volgens kengetallenkompas Bouwkosten 2014
5	clean	€ 8	/m2 GFA	gemiddeldekosten winkels en horeca volgens kengetallenkompas Bouwkosten 2
6	Bruto	€ 8	/m2 GFA	gemiddelde kosten onderwijs instelling volgens kengetallenkompas Bouwkoste

c Costs Maintenance

		GFA Vaste lasten €/m2	GFA beheer en verh	Onderhoudskosten	TOTAL /m2 GF/	TOAL /m2 GFA/opperatinal per
1	Offices	€ 4,3	€ 4,0	€ 8,5	€ 16,8	€ 504,0
2	Residential	€ 3,2	€ 4,0	€ 10,0	€ 17,2	€ 516,0
3	Hotel	€ 2,1	€ 4,0	€ 15,0	€ 21,1	€ 633,0
4	Retail, Food & Drinks	€ 6,0	€ 4,0	€ 5,5	€ 15,5	€ 465,0
5	Educational	€ 3,9	€ 4,0	€ 15,0	€ 22,9	€ 687,0

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