POTENTIAL TRANSFORMATION OF VACANT OFFICES INTO HOUSING FOR YOUNG PEOPLE: Optimization of Decision Making Process

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TABLE OF CONTENTS

PREFACE

In your hand, you have the report that presents my research on “Potential transformation of vacant offices into housing for young people”. This research is the final part of the Master Construction Management and Engineering (CME), faculty Architecture, Building and Planning (ABP), at Eindhoven University of Technology (TU/e). This research is conducted under the supervision of Paul Keijsers, Camelot Leegstandbeheer & -Advies, and Wim Schaefer, Brano Glumac and Bart van Weenen, TU/e.

At this moment, there are a large number of vacant offices on the Dutch office market that do not have a proper perspective. This vacancy can be partly solved by transforming these properties into a new destination for which there is demand. In response to this possible opportunities and obstacles are investigated. Here is looked which parameters have great influence on the potential that a vacant office has regarding to transformation into housing for young people.

At the end, a Decision Support Tool is developed that will support an investor (Camelot) to get an justified answer to the question if transformation of an vacant office is (financially) feasible. This at an early stage of the transformation process.

Through this way, I want to thank my supervisors Wim Schaefer, Brano Glumac and Bart van Weenen for their input and guidance during my graduation period. I am also grateful to Camelot, especially to Paul Keijsers and Gert-Jan van de Sande, for their valuable guidance from the practical side of the research. All other persons wo have contributed during this study, I would like to thank.

Finally, of course I would like to thank my parents, sister and girlfriend because of their big support throughout my academic career.

Mark van Swam,

Eindhoven, August 2014

“Winners have a plan, losers have an excuse.”

INTRODUCTION

1. INTRODUCTION

This report can be read in two ways. To quickly gain insight in the research and the results it is recommended to read the summary and Chapter 8 “Conclusion and findings”. In order to understand the background and scientific methods that are used the advice is to read the entire report.

The report is divided into 8 chapters. Within each chapter a part of the overall research process is described. The chapter numbers are shown in the top right corner of every page.

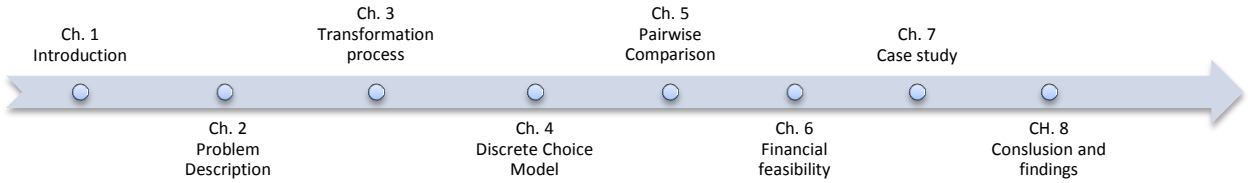


Figure 1 Outline chapters within this report

1.1 Overview of the situation, trends and developments

Vacancy and re-use are both current issues of today where commercial parties are struggling with. What to do with it? Depreciation and take your losses? Temporary re-use, wait until better times, demolition or permanent transformation? Hereby can be said that an investor can choose to make a plan to tackle the situation or one can choose to wait, the control will fall from their hands. An appropriate quote her is *“Winners have a plan, losers an excuse.”*

A small oversupply within the office market is necessary to react on the dynamics of the market. A “healthy” vacancy rate should be around 5% till 7% of the stock (Besselaar, 2011). It is well known that the vacancy rate in the Netherlands related to the office market is “unhealthy” for several years. To indicate the size of this problem, some facts will be addressed. The office stock within the Netherlands consists of 49,4 million m² of which 7,3 million m² is vacant. This means a vacancy rate of 14,7%. (Zadelhoff, 2013) Regional there are large differences regarding vacancy. The highest vacancy rate is mainly found in "de Randstad" and around the larger cities, where logically in the past, most of the commercial real estate is built (Bak R. et al., 2013).

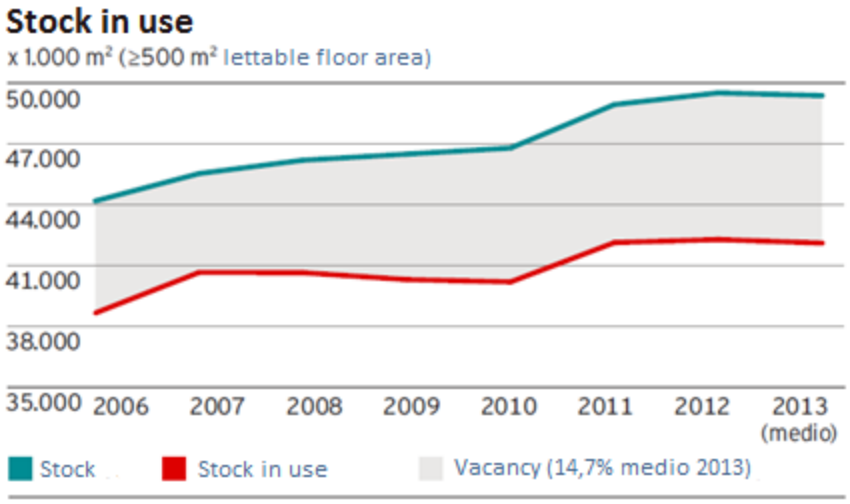


Figure 2 Office stock in use (source: Bak, DTZ Zadelhoff)

This imbalance can be explained due the fact that the labor force stops growing, the "new way of working" is gaining popularity and the surface area per workplace per employee decreases. (Besselaar, 2011) The solution for vacancy can be (most of the times) different for each case because not every property is vacant for the same reason. In broad terms vacancy can be divided into cyclical vacancy, and structural vacancy.

Cyclical vacancy; this type of vacancy is resulting from the delayed reaction to the market, the so called “varkenscyclus”. This cyclical vacancy is a result from the difference between demand and supply which never will be in an equilibrium. If there is more demand, developers will develop more real estate which finally will become an oversupply. Normally this oversupply will be adapted again by the market because the developers will develop less real estate when this vacancy occurs. If this is not the case than there will be a creation of structural vacancy. This results in an unbalance market. (Lamers, March 2013)

Structural vacancy; this type of vacancy will not be absorbed by the market. Real estate is structural vacant when the building is vacant for at least 3 years. In the last decades there is done several research to this type of vacancy.

Several researches and case studies are done to find out how this imbalance on the Dutch office market can be solved: transformation of old buildings, demolition, redevelopment, construction ban, stop land allocation, etc. During this research there will be a focus on transformation of vacant offices.

Both vacancy and transformation of existing buildings are of all ages. However the last few years the market is changed into a so called “replacement market” (vervangingsmarkt). The office stock in use is fairly stable, there is no demand for expansion. New buildings are mainly built to replace the old stock. This construction of new real estate leads to oversupply and so we can speak of a “buyer's market” (vragersmarkt). An increasing proportion of this supply is outdated and will be difficult to rent without any adjustments because these buildings do not longer meet the imposed requirements, even with a strong economic

recovery (Voordt & Geraedts, 2007; Bak, 2013). In order to prevent extended vacancy, it is necessary that a substantial portion of the outdated stock on the market will be removed. (Voordt & Geraedts, 2007) One way to do this is through transformation of vacant real estate.

This problem has multiple factors and actors with many conflicting interests, involvement or investments, which results in a complicated process. Some examples of these factors are, the physical capacity of the building, the location, the current and projected income stream of the building for current use and (temporary) re-use, the current and projected capital value of the building for current use and (temporary) re-use, level of demand for other uses, redevelopment costs, the willingness to sell and the effects of local and national planning factors on the possibility of conversion including policies and government guidance. (Heath, 2001; Geraedts & Voordt, 2007; Houtveen, July 2002) All these factors can ensure that many projects are not feasible. The drivers for transformation may be social, environmental and/or economic as well as functional obsolescence. (Remoy, 2012)

Transformation of existing offices is a sustainable way of addressing vacancy; either through residential conversion or within use adaptation. There is a two-fold benefit with office conversions which lower vacancy rates and enhance the sustainability of the built environment by reducing embodied energy in converted residential stock (Remoy H. W., 2012). By studying the building characteristics that are needed to increase the potential for transformation into housing for young people, it will become clear which buildings should be suitable and which buildings are not by using a quick scan.

Determinative for this process is the sense of urgency for the investor. (Houtveen, July 2002) The speed at which the overcapacity will disappear from the market depends on the dynamics surrounding the vacant offices. In most cases it is about the repositioning or in other words depreciation of the building, which improves the competitive position or makes an alternative destination financially attractive. When a building will be depreciated, the rent of that building will go down, the marketability will rise, and in an economic way this building will be more feasible for renovation or transformation. However, the rigid adaptability of the market is not only because of the financial situation. Several institutional features of the office market, as the scarcity of total vacant offices and the fact that the biggest part within the market is financed with debt capital, and the behavior of market parties prevent that downward price adjustment or decreasing the supply through restructure or transformation is achieved. (Zuidema, 2010) Investors / owners do not always experience the vacancy itself as a problem. In particular, if a building is not empty in totality, and thus remains an acceptable return. It is a given that offices that are totally empty are scarce. (Zuidema, 2010) In these cases devaluation or intervention has from the perspective of the investor no urgency. In addition, the difficult position of lenders, limits the providing of financing for the conducting redevelopment or transformation of an empty office. Besides the risk perception also the decisiveness and flexibility of the investor will determine the

extent to which the investor can respond on the resulting vacancy. The more decisive an investor is, the faster the necessary action can / will be taken to reduce the loss (vacancy). (Zuidema, 2010)

A common function that is proposed by developers and/or investors in case of transformation of vacant offices is student housing. There is an increasing demand for student housing in the Netherlands. Despite a stagnation in the construction of 16.000 new student housing, promised by the government until 2016, the demand continues to rise. At this moment, the Netherlands has a shortage of approximately 30.000 residences, which will increase further in the coming years (De Telegraaf, 2013; Kences, 2013). To achieve this goal and to realize a breakthrough, it is important that all parties involved take their responsibility.

Transforming vacant office buildings into student housing (and housing for young people) has become a more attractive subject to developers over the years. This can be explained by the relatively high price per square meter that can be achieved per person, the satisfaction with a lower quality of the dwelling and the scarcity of this type of housing. Branch organization and knowledge center Kences performs a yearly survey amongst 600.000 students: 'How do you want to live as student?'. This survey is supported by the ministry of internal affairs, colleges, universities and the LSVb (Dutch national student union) (Hilhorst, 2013). Which represents the needs and demands of students and young people.

A combination of the housing shortage for young people and the problem of office vacancy should give a great solution. This relieves the pressure on the tight housing market in university cities and owners of vacant office buildings have a good way of making some profit (Hilhorst, 2013). However transformation is not the solution to the whole issue of vacancy. Location and quality play a crucial role in this issue. For example transformation of one building located on a mono-functional office locations into housing units will not be feasible in both financial and social way. (Besselaar, 2011) It is not realistic to expect that the vacancy problem will be completely solved by transformation.

Most common problems that ensure that a project is not feasible are depreciation, the location and layout or the collaboration with the municipality. (Besselaar, 2011; Heath, 2001; Houtveen, July 2002)

1.2 Office buildings with a future

Property market analysts as DTZ Zadelhoff divide the stock of unoccupied offices by building quality, type and age into three distinct categories. This division is specific and takes the general division of cyclical and structural vacancy into account (Zadelfhoff, 2012).

Category	Description
"Promising" offices approx. 18%	- Close to major train stations; - Presence of facilities; - Limited competitive offer; - Rentable with current market rent (not under pressure); - Attractive architecture; - Function of office complementary to environment; - Adequate parking norm.
"Having chance" offices approx. 54%	- Good locations within suburbs or secondary core cities locations; - Offices know competitive offer; - Rents under pressure; - Visibility of status of secondary importance; - Physical characteristics offer possibilities for alternatives; - Upgrade building or good quality / price ratio increases chance of tenants.
"Disadvantaged" offices approx. 28%	- Structural (three years or longer) in offer; - No or minimal distinctiveness; - Offices designed from standard pattern; - Unilateral applicable location; - Many firms from construction period between 1980 and 2000; - Large volumes; - Rents are under pressure, rent reduction does not lead to an increase of user interest.

Table 1 Division of vacancy (Zadelfhoff, 2012)

To determine to which category a particular office belongs DTZ Zadelhoff has created an scheme where characteristics are specified by which the long-term rental opportunities of office space can be determined. This scheme can be found in Appendix A.

1.3 Sustainability

Because of the increasing importance of sustainability throughout the world, it is important to discuss what transformation can add to this term. In generally the issue of sustainability is not one of the main topics during a transformation project. However, literature shows that area improvement and transformation can stimulate the issue of sustainability.

The motivations for implementing sustainable measures are mixed. For example, from imposed requirements of the client, sometimes in cooperation with the municipality, or because the construction is aimed at the luxury segment, where sustainability is linked to higher quality.

Besides these motivations, a pleasant environment in which living, working and recreation are in equilibrium with each other, creates a higher utilization of areas. It also ensures maintenance of buildings for cultural and emotional context of a city. All of this provides a sustainable environment in which people want to live, work or recreate. (Vos, 2013)

Vacancy occurs when the demand for floor space for a certain function decreases. The current destination of the vacant property can be converted into a feature for which at this moment (and in the future) there is enough demand by using transformation. By transforming the vacant building in a way that it is technically possible to undo the transformation or to even further transform the building, ensures that the property is flexible and easy to adjust for different (market)demand in the future. This requires a broader and more extensive preparation but ensures an optimal result for the made efforts.

The fact is that with the application of transformation the building is reused, gets a second life. This is commonly cited as the most important aspect of sustainability regarding transformation. Unfortunately, not in all cases it is possible to maintain the entire existing building. Reasons for this can be: poor condition of the existing building and the (new) requirements of the Building Decree (most important are fire and structural safety, sound and insulation). (Vos, 2013)

Financial feasibility, including return, is (usually) the most important aspect of transformation. So for sustainable measures it is necessary that there is enough financial space to implement them. For most transformations, however, there is a lot of pressure on the budget and there is not much room available for these measures, sustainability remains of secondary importance. In contrast, Vos (2013) stated that experts generally confirm that it is highly dependent on the end user if sustainable measures are included in the plan. Depending on the market segment for which the houses will be put away on the market after transformation, the quality level is determined. At a higher market segment, quality is partially determined by sustainable measures. Yet even for the lower segment the investor will look for the application of sustainability to distinguish the building from all other buildings.

An active attitude of governmental parties regarding sharing of knowledge about sustainability provides an incentive to take this into account within transformation projects. (Vos, 2013)

Transformation of existing offices is a sustainable way of addressing vacancy; either through residential conversion or within use adaptation. There is a two-fold benefit with office conversions which lower vacancy rates and enhance the sustainability of the built environment by reducing embodied energy in converted residential stock. (Remoy, H.W., 2012)

1.3.1 Possibilities and opportunities

Given the economic crisis and the high pressure on the financial feasibility each (extra) investment for sustainable measures is often deleted. At the time that an additional investment pays itself back, there is no hesitation about to take this measure. Often there is a lack with the initiating party about the opportunities that are available.

Opportunities are seen in the area of sustainability for a complete area. This involves transformation as an integral part of a transition area. The entire area will raise to a higher level and an interaction between the buildings and parts of the area can take place. (Vos, 2013)

Requirements for sustainability with respect to transformation are contained in the Building Decree. Where such requirements have been included, such as insulation and ventilation, it can be concluded that these requirements are below the level specified for new buildings. It is the absolute minimum in terms of safety, health and energy. To achieve a sustainable building it remains relevant to establish a performance requirement before transformation starts. This final performance may not come below the level obtained legally. (Vos, 2013; Overveld, Graaf, & Berghuis, 2011)

2. PROBLEM DESCRIPTION

As mentioned in Chapter 1 not all office buildings are suitable for transformation. For an investor it is important to distinguish vacant buildings with potential for transformation as early as possible in the process. This is important because feasibility studies during the initiative and definition phase need a large investment of both time and money, while there is no guarantee for success. But *how* can an investor quickly determine whether vacant offices are suitable for transformation into housing for young people or not? An large amount of vacant real estate is "available" for transformation, but an investor must determine quickly whether the vacant offices are suitable for other purposes and if transformation is financially feasible. The following questions are important: What factors ensure the applicability and financial feasibility of possible transformation? Which properties are suitable for transformation? An optimization of the decision making process is needed and a better transition to the actual transformation process required.

2.1 Problem definition

The problem that can be defined from this context is:

An investor has the goal to optimize the exploitation of vacant offices by maximizing returns and minimizing risks. A lot of vacant offices are "available" for transformation which gives difficulties in the quick assessment process regarding the potential for transformation into housing for young people. A Decision Support Tool based on various parameters and sub-parameters, for example market, location, building and finance, should optimize this decision making process (all these factors collectively determine the possibilities and potential of transformation).

Despite everything, transformation of vacant offices only makes sense when the new function(s) provide in need. The supply must match demand, in terms of their characteristics and location of the building. (Dam, 2013; Voordt & Geraedts, 2007) In order to determine whether a converted building meets the needs and preferences of potential target groups, it is necessary to know which aspects are decisive for a specific function.

So successful transformation of vacant real estate depends on several factors and characteristics. Physical attributes as building depth, accessibility, facades and the structural frame are important factors but also location, age and legal and social attributes are important factors to take into account. Besides these building characteristics there is a significant influence through the dynamic working of the market, tenants wishes, the risk factor, requirements and the strategy of the investor. Because of these multiple factors and actors the process is complicated which makes it difficult for an investor to investigate

whether a project / transformation is feasible or how to minimize the risks. It is obvious that the financial aspect is one of the many factors that influence this process.

For this research there will be a focus on the decision making process regarding the purchase of vacant real estate with the aim of transformation. Next to that, there will be a focus on the project management regarding the transformation process after the purchase of such real estate.

2.2 Research question

The context described above has led to the following research question that will be answered within this report:

"How can the process of assessing the suitability of vacant offices for transformation into housing for young people be optimized?"

In order to understand the problem better, the problem is further divided into (supporting) sub-questions:

Sub question one: Which factors have influence on the transformation potential of vacant offices? (Chapter 5)

Sub question two: What are the main preferences / needs of the target group (young people) regarding transformation and housing? (Chapter 4)

Sub question three: Which (success-) factors need to be examined regarding the suitability for transformation into housing for young people before a justified and non-binding offer can be made on a property? (Chapter 7)

Sub question four: How could a (structural) vacant office be evaluated regarding the suitability for transformation into housing for young people? Suitability on technical, geographical, legislative and financial level. (Chapter 3)

Sub question five: What is the best way to optimize the project management with respect to the process of transformation to maximize the returns and minimize the risks that these kind of investments entails? How can a Decision Support Tool be composed to support this decision from the perspective of the investor?" (Chapter 3 and 6)

2.3 Research design

The theory defines a conceptual process in which financial feasibility is crucial for the feasibility of transforming vacant offices. The core of the study consists of a study regarding to potential transformation of vacant offices into housing for young people. This suitability is evaluated on several factors; potential tenant (target group), suitability building (location and building) and financial feasibility. The output of the study is a model that gives insight about the feasibility of transformation based on a financial feasibility analysis (Discounted Cash Flow). Figure 3 gives a schematic view of the research design.

The purpose of this research is to improve the evaluation procedure of an investor regarding the decision to purchase vacant offices with the aim of transformation. The process of this research will consist out of several phases, that need to be accomplished. The tools that will be used during this process are literature studies, interviews / surveys, Multi-criteria assessment, MCDA, Discrete Choice Modelling and Decision Support tools

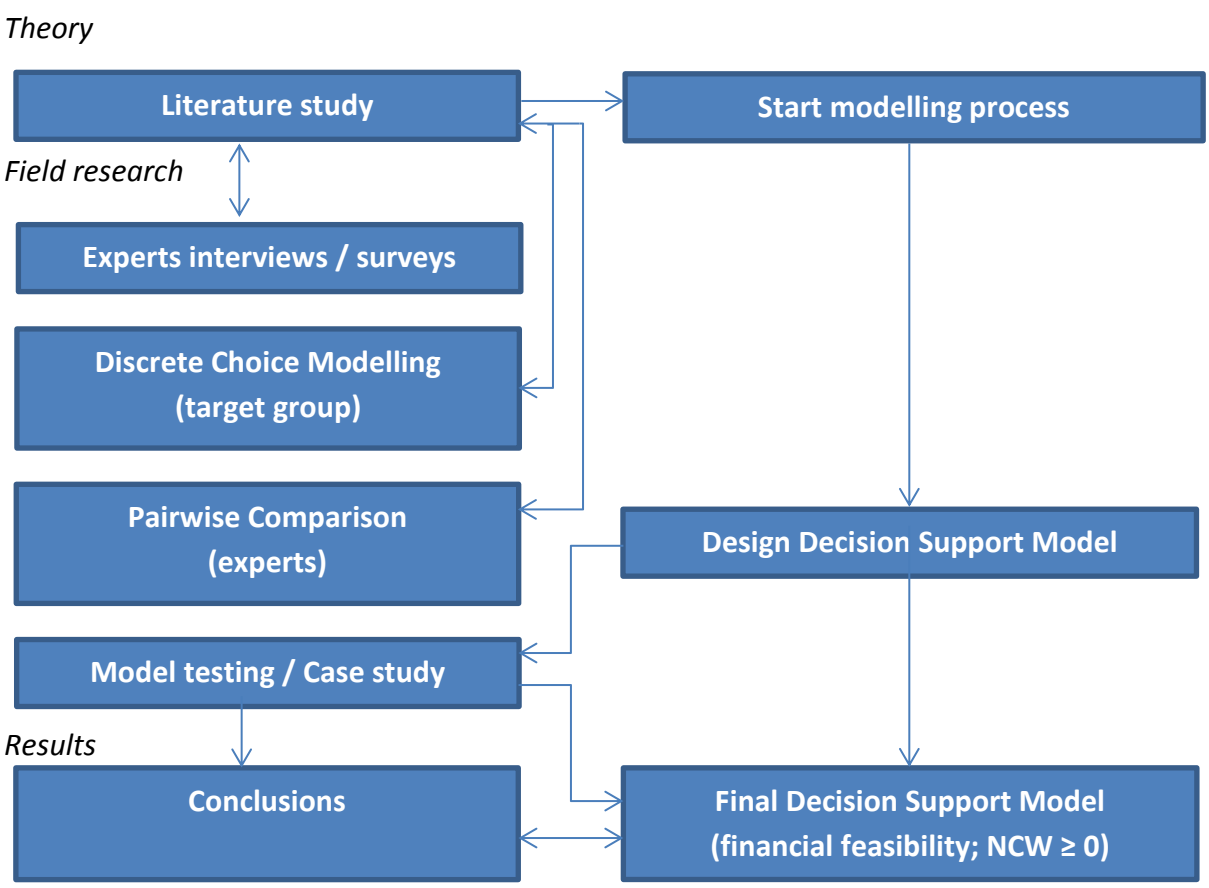


Figure 3 Research Design

2.3.1 Research process

The first phase starts with a **literature study** related to vacant offices and possibilities of transformation into housing for young people. The decision making process of purchase / investment of vacant real estate and the actual transformation process will be investigated to detect challenges and opportunities. The key factors in the transformation process and their possible impact will be obtained (Chapter 1 to 3).

For understanding the target group preferences a **Discrete Choice Model** (Chapter 4) will be used. The discrete choice modelling approach requires that a representative sample of customers make choices in simulated situations derived from realistic variations of market offerings. The performing of a discrete choice model experiment typically comprises of three steps. First, using market assessment, customer interviews, case studies, industry data, literature reviews, focus groups, and other information sources, a list of drivers that are believed to influence customers' purchasing decisions is compiled. Once the list of choice drivers is finalized, experimental design techniques are used to develop many realistic versions of service offerings. Next, choice experiments are constructed that ask respondents to select one out of two or more alternatives available to them in a series of choice sets. In the final phase, econometric models based on responses from a representative sample of potential future customers are used to identify empirical key patterns in the survey responses, providing a relative weighting for each driver and, if considered necessary, for interactions among drivers. Developers and managers can then select the optimal combination of attributes to develop a profitable and sustainable value proposition that, under normal competitive constraints, will maximally leverage their available resources. (Verma & al., 2009) (Vasilache, 2013) Based on the outcomes of this part the Willingness To Pay (WTP) can be determined. This is the amount of money that the consumer is willing to pay for a certain alternative.

Multi-criteria assessment will be used since no single criterion can adequately address all the issues involved in complex decisions of this type, a multi-criteria approach to decision making offers considerable advantage. This scientific methodology helps with ranking the multiple factors and issues on the basis of influence and importance. For example: MCA can add scores on economic, environmental and social criteria together. The goals of the MCA are organizing data, giving more transparency to the decision making process and supporting decision makers. For this part of the research, pairwise comparison will be used. A questionnaire for experts will be conducted in which the experts have to evaluate the most important attributes, arising from the literature study, among each other (Chapter 5).

Multiple-Criteria Decision Analysis (**MCDA**) is a discipline that explicitly considers multiple criteria in decision-making environments, especially when there are conflicting criteria that need to be evaluated. Cost or price is usually one of the main criteria. Structuring complex problems well and considering multiple criteria explicitly leads to more informed and better decisions.

Based on all obtained information a **Decision Support System** will be developed so that the decision making process regarding the purchase of vacant offices will be as efficient an low-risk as possible. Also recommendation is given on how to set up the further process regarding to the actual transformation (Chapter 6).

This developed Decision Support System will be evaluated and validated by working out a **case study**. This case study will be introduced by Camelot and the results and process will subsequently be evaluated by experts of the company (Chapter 7).

2.4 Research limitations

To take the whole “vacant” market into account within this research is too much, so for a more realistic research the next boundaries are established:

1. The focus of this research is on *vacant offices*;
2. The potential transformation is focused on *the target group of young people* (not only students) which are situated on the rental market; General feature of this group is that it is a fast "moving / mutating" group;
3. The focus will be on *permanent transformation*, because of the fact that an increasing proportion of this supply is outdated and will be difficult to rent without any adjustments, even with a strong economic recovery;
4. Despite that the potential of cooperation with municipalities may be an important factor, shall this factor be disregarded within this research because it is not measurable and will vary for each situation;
5. Transformation (construction) costs are variable. Currently there is little knowledge available regarding cost indicators for transformation projects. Therefore there is chosen to held the deviation of costs as described in the report of Van Dam (2013). Research on cost indicators for transformation projects is a study on itself.

2.5 Expected results

There are several instruments developed in order to be able to judge office buildings on their potential for transformation into dwellings. The best known instrument is the “Transformatiepotentiemeter” developed by Geraedts and Van der Voordt (Geraedts & Voordt, 2004). This instrument consists of criteria to measure opportunities and risks. The criteria that are used consider internal building and location aspects. Such an instrument can be used as the basis for the decision that has to be made. However, it is depending on the target group whether the transformation is actually financially feasible. This instrument has therefore limitations regarding the requirements and needs of the target group, the applicable regulations and the financial aspect. In Appendix B are the criteria for low

transformation potential (the greater the number of checkmarks, the higher the risk and the lower the transformation potential) listed, that are evaluated within the “Transformation meter” of Geraedts and Van der Voordt.

The basis of the above mentioned instrument will be used during the preparation of a Decision Support Tool to optimize the decision making process.

The findings of this research should give an overview of the most important factors and barriers that influences the choice of an investor to purchase a vacant property with the purpose to transform it into housing for young people. Furthermore there will be indicated what the most important preferences are from the potential target group. The combination of this information will indicate which offices are suitable for the new use.

This study will be valuable for Dutch housing providers who have to build new housing according to the wishes and needs of the young people to reduce quantitative and qualitative shortages.

Further translation can be made from financial perspective. The Willingness To Pay (WTP) can be calculated through the preferences of future users and the associated Discrete Choice Experiment. In addition, the importance of building related factors and attributes can be translated to the impact on investment costs. The financial feasibility can be tested by evaluating these two results in a Discounted Cash Flow.

Based on this information a decision support tool with the focus on parameters and sub parameters will be developed / improved to support the decision of the investor.

The relevance of this research related to Camelot, is the optimization of the decision making process to purchase vacant offices with the aim for transformation. This research will contribute to the purchasing attitude of Camelot. In addition, it is known that currently the real estate market in the Netherlands is “unhealthy”, so it is clear that there has to be made progress in this field. This is a current issue in several ways, many aspects that are important in the field of Construction Management and Engineering will be elaborated.

Results of the study can be used by developers to test project feasibility and select the optimal combination of attributes to generate a profitable and sustainable value proposition that, under normal competitive constraints, will maximally leverage their available resources.

RESEARCH

3. TRANSFORMATION PROCESS

"Transformation; The housing of functions in one or more existing buildings, which are established for other purposes. The activities are aimed at adapting a building to a new set of requirements on both technical and functional area."

The process of transformation shows similarities to the procedure by new construction projects. In both cases, after the initiative phase there is a preparation phase including feasibility studies, a design phase, the implementation and delivery phase, and the occupation and administration/management phase. Yet transformation is more complicated than new construction projects, because an existing building or building complex involves a number of specific conditions and boundaries. Considering transformation, the starting point is the existing object which need to be transformed within its own contours. This increases the likelihood of unforeseen circumstances. For this reason a transformation process is more difficult to control than a new construction project. Research has shown that the greatest differences with respect to the construction process of new projects take place in the initiative and the definition phase. This is mainly due to the number of additional feasibility studies that are needed to obtain the right information regarding the property that needs to transform. (Andriessen cited in Voordt & Geraedts, 2007)

The goal during this research is to optimize the decision making process at the beginning of the actual transformation process, within the initiative phase. This means that the right information is generated at an early stage of the initiative phase, so that it is easier to control the process and risks can be reduced. Since the biggest differences between the traditional construction process and the transformation process occur during the initiative phase, this chapter will focus on the optimization of the initiative phase regarding the transformation process.

3.1 Current process during the initiative phase

During the initiative phase, figure 4, a distinction can be made between an initiative driven by a commercial point of view or based on a private initiative. Different parties may intend to transform an existing property at the beginning of this phase (the choice between new construction and transformation is then already made). (Voordt & Geraedts, 2007)

Before further plans can be worked out, multiple feasibility studies regarding the potential for transformation of the building need to be accomplished. At the end of this phase there will be a "Go" or "No-go" recommendation for further development of the project.

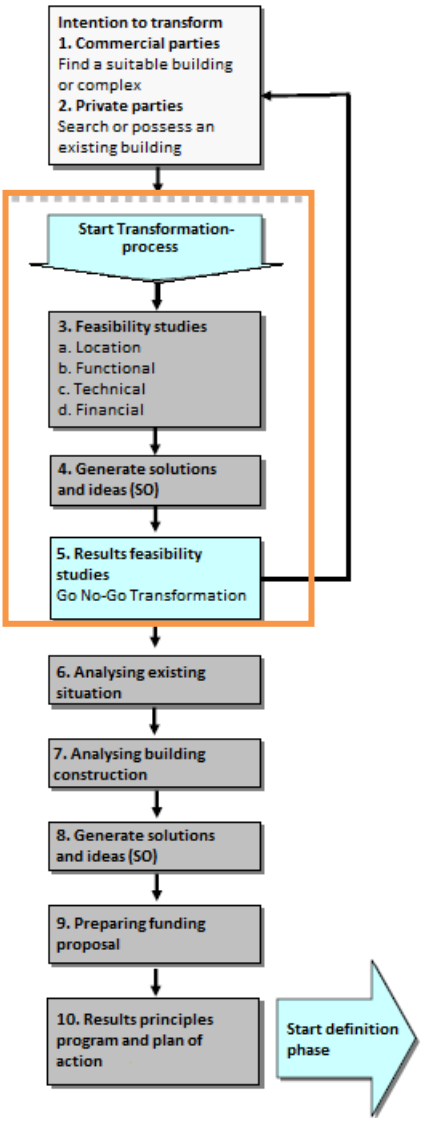


Figure 4 Schematic representation of the initiative phase

At the time that possible "suitable" properties are available, a feasibility study can give an answer about the transformation potential of the building. Hereby can be mentioned that existing buildings could have a number of qualities and constraints that will influence this potential. (Voordt & Geraedts, 2007)

Feasibility studies provide an analysis of the location, functional, technical, financial and environmental aspects. This kind of studies require a greater investment than is the case for new construction projects.

Because of the large investment and number of studies that are needed at this stage in which one could not get guarantee of a viable project, it is wise to work from coarse to fine during this phase. When a building has little or no transformation potential, the investor wants to know this as early as possible to reduce unnecessary costs. The feasibility studies are aimed to investigate the transformation potential of the existing building. These studies will result in a "Go" or "No-go".

Because it is important to work from coarse to fine during this phase, the optimization of the process will take place during the feasibility studies. These feasibility studies ask a large investment, while available knowledge and experience could made this process more efficient.

The various feasibility studies, overview figure 5, are based on data obtained from information of the location and the building itself, and can be performed independently of each other. The requirements and possibilities of the various government agencies can be investigated, when the potential of the building has become obsolete (possible exemptions (ontheffingen), subsidies, etc.). Based on price negotiation there could be a definitive "Go" or "No-go" advise.

The initiative phase results in a number of principles that will be used during the definition phase to develop the program of requirements (Programma van Eisen) with associated budget to receive approval from the initiator. (Voordt & Geraedts, 2007)

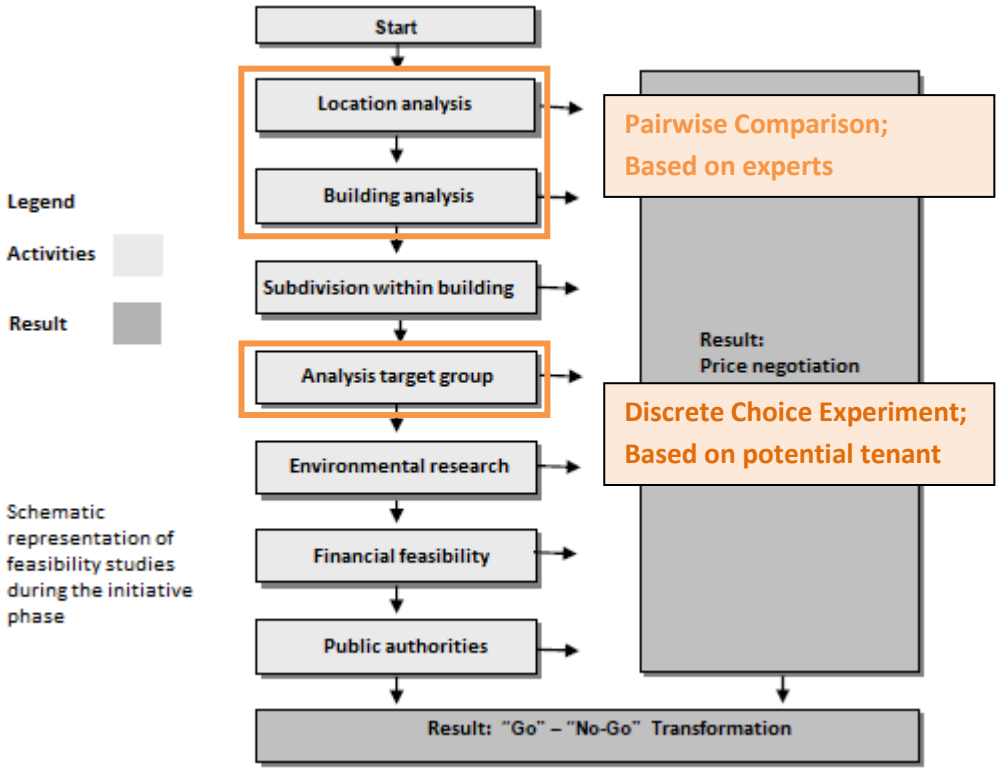


Figure 5 Schematic overview of the several feasibility studies

In general it can be said that the preparation regarding to the transformation process requires a larger investment and also takes more time for sure.

3.2 Optimalization of the initiative phase

The available knowledge and experience of experts can be used during the transformation process through a QuickScan that effectively assesses the building on building related factors and attributes. By using the experience and knowledge of experts, the influence of these factors and attributes on the potential of the building regarding transformation may be determined. Combined with the housing needs of a specific target group, the feasibility of a specific building can be tested by using a QuickScan. Hereby it is important that the decisive criteria (called Vetocriteria) of a building are tested in the earliest stage that is possible. (Andriessen, 1999; Voordt & Geraedts, 2007) This optimization of the initiative phase is included in figure 6.

When the housing needs and demands of the potential target group are known, based on a market research (in this case Discrete Choice Model), a housing alternative can be assembled that gains the highest utility. Also the Willingness To Pay for this specific alternative could be calculated, this can be used as a guideline for the potential rent. In order to determine whether the chosen target group is correct, the suitability of this alternative can be evaluated for a certain building. Next to this the building can be evaluated

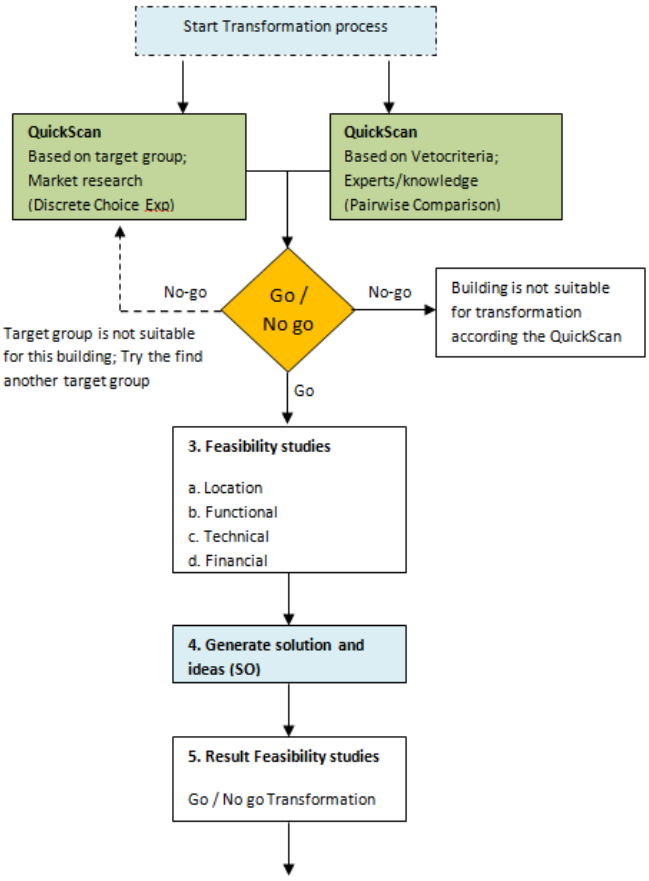


Figure 6 Optimalisation initiative phase

based on criteria set by various experts, arising from the literature study and by using Pairwise Comparison. Based on this assessment, a final score can be assigned to the building on which it is decided whether or not the building is suitable for transformation.

By using a QuickScan three conclusions can arise, if the building is not suitable for transformation with respect to the criteria of the investor a definitive "No-go" will follow. When the building does meet the criteria of the investor, but the housing needs and demands of the target group can not be achieved, a "No-go" will follow with the possibility to follow the QuickScan again based on a new target group. The third conclusion that may arise from the QuickScan is that the building meets both the criteria and requirements of the investor and the possibility to realize the housing needs and demands of the target group, a definitive "Go" will follow after which the transformation process can be continued.

When the appropriate target group is found, and there is enough demand on the market from this group, possible solutions can be given based on the results of the other feasibility studies. It is also possible to determine whether the current situation satisfies regarding the requirements imposed with the new function. The analyses made for the building and function have the purpose to determine the final transformation costs and serve as preconditions to give a founded "Go" or "No-go" advise. By this optimization during the initiative phase, the process remains flexible and universal.

Financial feasibility plays a central role in the investing decisions of companies and investors. During this research the Discounted Cash Flow (DCF) model will be used to calculate this financial feasibility. The (potential) future rent is based on a Discrete Choice Experiment that will be translated into the Willingness To Pay (WTP). Next to this, the investment costs will be based on a cost indicator which is justified by the use of a Pairwise Comparison experiment under experts. All these subjects will be discussed in the following chapters.

4. DISCRETE CHOICE MODEL (DCM)

The most common characteristics and attributes that are found during the literature study that can have influence on the transformation potential of vacant buildings are listed in Appendix B and C. However, not all attributes are equally important from the perspective of the different actors in the transformation process. For example attributes regarding the Dutch building decree and other necessary permits are (most of the times) only concerning the developer and investor. Next to this there are also certain attributes and characteristics that will give the potential tenant (target group) sufficient utility so that they are more willing to rent certain housing units. These attributes depend upon the defined target group(s), during this research young people, but will always include price and location.

This chapter introduces the research method Discrete Choice Modeling (DCM) and the application of DCM within this research. In addition to this the characteristics and attributes that are important for the target group will be discussed further on in this chapter.

4.1 Discrete Choice Experiment

''An object can have no value unless it has utility. No one will give anything for an article unless it yields him satisfaction. Doubtless people are sometimes foolish, and buy things, as children do, to please a moment's fancy; but at least they think at the moment that there is a wish to be gratified.'' – F.M. Taussig, Principles of Economics, 1912

The aim of this Discrete Choice Experiment is understanding the preferences of future tenants regarding possible housing units realized with transformation. Knowing the desired mix of attributes that a target group is looking for, might guarantee the success of the transformation project. As previously indicated in the report the focus is on the market segment existing of young people (students, (re)starters on the housing market, temporary/starting employees), a rapidly mutating and moving target group. So their preferences need to be analyzed.

In housing choice decision research, four life-course careers are defined: labour career, family career, educational career, and housing career. Changes in each of these life-course careers influence the probability of moving: households will reconsider their housing situation because of changing needs. Young people, also including students, are in a unique (very dynamic) life stage which is very dynamic with many occurring life events in all career paths (Coulter et al., 2010; Geist & McManus, 2008; Lee & Waddel, 2010 cited in Nijenstein, 2012). Therefore, young people move relatively often.

The target group within this research can be described as a market segment that is characterized by starters on the housing market, lower till middle income with less luxurious housing needs that mainly want fast and inexpensive housing units. This target group is

important to the housing market, because of their many and rapid movements. These potential tenants often wish a housing unit in the low and medium-priced segment. However such kind of properties are hard to obtain. The offer is small and it is difficult for them to get a mortgage.

There are many housing attributes with a range from intrinsic housing attributes such as cost and size to extrinsic attributes such as exterior design and other location factors. (Opoku & Abdul-Muhmin, 2010; Ilesanmi, 2010) The relative importance of different housing attributes is a function of national and/or social context and the perspective of the actor. Not all attributes are equally important for the different actors in the transformation process. For example, for consumers from highly developed countries, features of the house, economic and location factors are the most important factors. (Opoku & Abdul-Muhmin, 2010 cited in Vasilache, 2013) These attributes depend upon the defined target group(s), but will always include price and location. Location is always the most important attribute of real estate, while other attributes can be changed by various interventions, the location aspects cannot be influenced.

4.1.1 Background Discrete Choice Modelling

Discrete Choice Modeling (DCM) is a relatively new statistical technique that looks at the choices that individuals make between alternatives of products and services (Glumac, 2012). There are various types of data and data collection methods available to estimate preferences and choices of certain group of respondents (eg. A. Kemperman, 2000 cited in Glumac, 2012). DCM allows the researcher to determine the impact of product and/or service composition on different target groups of individuals.

A Discrete Choice Experiment (DCE) describes the likelihood or probability of a particular choice of a consumer for a number of alternatives. An individual is assumed to have preferences defined over a set of alternatives, treatment combination, based on *utility maximization*. So DCE is a technique for investigating individual or group preferences (Hensher, Rose, & Greene, 2005). The results of this experiment will be helpful to create a strategy for improvement of potential housing units including the lettability and will therefore help to maximize returns.

During the preparation of the Discrete Choice Experiment, the steps in the design scheme proposed by Hensher, Rose & Greene (2005) are held as a guideline. This process is presented in figure 7.

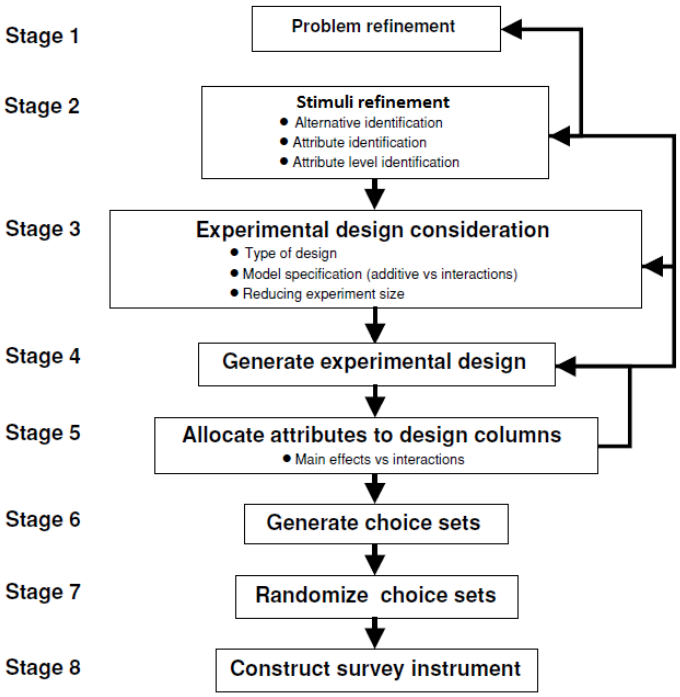


Figure 7 Design process for a Discrete Choice Experiment (Hensher, Rose, & Greene, 2005)

The methodological steps are:

1) Problem refinement; The problem during this research is to distinguish the vacant offices that have potential for transformation into housing for young people out of all offered vacant offices. This part is already discussed in chapter 2 Problem description.

2) Stimuli refinement; The Discrete Choice Model is based on attributes. These attributes, push and pull attributes, explain why the target group wants to live at a specific location and in a certain building. The most important attributes, based on a literature study, form the input of the model. In order for the questionnaire to be short enough only the attributes and attribute levels that are relevant and interesting for the potential target group will be considered in this questionnaire.

We define attribute levels as the levels assigned to an attribute as part of the experimental design process. The first decision is how many attribute levels to assign to each attribute, noting that the number of levels does not have to be the same for each attribute. Each "possible" attribute level may be mapped to a point in utility space. The more levels we measure of an attribute, the more information (and hopefully accuracy) we capture in utility space (Hensher, Rose, & Greene, 2005).

3) Experimental design consideration; Regarding the experimental design, several design characteristics have to be considered. Number of different classes of designs are available (full factorial or fractional factorial design), The coding format (orthogonal, dummy or effects coding), labeled or unlabeled experiments and effects between attributes (Hensher, Rose, & Greene, 2005). These characteristics will be discussed within subchapter 4.2.3 Experimental design consideration.

4) Generate experimental design; When the characteristics are established the experiment can be generated. This means that the combination between the attribute levels has to be made. Afterwards, the attributes need to be allocated to design columns. Therefore it is required to code the attribute levels using orthogonal codes (Hensher, Rose, & Greene, 2005). At the end of the design process, based on the book of Hahn & Shapiro (1966) choice sets will be generated and randomized to receive reliable data. When these choice sets are realized, the survey will be prepared and distributed to reach respondents.

Elaborating a questionnaire is a complex process and the researcher has to empathize with the respondents, in order to make the questionnaire understandable. This phase is crucial because the collected data has to deliver the necessary information to answer the research question.

The next step is to collect all data and processing this data in the program SPSS. All incorrect responses need to be removed (cleaning data). When these steps are done the preferences of the potential tenant can be analyzed and quantified by providing a relative weight for each attribute (and corresponding levels). The results of this study can be used by developers and investors to evaluate the suitability of housing alternatives for the potential tenant (young people) within a certain building. This can be done by comparing the characteristics and possibilities of the building with the needs of the potential tenants.

4.2 Experimental design

Preferences and wishes of each individual within the target group can be translated into a choice. Choices are based on income combined with the degree of satisfaction, utility, that the product offers. (Hensher, Rose, & Greene, 2005)

Not all characteristics and attributes that arise from the literature study are important regarding to the requirements and wishes of the potential user, therefore these “unimportant” attributes will not be taken into account within the questionnaire.

Besides the attention of who is making the choice, it is important for this experiment to describe the settings of a decision moment, a so called scenario.

4.2.1 Fixed attributes (scenario)

There are several attributes that remain constant through the entire questionnaire, table 2. This can be translated into a so called scenario. These attributes are chosen to be constant, because they describe a situation in which the respondent has to choose between different housing alternatives. In addition, these are minimum requirements from the developer.

Fixed attributes (scenario)			**Explanation**
1. Market	0	Rental market	Housing units available for rent
	1	Buyers' market	
2. Housing situation	0	Multi-family housing	Flats and apartments (realized in vacant buildings)
	1	Single-family housing	
3. Location	0	University cities	Among others: Amsterdam, Delft, Eindhoven, Enschede, Groningen, Leeuwarden, Leiden, Maastricht, Nijmegen, Rotterdam, Tilburg, Utrecht en Wageningen
	1	Other cities	
	2	Village	
4. Quality / Durability	0	Quality 3	Energy label C or lower Energy label B; basis requirement from the investor Energy label A or higher
	1	Quality 2	
	2	Quality 1	
5. Furnishing	0	Unfurnished	All amenities (washing machine, microwave, other kitchen furniture, bed, table with chairs and wardrobe and so on) are included in the rental
	1	Semi-furnished	
	2	Fully furnished	

Table 2 Fixed attributes and levels

1. *Market and Housing situation*

Because of the proposed target group and their characteristics the focus is only on the rental market and not on the buyers' market. Next to this, it can be said that transformation is only achievable on a larger scale so the focus will be on multi-family housing where several lettable units are available.

3. *Location*

It is a given that most of the successful transformations of vacant real estate occurs within an urban environment as a city. (Voordt & Geraedts, 2007) This fact, in combination with the given target segment makes it more likely that the research is focused on transformation within the large university cities in the Netherlands.

4. Quality / Durability

The amount of money that a potential tenant is able to spend on housing, influences the level of investment from the investor. In order to keep costs under reasonable levels to increase the likelihood of financial feasibility, the quality after transformation will be set to (a minimum of) Energy label B. The Energy label shows the energetic quality of a dwelling. Introduced in 2008 (renewed in 2010), it shows the presence of insulation, e.g. wall insulation or double glazing, building type and a prediction of the annual energy consumption, divided in gas, electricity and (district) heat, depending on the installations

types, needed for heating and ventilation. In order to comply with current regulation on energy efficiency and WWS (WoningWaarderingsStelsel), the buildings will be transformed to an Energy label B. (Vasilache, 2013).

5. *Furnishing*

The potential tenant within the target group moves relatively often (relatively short residence time), and (most of the times) they do not own their own furniture and providing it themselves will dramatically increase their expenses. Next to that, when new tenants with their own furniture are moving into a building there is always a chance of (unforeseen) costs for damages, etc. This means that due to the large number of movements that takes place in the building, aimed at the fast mutating (fast moving) target group, the risk of these costs will increase. Therefore, there is chosen to provide the apartments with (basic) furniture, including bed, wardrobe, desk, etc.

4.2.2 Influential attributes

Housing choice decisions are complex in which many attributes are involved (Jansen et al., 2011 cited in Nijenstein, 2012). The attributes used in this experiment are derived from a literature study. These attributes can be divided into the following main categories: Functional, Technical, Cultural, Legal and Financial. An example list of these attributes can be found in Appendix C (Voordt en Gereadts).

The findings within this literature study together with the input of experts of Camelot represent the input for this experiment. Refinements of this list is done by some modifications that were necessary. Not all attributes are of influence on the choice of a potential tenant in order to rent a housing unit in a transformed building. Regarding to this part of the research, the complete list of attributes is reduced to only the key attributes that are important in the choice of the potential tenant. These modifications are mostly related to the rules of thumbs that the most appropriate number of attributes for modeling is between 7 and 10 attributes (Hensher, Rose, & Greene, 2005) (Glumac, 2012).

Several studies have been conducted about the influence of housing characteristics and their influence on the choice to live somewhere or not. Housing characteristics such as **price** and **size** are thought to influence housing preferences and housing choice behaviour substantially (Dieleman, 2001; Lee & Waddell, 2010; Lindberg et al., 1989; Louviere & Timmermans, 1990; Molin et al., 1996; Molin, Oppewal, & Timmermans, 2001; Timmermans, Borgers, Van Dijk, & Oppewal, 1992 cited in Nijenstein, 2012; Voordt & Geraedts, 2007). Next to that, aspects of the residential environment and **location aspects** as **green areas**, parking facilities and **accessibility** are from a lesser extent but still influential on the housing choice behaviour (Kim, Pagliara, & Preston, 2005; Lee & Waddell, 2010; Louviere &

Timmermans, 1990; Molin et al., 1996; Lindberg et al., 1989 cited in Nijenstein, 2012; Bouwmeester, 2006)

More functional attributes that are mentioned often within the different literature are the **type of housing units** (apartments, studio, etc.) and the **outdoor space** (garden, balcony, etc.) (Voordt & Geraedts, 2007; Nijenstein, 2012; Vasilache, 2013; Beurden, 2013).

Student housing providers and organisations in the Netherlands have conducted quite some research on students' housing choice behaviour in the Netherlands (e.g. Gjaltema, Vijncke & Poulus, 2009; Laagland'advies, 2009; Poulus, 2011; Rabobank, 2006; Van Alphen, 2010; WonenBreburg, 2009, 2011 cited in Nijenstein, 2012) (Voordt & Geraedts, 2007). In these studies, price, size, condition of the complex, **shared versus private facilities** and accessibility of city centre, facilities and campus were found to be important in housing choice decisions for students.

In addition to these frequently mentioned attributes, it is interesting to see if the **formerly use** of the building influence the housing choice behaviour of the potential user. The formerly use influences the exterior, the appearance and the layout of the building. But does the former use of the building also affects the housing choice behaviour of the potential target group.

The selected attributes that are used within the questionnaire are presented in table 3. The attribute levels represent the levels assigned to an attribute as part of the experimental design process. These are represented by numbers that will have no meaning to the decision maker being surveyed. That is why, attribute level labels are assigned. These labels may be numbers (quantitative) or words (qualitative). (Hensher, Rose, & Greene, 2005)

While it breaks with the global utility maximizing rule, reducing the alternatives by excluding "insignificant" alternatives is performed. This is done to reach a manageable number of alternatives.

4.2.2.1 Choice attributes (variables)

Attribute	Level	Labels	Explanation
1. Type of building (Formerly use)	0 1 2	Former industrial building Former elderly home Former office building	The initial use of the building
2. Facilities (Private or shared)	0 1 2	Shared facilities Partly shared and partly private Private facilities	Own bedroom, all other facilities are shared Own bathroom, shared laundry room and kitchen All facilities are private
3. Type of housing	0 1 2	Room Studio Apartment	Only a bedroom (common areas) Living, dining and bedroom combined (open floor plan) Apartment with separate bedroom
4. Price (€/sqm)	0 1 2	25-28 €/sqm 21-24 €/sqm 17-20 €/sqm	Average rental prices (incl. service charges and furnishing costs) on the market
5. Outdoor space	0 1 2	None Balcony Garden	Availability of outdoor space
6. Proximity of city center	0 1 2	3 km < Distance to city center 1 km < Distance to city center ≤ 3 km Distance to city center ≤ 1 km	Distance to city center or equivalent environment (applicable in a city with multiple centers)
7. Accessibility by Public transport	0 1 2	3 km < Distance to station 1 km < Distance to station ≤ 3 km Distance to station ≤ 1 km	Distance to the train/bus/underground/tram station or stop
8. Storage space	0 1 2	Not available Available; outside the building Available; inside the building	Availability of storage space This storage could be situated on the same floor or in the basement

Table 3 Choice attributes and levels

1. *Type of building*

Several types of buildings can be adapted when studying transformation of vacant buildings into housing units. However, not all buildings are equally suitable for transformation. Because of the small margins there is lot of pressure on the financial feasibility regarding transformation of vacant buildings, therefore it is important that the realization costs of the transformation are as low as possible. So the basic structure of the building should allow to realize small housing units.

In the Netherlands vacancy on the real estate market is adapted as a serious problem. This vacancy is not only situated in the office sector, but extends also to other sectors such as industrial real estate en care homes. (Vatgoedmarkt, 2014; Telegraaf, 2014) A lot of these vacant offices and industrial buildings are available for transformation, and in the future there will occur more and more vacancy among care homes due the changing health care measures (regarding to elderly care in the Netherlands). The government has decided in the coalition agreement to cut down the spending in elderly care. In the future there will be no place in a government-funded care house for someone with a light indicator for care. People still have the possibility to rent a room, but the policy of the government is aimed to keep people at their own home longer. (Boex & Voermans, 2014; Waalen, 2013) With this change, the demand for health care properties will decline and responding to this there will occur more vacancy in this sector.

During this research these three types of real estate will be taken into account in the questionnaire. Because in the future vacancy will consist for a large portion out of these three building types and the basic structure of these buildings are often suitable for transformation into multi-family housing units (for example apartments and student housing).

It is a fact that the formerly use of the building influences the exterior, the appearance and the layout of the building, but it is interesting to see if the formerly use of the building also influence the housing choice behaviour of the potential user. The three different levels are:

0. Former industrial building;
1. Former care homes;
2. Former office building.

2. *Facilities*

Facilities can be shared or private, regarding to the target group both possibilities could be acceptable. The (most common) possibilities are described and divided among the following levels:

0. All facilities are shared;
1. Private bathroom, shared laundry room and kitchen;
2. All facilities are private.

3. *Type of housing*

Several types of housing can be adapted when studying transformation of vacant buildings into housing units. However, the types of housing that also match with the target group of young people are more limited. Only single rooms, studios, apartments and row-houses fall within the range. The single rooms consist only out of a bedroom (possibly with some minor facilities). Studios are dwellings consisting of one large space (room) on one floor. Apartments are individual housing units in a multi-family building and row-houses are self-standing units that are multiple concatenated (a continuous row). During this research the row houses will be left out of consideration as they cannot be achieved in the proposed building types.

The Floor layout is relevant as it defines the amount of privacy the dwelling has to offer. With respect to the target group (lower till middle income with less luxurious housing needs), smaller affordable housing units were considered either with one open floor space or with a separate bedroom, with the possibility of private or shared facilities. That is why there is chosen for two different levels: (Vasilache, 2013)

0. Room;
1. Studio;
2. Apartment;

4. *Price*

While location and price are strictly correlated (also due to land prices) they cannot be both introduced into the questionnaire as the attributes must not be correlated. Introducing correlated attributes, will result in confusion and it will be impossible to establish the role of each term. In such cases, in order to respect the IID condition of (independently and identically distributed) only one attribute will be selected and used as a proxy for the other. (Vasilache, 2013) (Hensher, Rose, & Greene, 2005)

Price is always an important criteria or attribute in each product selection. Prices will be based on market values generated by data from Camelot Leegstandbeheer & -advies. These market values will be presented in €/sqm. All tpes of housing are quiet similar regarding to rental prices. By using the data and knowledge from Camelot, an average rental price per sqm has been established. Next to his average there are situations that the rent may be slightly higher or lower, due to the dynamics of the market. The following distribution can be made (Funda, 2014; Camelot, 2013):

0. 25-28 €/sqm (€25 < Rent/sqm ≤ €28);
1. 21-24 €/sqm (€21 < Rent/sqm ≤ €24);
2. 17-20 €/sqm (€17 < Rent/sqm ≤ €20);

5. *Outdoor space*

Since 2012 the new Dutch building decree is active. This decree does not require any outdoor space for a certain living unit or dwelling (Overveld, Graaf, & Berghuis, 2011). However it is important and interesting to know if the presence of any outdoor space as a balcony or garden influence the decision of the potential user. This attribute is divided into three different levels to be able to estimate how this decision will be influenced or not.

0. No outdoor space;
1. Balcony;
2. Garden.

6. *Proximity of city center*

The distance to a city center or equivalent environment is important during the consideration of various housing alternatives (e.g. De Meirleir, 2006; Salvaneschi & Akin, 1966 cited in Glumac, 2012). For long periods and a lot of developments most cities have evolved different cores, with an equivalent environment, within the same city. This is the reason why this attribute is not only based on the original city center but to key city sites. The following distribution regarding this attribute is used:

0. 3 km < Distance to city center (or equivalent);
1. 1 km < Distance to city center (or equivalent) ≤ 3 km;
2. Distance to city center (or equivalent) ≤ 1 km.

7. *Accessibility by public transport*

The average distance from a housing unit to a public transport station (or stop) in the Netherlands is 5,1km (CBS, 2014). University cities are in general, in terms of accessibility, efficiently arranged so this average distance is much smaller, for that reason the following levels are distinguished:

0. 3 km < Distance to station;
1. 1 km < Distance to station ≤ 3 km;
2. Distance to station ≤ 1 km

8. *Storage space*

Since the new Dutch building decree (2012) is active, it is not mandatory that each housing unit also has storage space (Overveld, Graaf, & Berghuis, 2011). Regarding to the target group several possibilities could be acceptable. Three basic and most common possibilities:

0. Not available;
1. Available; outside the building;
2. Available; inside the building.

4.2.3 Experimental Design Consideration

After identifying the attributes and their levels and labels the analyst has to decide what kind of design is suitable for this experiment. The most important decision and steps for a DCM are described below. All considerations are based on the book "Applied choice analysis: a primer" from Hensher, Rose, & Greene (2005).

The first choice is based on the preference for a full factorial design or a fractional factorial design. A full factorial design covers all possible combinations, L^A, where L are the number of attribute levels and A number of attributes. For this research: $L^A = 3^8 = 6561$ treatment combinations. With this type of design it is possible to estimate all main effects and all interaction effects independent of one another. But from a practical perspective this ensures that the questionnaire is too long to handle by the respondents, so the experiment will be based on a fractional factorial design.

The amount (minimum number) of treatment combinations necessary for a fractional factorial design is based on figure 8 (Hahn & Shapiro, 1966).

DESIGN INDEX

A SUMMARY OF EXPERIMENTAL PLANS

Page 3

1	2	3a	3b	3c	3d	4	5	6	7	8	9	10
Experimental Plan Code Number	Total Number of Variables	Number of Variables at 2 Levels	Number of Variables at 3 Levels	Number of Variables at 4 Levels	Number of Variables at 5 Levels	Number of Tests Required	Are All Main Effects Independent of 2 Factor Interactions?	Number of Independent Two-factor Interactions Under Assumed Model	Residual Degrees of Freedom	Master Plan #	Using Columns Number	Columns From Which 2 Factor Interactions Can Be Estimated
21a	8	0	8	0	0	27	No	1	6	8	1,2,5,6,10,11,12,13	AC: 1,2
21b	8	0	8	0	0	81	Yes	10	24	13	1,2,5,6,11,15,35,38	AC: 1,2,5,6,11
21c	8	0	8	0	0	81	No	7	36	13	1,2,5,6,10,14,22,26	WAO: 1
21d	8	0	8	0	0	243	Yes	28 (All)	114	NBS54	Pg. 25	All

Figure 8 Design Index; A summary of experimental plans (Hahn & Shapiro, 1966)

The number of treatment combinations depends on the amount of variables that need to be estimated. In this case there is a total of 8 different variables, each consisting of 3 levels, resulting in 27 treatment combinations. This is significantly smaller than the 6561 treatment combinations within a full factorial design. The more variables that need to be estimated for the experiment the more treatment combinations are required for the experiment.

The next decision that need to be made is the choice between a labeled or unlabeled experiment. For this experiment there is chosen for a unlabeled design because this does not require identification and use of all possible alternatives. Because of this we have no problem with the previously selected attributes and attribute levels.

An effect is the impact a particular attribute level has on choice. For experimental designs, we define an effect as the difference in treatment means. A main effect is defined as the direct independent effect of each attribute upon the response variable, choice. The main effect, therefore, is the difference in the means of each level of an attribute and the overall or grand mean. An interaction effect is an effect upon a response variable, choice, obtained

by combining two or more attributes which would not have been observed had each of the attributes been estimated separately (Hensher, Rose, & Greene, 2005).

An interaction occurs when the preference for the level of one attribute is dependent upon the level of a second attribute or the impact two attributes are having when acting in concert. The experiment will only estimate the main effects as no interactions between the chosen attributes are considered to be relevant. This type of design is called orthogonal main effects only design (Vasilache, 2013).

The experiment will estimate non-linear effects, by using dummy or effects coding. Both coding methods have the advantage that non-linear effects in the attribute levels may be measured. Hensher, Rose, & Greene (2005) suggests that by dummy coding the data we have perfectly confounded the base level of an attribute with the overall or grand mean. Each attribute we dummy code will also be perfectly confounded with the grand mean. The question is then, what have we measured? For this reason it is preferred to use effects coding among dummy coding, because with effects coding there is no perfectly confounding of the base attribute level wit hthe grand mean of the utility function.

The last aspect to be considered here concerns the introduction of the no choice alternative. As the objective of the experiment is to estimate the demand for various alternatives, then the inclusion of a non-choice alternative is needed, thus decision makers will not be forced to select among the available alternatives. Forcing respondents to select only from the presented alternatives would lead to over estimated results (Hensher, Rose, & Greene, 2005).

4.2.4 Generated experimental design

27 treatment combinations are sufficient to create an orthogonal uncorrelated design, figure 8. Hahn & Shapiro (1966) have provide a design matrix, Masterplan 8, that belongs to Experimental Plan Code 21a resulting from the design consideration. This plan, based on number of attributes and their levels, is translated into a workable and clear design matrix, figure 9a. The explanation of the symbols can be found in figure 9b.

Treatment combinations	*Design Matrix*							
	BU	**FA**	**HO**	**PR**	**OU**	**CE**	**AP**	**ST**
1	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*2*
3	*0*	*0*	*2*	*2*	*2*	*1*	*2*	*1*
4	*0*	*1*	*0*	*0*	*1*	*1*	*2*	*2*
5	*0*	*1*	*1*	*1*	*2*	*0*	*0*	*1*
6	*0*	*1*	*2*	*2*	*0*	*2*	*1*	*0*
7	*0*	*2*	*0*	*0*	*2*	*2*	*1*	*1*
8	*0*	*2*	*1*	*1*	*0*	*1*	*2*	*0*
9	*0*	*2*	*2*	*2*	*1*	*0*	*0*	*2*
10	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*1*
11	*1*	*0*	*1*	*2*	*2*	*0*	*2*	*0*
12	*1*	*0*	*2*	*0*	*0*	*2*	*0*	*2*
13	*1*	*1*	*0*	*1*	*2*	*2*	*0*	*0*
14	*1*	*1*	*1*	*2*	*0*	*1*	*1*	*2*
15	*1*	*1*	*2*	*0*	*1*	*0*	*2*	*1*
16	*1*	*2*	*0*	*1*	*0*	*0*	*2*	*2*
17	*1*	*2*	*1*	*2*	*1*	*2*	*0*	*1*
18	*1*	*2*	*2*	*0*	*2*	*1*	*1*	*0*
19	*2*	*0*	*0*	*2*	*2*	*2*	*2*	*2*
20	*2*	*0*	*1*	*0*	*0*	*1*	*0*	*1*
21	*2*	*0*	*2*	*1*	*1*	*0*	*1*	*0*
22	*2*	*1*	*0*	*2*	*0*	*0*	*1*	*1*
23	*2*	*1*	*1*	*0*	*1*	*2*	*2*	*0*
24	*2*	*1*	*2*	*1*	*2*	*1*	*0*	*2*
25	*2*	*2*	*0*	*2*	*1*	*1*	*0*	*0*
26	*2*	*2*	*1*	*0*	*2*	*0*	*1*	*2*
27	*2*	*2*	*2*	*1*	*0*	*2*	*2*	*1*

Figure 9a Design Matrix regarding DCM

	Symbol	Explanation
1	**BU**	Building type
2	**FA**	Facilities
3	**HO**	Housing unit
4	**PR**	Price
5	**OU**	Outdoor space
6	**CE**	Proximity city center
7	**AP**	Accessibility Public transport
8	**ST**	Storage space

Figure 9b Explanation of symbols

The correlation test, Appendix D, shows that all attributes are statistically independent (uncorrelated). Orthogonality between the design attributes represents the basic criterion in the generation process. Optimal designs optimize the amount of information obtained from a design and are considered statistically efficient. By using the predefined orthogonal fractional factorial design, the amount of information obtained from a design is optimized and correlations within the design are minimized to zero (Hensher, Rose, & Greene, 2005).

4.2.4.1 Choice sets

A choice set consists out of different treatment combinations, alternatives consisting of a set of attribute levels, of which the respondent has to choose the alternative that he/she prefers. If there is no preferable treatment combination the respondent can choose the option “No preference”. It represents the information of the choices made by the respondents.

Choice set	Alt. 1	Alt. 2	Alt. 3
1	4	25	19
2	21	8	18
3	16	27	11
4	12	26	17
5	15	10	22
6	24	6	3
7	1	13	2
8	20	23	5
9	14	9	7
10	25	15	23
11	7	6	12
12	14	1	5

Figure 10 Generated choice sets

There are 27 treatment combinations, which are presented as 9 choice sets of 3 alternatives. Various choice sets can be created by randomizing the treatment combinations over choice sets, this is done in Excel. Preferably each respondent will randomly face all 27 treatment combinations presented with different sets of 9 choices. Each alternative / treatment combination act as an independent hypothetical scenario (combination of the fixed attributes and the choice attributes belonging to that alternative). After generation of all choice sets, labels were assigned for each alternative in the form “Alternative 1”, “Alternative 2”, “Alternative 3” and “No preference”.

A detailed version of the generated choice sets can be found in Appendix E. An example of a choice set is shown in figure 11.

Which housing alternative meets the most of your needs?

Attributes	Alternative 1	Alternative 2	Alternative 3	No preference
Building type	Former industrial building	Former office building	Former industrial building	
Facilities	Independent	Collectively	Semi-independent	
Type of housing	Studio	Studio	Room	
Price (€/m²)	21-24 euro/m²	25-28 euro/m²	25-28 euro/m²	
Outdoor space	Not available	Not available	Balcony	
Proximity of city center or equivalent	1km< Distance <=3km	1km< Distance <=3km	1km< Distance <=3km	
Accessibility by public transport	Distance <=1km	Distance >3km	Distance <=1km	
Storage space	Not available	Available outside the building	Available inside the building	
UW KEUZE:	o	o	o	o

Figure 11 Example of choice set in questionnaire

An overview of the entire questionnaire is attached in Appendix F.

4.3 Results Discrete Choice Experiment

The most cited rule of thumb (Rose & Bliemer, 2013) is developed by Johnson and Orme (2003) (Orme cited in Vasilache, 2013):

$n \geq 500 \frac{L}{S * a}$, where L represent the highest number of level of attributes (= 3), S the number of choice sets (= 9) and a the number of alternatives (= 3, not concerning “no preference”). 500 is intended to be a minimum threshold when researchers cannot afford to do better. It

would be better, when possible, to have 1000 or more representations per main effect level. (Vasilache, 2013)

Considering this rule of thumb and the remark placed by Vasilache (2013), the minimum number of respondentens is n ≥ 1000 * $\frac{3}{9*3}$ = 112.

Orme (2010) suggests that a minimum sample size of 200 respondents for studies involving an analysis of differences between sample segments can suffice. (Orme, 2010)

Rose & Bliemer (2013) state that sample sizes whit less than thirty responses per alternative produce estimators which cannot be analyzed reliably by asymptotic methods.

Based on these findings the minimum sample of respondents is set at 200.

4.3.1 Data collection

The data was gathered using Berg Enquête System © 2007, an on-line survey tool. The questionnaire was open for public from the 20/05/2014 until 12/06/2014 and was promoted on social media like Facebook and LinkedIn and with help of TU/e, Camelot Leegstandbeheer & -advies and PanelClix online marktonderzoek. The questionnaire was excessed by 769 respondents which has resulted in 441 complete responses. The minimum amount of responses was set at 200 complete questionnaires, so this is satisfying. The overall response rate was 57,4%.

Since the target group for this research is set at young people, the questionnaires from respondents that do not fall within this target group should be excluded from the analysis. Inbo and WoningNet (2013) suggests that starters until the age of 29 years fall within this target group. The requirements for this group are then sharpened by stating that only young people with a maximum of 2 years working experience belong to this target group. After a first analysis concerning the characteristics of the respondents 110 questionnaires were excluded from further analysis. Which ensures that there are 331 complete questionnaires remain to be analyzed. From these complete questionnaires, 3 more had to be rejected. They were rejected because the respondents only chose for the “no preference” option.

As previously mentioned (chapter 5.2.3 Experimental design considerations), in order to test for non-linear effects, the data is recoded by using effects coding. The attributes are recoded based on the scheme in table 4.

Levels	3 levels		2 levels
High	1	0	1
Medium	0	1	
Low	-1	-1	-1

Table 4 Effects coding

After cleaning and recoding the data it can be formatted to be analyzed by using SPSS22. Each alternative within a choice set is allocated to a separate row of data. Considering this, each respondent will be represented by 9 blocks, representing an individual choice set. Each block consists of 4 rows, corresponding to an alternative within the choice set. Thus, for each respondent there will be 36 rows of data.

4.3.2 Respondents

The respondents can be categorized based on their answers on the "personal characteristics" questions. The most important characteristics to identify the respondents for this research are age and career status. An overview of this group is given in table 5. In this table the target group is highlighted in grey (total of 331 respondents, of which 3 respondents, that only have chosen for "no preference", will be rejected).

Age	Total respondents	Student	Unemployed	Employee < 2 year	Employee > 2 year
< 20 year	41	40	0	1	0
20 -24 year	221	176	2	29	14
25 - 29 year	124	44	6	33	41
30 - 34 year	17	2	5	2	8
> 34 year	38	1	6	5	26
	441	*263*	*19*	*70*	*89*

Table 5 Personal characteristics respondents

The most important conclusion from table 4 is that the respondents within the target group for this research exists for 78,5% out of students (260 respondents). A graphic representation can be found in figure 12.

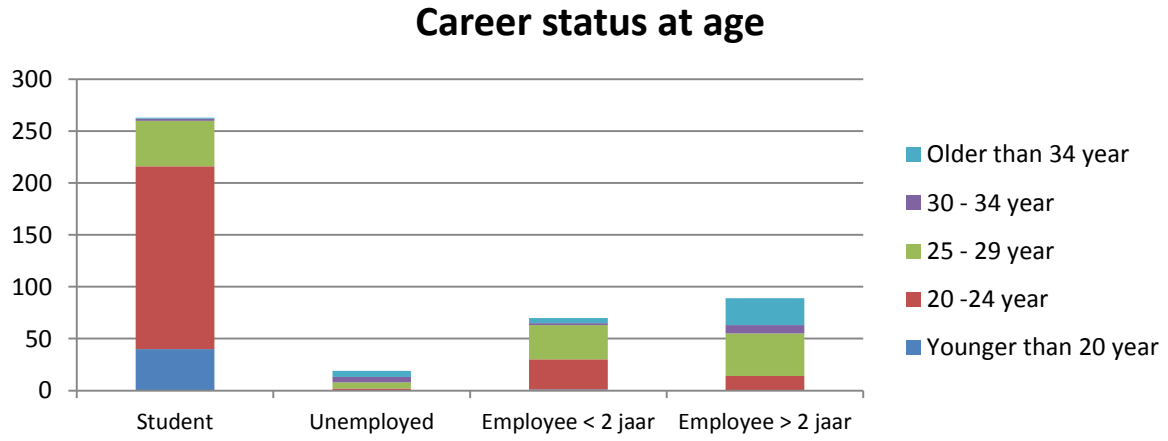


Figure 12 Graphic representation of respondent by age and career

4.3.3 Data check

A quick data check is performed by analyzing the descriptive statistics output, figure 13, which suggests that all variables are within expected parameters. The number of cases (11.808) shows that all observations were read: 328 * 36 = 11.808. Other parameters to be checked are: all attributes are between -1 and 1, age and career are between 1 and 3 and alternative is between 1 and 4. During this quick data check no errors have occurred.

Statistics

		Preference	BU	FA	HO	PR	OU	CE	AP	ST
N	Valid	11808	8856	8856	8856	8856	8856	8856	8856	8856
	Missing	0	2952	2952	2952	2952	2952	2952	2952	2952
Mean		2.04	,00	,00	,00	,00	,00	,00	,00	,00
Minimum		1	-1	-1	-1	-1	-1	-1	-1	-1
Maximum		4	1	1	1	1	1	1	1	1

Statistics

		Age	Career
N	Valid	328	328
	Missing	0	0
Mean		2,13	1,40
Minimum		1	1
Maximum		3	3

Figure 13 Output descriptive statistics

The descriptive outcomes highlights that most of the respondents are representing the second group of age (20-24 years) as the mean value of age is given by 2.13, figure 13.

Next to this, based on the descriptive outputs there can be stated that an orthogonal array is generated. This results from the conclusion that the averages of all attributes are equal to 0.

The correlation matrix was generated and analyzed in order to check for correlations, Appendix G. This ascertainment is relevant, as significant correlation may result in multi-collinearity at the time of modeling, which has implications for both model estimation and prediction. No significant correlations were observed, thus orthogonality is not seriously compromised and data analysis can be pursued.

4.3.4 Model estimations

Data analysis is based on the Multinomial Logit Model (MNL) where, for current choice experiment with three unlabeled alternatives and a “no preference” option, the utility of each alternative is based on the following choice model estimation:

$U_{(1)} = U_{(2)} = U_{(3)} = B_0 + (\text{Coefficient BU})^2 + (\text{Coefficient FA})^2 + (\text{Coefficient HO})^2 + (\text{Coefficient PR})^2 + (\text{Coefficient OU})^2 + (\text{Coefficient CE})^2 + (\text{Coefficient AP})^2 + (\text{Coefficient ST})^2$

$U_{(4)}$ = 0 for the "no preference" alternative

B_0 is a constant defined as the base alternative, representing the utility of undefined attributes. During the analysis no levels were assigned for the coding of the "no preference" alternative, because nothing is known by definition of its attributes and levels. Thus in examining the "no preference" utility perceived by respondents, it is equal to $-B_0$. (Haaijer, Kamakura, & Wedel, 2001)

B_0 indicates the general attitude toward the proposed housing alternative. This attitude can be positive or negative and it is indicated by the sign of the variables' coefficient. When B_0's value is positive, the utility offered by the proposed alternative starts from a value above 0, indicating that the alternative is of interest and that the respondents or socio-demographic groups are positive toward this type of housing. On the other side, when the value of B_0 is negative, it suggests that the respondent or group of respondents is not interested in the proposed type of housing. Similar to any other variable, the bigger the value of the B_0 coefficient, the more influence it has on the overall preference of a certain group. (Vasilache, 2013)

4.3.5 MNL Model

An MNL model is generated and parameters were estimated for the target group young people (respondents until 29 years, with a maximum of 2 years work experience).

Each possible MNL model performs differently and their goodness of fit is tested using the McFadden's pseudo-R^2: pseudo-R^2 = LL_M / LL_0, where LL_M is the likelihood function for the estimated model and LL_0 is the likelihood function for the model estimated with no coefficients, also known as the base model.

The value of pseudo-R^2 from a model can not be evaluated as good or bad in singularity, but it can be judged relative to other models that have been estimated similarly. Values of 0.2 to 0.4 are considered highly satisfactory and that the model has an excellent fit, while models with values of pseudo-R^2 below 0.1 are considered weak. The models with higher R^2 will be considered as better performing models.

The pseudo-R^2 for the current model is 0,086. Given the previous comment this model could be considered weak, but the low value could be explained because the situation of the target group is not always homogeneous and because there are just three levels for each attribute. For this research we accept this value for pseudo-R^2, because this model provides meaningful information about the general preferences of young people. The positive (and relatively high) value for the B_0 coefficient (= 1.450) suggests that generally respondents have a positive attitude towards the proposed alternatives and the significance of the coefficient comes to support this.

All three levels of all attributes, except Building Type (BU), are considered significant. This high number of significant attributes can be explained by the heterogeneity between the respondents, each respondent has different preferences. The attribute BU is the only attribute that is not significant at all. There can be concluded that this attribute plays no role in the choice between the different housing alternatives. Further the B_0 coefficients for Facilities (FA), Outdoor space (OU) and Housing unit (HO) are relatively high (positive or negative) and thus these attributes have the most impact during the housing alternative choice. An overview of the outcome regarding the MNL model from SPSS is given in table 6, and Appendix H.

Overall cheaper apartments with a garden and private facilities close to public transport stations or stops are preferred by the specified target group. This is no surprise. However, it is remarkable that not the high level of price but the attribute levels concerning shared facilities, semi-private facilities and no outdoor space have the biggest negative influence on housing choice behaviour. The levels of private facilities, apartment and garden have the biggest positive influence.

How further the distance to the public transport is how higher the negative impact is on the housing alternative. As mentioned before the former function of the building does not influence the utility that a housing alternative offers.

Table 7 Target group preferences, shows the preferences for each attribute level of the target group young people. Her the non-linearity of the estimate attributes levels is highly visible, and so are the differences in preferences between the levels.

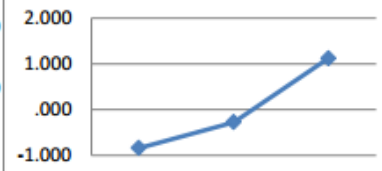
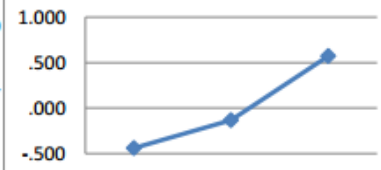
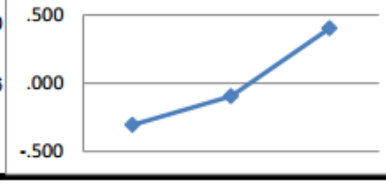
As mentioned earlier the biggest differences between the levels are concerning Facilities, private facilities are strongly preferred among the other two levels.

Parameter Estimates

Voorkeur_A[a]		Labels	B	Std. Error	Wald	df	Sig.	Exp(B)	for Exp(B) Lower Bound	for Exp(B) Upper Bound
1	Intercept	B0	1.450	.110	172.361	1	.000			
	[BU=-1]	Former industrial building	-.058	.060	.947	1	**.331**	.944	.840	1.061
	[BU=0]	Former elderly home	.028	.060	.215	1	**.643**	1.028	.915	1.156
	[BU=1]	Former office building	.030			0				
	[FA=-1]	Shared facilities	**-1.527**	.068	511.039	1	.000	.217	.190	.248
	[FA=0]	Semi-private facilities	**-.723**	.055	170.154	1	.000	.485	.435	.541
	[FA=1]	Private facilities	**2.250**			0				
	[HO=-1]	Room	**-.718**	.060	143.286	1	.000	.488	.434	.549
	[HO=0]	Studio	-.416	.058	51.106	1	.000	.659	.588	.739
	[HO=1]	Apartment	**1.134**			0				
	[PR=-1]	25 - 28 euro / m²	-.637	.067	91.470	1	.000	.529	.464	.603
	[PR=0]	21 - 24 euro / m²	-.261	.058	20.486	1	.000	.771	.688	.863
	[PR=1]	17 - 20 euro / m²	**.897**			0				
	[OU=-1]	None	**-.844**	.067	158.817	1	.000	.430	.377	.490
	[OU=0]	Balcony	-.278	.057	23.552	1	.000	.757	.677	.847
	[OU=1]	Garden	**1.122**			0				
	[CE=-1]	Distance > 3km	-.441	.061	52.187	1	.000	.643	.571	.725
	[CE=0]	1km < Distance ≤ 3km	-.133	.059	5.104	1	.024	.876	.780	.983
	[CE=1]	Distance ≤ 1km	.574			0				
	[AP=-1]	Distance > 3km	-.493	.067	54.408	1	.000	.611	.536	.696
	[AP=0]	1km < Distance ≤ 3km	-.099	.058	2.934	1	.087	.906	.809	1.014
	[AP=1]	Distance ≤ 1km	.592			0				
	[ST=-1]	Not available	-.306	.060	25.961	1	.000	.736	.655	.828
	[ST=0]	Available; outside the building	-.096	.060	2.610	1	.106	.908	.808	1.021
	[ST=1]	Available; inside the building	0.403			0				

a. The reference category is: 0.

Table 6 Model estimates SPSS

Attributes	Levels	Labels	B	Sig.	Graph.
	Intercept	B0	1.450	.000	
Building type	[BU=-1]	Former industrial building	-.058	.331	
	[BU=0]	Former elderly home	.028	.643	
	[BU=1]	Former office building	.030		
Facilities	[FA=-1]	Shared facilities	**-1.527**	.000	
	[FA=0]	Semi-private facilities	**-.723**	.000	
	[FA=1]	Private facilities	**2.250**		
Housing unit	[HO=-1]	Room	**-.718**	.000	
	[HO=0]	Studio	-.416	.000	
	[HO=1]	Apartment	**1.134**		
Price	[PR=-1]	25 - 28 euro / m²	-.637	.000	
	[PR=0]	21 - 24 euro / m²	-.261	.000	
	[PR=1]	17 - 20 euro / m²	**.897**		
Outdoor space	[OU=-1]	None	**-.844**	.000	
	[OU=0]	Balcony	-.278	.000	
	[OU=1]	Garden	**1.122**		
Distance to City Centre	[CE=-1]	Distance > 3km	-.441	.000	
	[CE=0]	1km < Distance ≤ 3km	-.133	.024	
	[CE=1]	Distance ≤ 1km	.574		
Distance to Public Transport	[AP=-1]	Distance > 3km	-.493	.000	
	[AP=0]	1km < Distance ≤ 3km	-.099	.087	
	[AP=1]	Distance ≤ 1km	.592		
Storage space	[ST=-1]	Not available	-.306	.000	
	[ST=0]	Available; outside the building	-.096	.106	
	[ST=1]	Available; inside the building	0.403		

a. The reference category is: 0.

Table 7 Target group preferences

4.3.6 Preferred alternatives

The MNL model developed from the Discrete Choice Experiment can be easily incorporated into a decision support system (DSS) so that the impact of changes in the levels of attributes on choice shares can be predicted. Also tradeoffs in different attribute levels can be tested in order to find the most attractive solution, or to test market competition. (Vasilache, 2013) By introducing data of different alternatives, the utility that these alternatives will deliver to the future user can be generated. Figure 14 and 15 gives an overview of the 27 presented alternatives and their related utilities. Based on the results it can be concluded that alternative 18 represents the highest utility compared to all presented alternatives. This alternative was really close to the maximum utility that could be generated. Alternative 23 is the alternative that is least preferred.

Treatment combinations	Design Matrix									Rank
	BU	FA	HO	PR	OU	CE	AP	ST	Utility	
1	-1	-1	-1	-1	-1	-1	-1	-1	5.95	14
2	-1	-1	0	0	0	1	0	1	4.60	19
3	-1	-1	1	1	1	0	1	0	7.51	10
4	-1	0	-1	-1	0	0	1	1	3.50	26
5	-1	0	0	0	1	-1	-1	0	3.92	24
6	-1	0	1	1	-1	1	0	-1	5.21	17
7	-1	1	-1	-1	1	1	0	0	9.04	4
8	-1	1	0	0	-1	0	1	-1	7.93	9
9	-1	1	1	1	0	-1	-1	1	9.28	2
10	0	-1	-1	0	0	0	0	0	4.48	21
11	0	-1	0	1	1	-1	1	-1	6.66	13
12	0	-1	1	-1	-1	1	-1	1	6.92	12
13	0	0	-1	0	1	1	-1	-1	4.48	20
14	0	0	0	1	-1	0	0	1	3.85	25
15	0	0	1	-1	0	-1	1	0	4.30	22
16	0	1	-1	0	-1	-1	1	1	8.52	6
17	0	1	0	1	0	1	-1	0	8.15	8
18	0	1	1	-1	1	0	1	-1	9.93	1
19	1	-1	-1	1	1	1	1	1	7.20	11
20	1	-1	0	-1	-1	0	-1	0	5.34	16
21	1	-1	1	0	0	-1	1	-1	5.85	15
22	1	0	-1	1	-1	-1	0	0	4.22	23
23	1	0	0	-1	0	1	1	-1	3.40	27
24	1	0	1	0	1	0	-1	1	5.01	18
25	1	1	-1	1	0	0	-1	-1	8.27	7
26	1	1	0	-1	1	-1	0	1	8.72	5
27	1	1	1	0	-1	1	1	0	9.27	3
Maximum	1	1	1	1	1	1	1	1	10.71	

Symbol	Explanation
[BU=-1]	Former industrial building
[BU=0]	Former elderly home
[BU=1]	Former office building
[FA=-1]	Shared facilities
[FA=0]	Semi-private facilities
[FA=1]	Private facilities
[HO=-1]	Room
[HO=0]	Studio
[HO=1]	Apartment
[PR=-1]	25 - 28 euro / m²
[PR=0]	21 - 24 euro / m²
[PR=1]	17 - 20 euro / m²
[OU=-1]	None
[OU=0]	Balcony
[OU=1]	Garden
[CE=-1]	Distance > 3km
[CE=0]	1km < Distance ≤ 3km
[CE=1]	Distance ≤ 1km
[AP=-1]	Distance > 3km
[AP=0]	1km < Distance ≤ 3km
[AP=1]	Distance ≤ 1km
[ST=-1]	Not available
[ST=0]	Available; outside the building
[ST=1]	Available; inside the building

Figure 14b Descriptives

Figure 14a Rank of presented alternatives based on utility

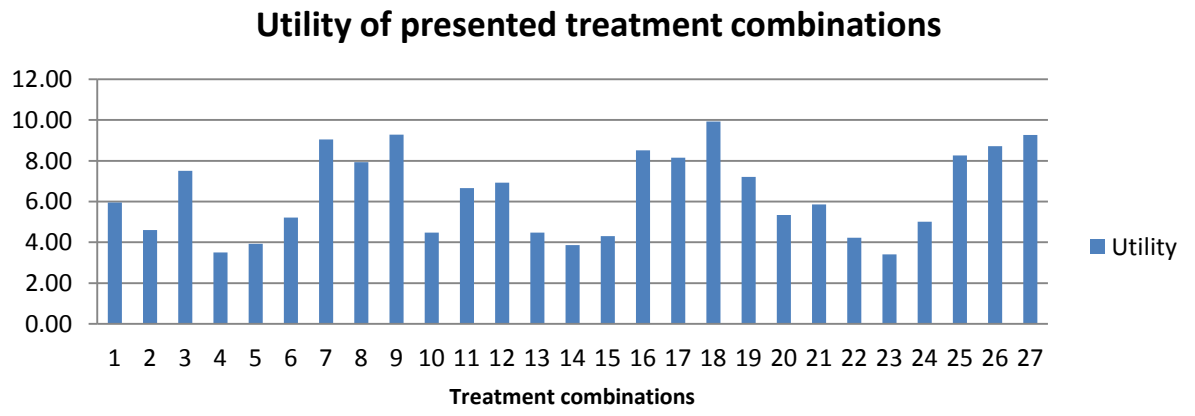


Figure 15 Overview of utility per treatment combination

The findings of this research can be integrated by the development of an support tool that assists developers in choosing the best structure for reuse, by acknowledging not only the best solution from the investor's point of view, but the future users' preferences as well. (Vasilache, 2013) By translating the group preferences into the Willingness To Pay, the preferences can be taken into account during a financial feasibility study (preferences translated into future rent).

4.3.7 Willingness To Pay (WTP)

During the choice experiment, respondents choose alternative 1 in 32,2%, alternative 2 in 34,8%, alternative 3 in 29,3% and the status quo "no preference" in 3,7% of the observations. Figure 16 displays the percentage of respondents participating at or above a specified cost, out of the total profiles viewed at or above the specified cost.

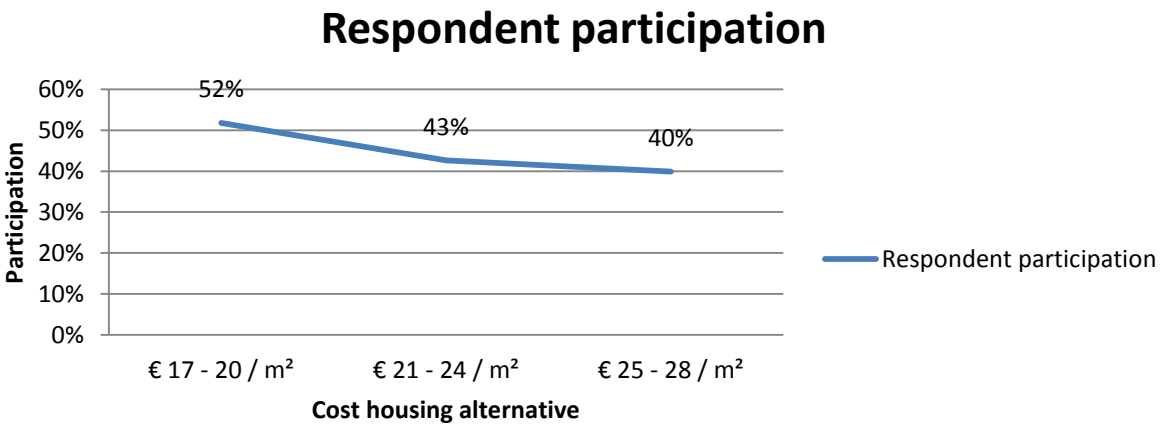


Figure 16 Respondent participation at surveyed cost levels

For example, of the observations including a cost attribute of €17–20/m², 52% of the observations chose this housing alternative (selected alternative 1, 2 or 3). However, at the cost of €21–24/m², only 43% of the respondents participated, and at the top level of €25–28/m², only 40% of the observations which viewed this option choose to participate at that price level.

These results also can be used to estimate the Willingness To Pay (WTP) for housing attributes. A common objective in the use of discrete choice models is the derivation of measures designed to determine the amount of money individuals are willing to forfeit in order to obtain some benefit from the undertaking of some specific action or task. Such measures are referred to as measures of willingness to pay (WTP). Hensher, Rose, & Greene (2005) state that the WTP can be calculated as the ratio of two parameters estimates, holding all else constant. Provided at least one attribute is measured in monetary units, the

ratio of the two parameters will provide a financial indicator of WTP. (Hensher, Rose, & Greene, 2005)

$$\text{WTP} = \frac{\beta attribute}{\beta cost}$$

In calculating a measure of WTP, it is important that both attributes to be used in the calculation are found to be statistically significant, otherwise no meaningful WTP measure can be established. For this reason the WTP for the levels of the attribute Building Type will not be considered.

For β_{cost} holds that the coefficient of the price level that is held is closest to the mean value of the price levels that is generally chosen in the preferred alternatives. The mean value of the price attribute during the Discrete Choice Experiment is 0,08, what comes closest to price level 0 (€ 21 -24 / m²). The WTP calculation, based on the formula described above, can be found in table 8.

			Price		
			[PR=0]	**WTP**	**WTP per level**
Attributes	**Levels**	**β_{levels}**	**β_{price}**	**(β_{levels} / β_{price})**	
Facilities	[FA=-1]	-1.527	-0.261	-5.85	2.77
	[FA=0]	-0.723	-0.261	-2.77	5.85
	[FA=1]	2.250	-0.261	8.62	8.62
Housing unit	[HO=-1]	-0.718	-0.261	-2.75	1.59
	[HO=0]	-0.416	-0.261	-1.59	2.75
	[HO=1]	1.134	-0.261	4.34	4.34
Outdoor space	[OU=-1]	-0.844	-0.261	-3.23	1.07
	[OU=0]	-0.278	-0.261	-1.07	3.23
	[OU=1]	1.122	-0.261	4.30	4.30
Distance to City Centre	[CE=-1]	-0.441	-0.261	-1.69	0.51
	[CE=0]	-0.133	-0.261	-0.51	1.69
	[CE=1]	0.574	-0.261	2.20	2.20
Distance to Puclic Transport	[AP=-1]	-0.493	-0.261	-1.89	0.38
	[AP=0]	-0.099	-0.261	-0.38	1.89
	[AP=1]	0.592	-0.261	2.27	2.27
Storage space	[ST=-1]	-0.306	-0.261	-1.17	0.37
	[ST=0]	-0.096	-0.261	-0.37	1.17
	[ST=1]	0.402	-0.261	1.54	1.54

Table 8 WTP Calculation attribute levels

The WTP table should be read as follows. Each attribute has a basic level, which is level 1. This gives the basic value that a potential tenant is willing to pay for this attribute level. The WTP for the 2 remaining levels of each attribute are values that a potential tenant is willing to pay more or less comparing to the base level. Within the column WTP per level, the real price is given that young people are willing to pay when this level occurs in the offered housing alternative.

5. PAIRWISE COMPARISON EXPERTS

It is often desirable in decision analysis problems to elicit from an individual, the rankings of attributes according to the individuals preference and to understand the degree to which each attribute is preferred to the others. A common method for obtaining this information involves the use of pairwise comparisons, which allows an analyst to convert subjective expressions of preference between two attributes into numerical values indicating preferences across the entire group of attributes. The problem is broken into smaller constituents and then judged by pairwise comparison. The element of the hierarchy can relate to any aspect of the decision problem. Once the hierarchy is built, the decision makers evaluate its elements systematically by comparing them to other one, using two elements at a time. (Ozgur, Catak, Karabas & Yildirim, 2012)

Key to the use of pairwise comparisons is the underlying numerical scale that is used to convert subjective linguistic expressions of preference into numerical values. This scale represents the psychological manner in which individuals perceive increments of preference among abstract attributes and it has important implications about the distribution and consistency of an individual's preferences. (Elliott, 2010)

5.1 Introduction

A fundamental assumption of the pairwise comparison process is that, for any group of attributes, it is possible for an individual to supply information that allows an analyst to construct a set of weights, w_i, that will indicate how relatively important each of the attributes is to the individual in a certain predefined context. To uncover these weights, items in a group are presented to an individual two at a time and he is asked to answer two questions about each pair. First, which of the items in the pair is more important in the predefined context and, then, how much more important it is. The individual is, of course, permitted to respond that items are equally important. To answer the second question regarding the degree of preference, the individual is given a list of linguistic phrases, shown in table 9, to select from. It is traditional to present either five or nine phrases. Presenting one pair to an individual and collecting the response to the two questions is referred to as eliciting a judgment. (Elliott, 2010)

Determining the weights implied by a set of judgments requires two components. Each phrase used in the judgments must be assigned a numerical value from the scale and then these values must be manipulated to determine the weight vector. In general, if we wish to determine weights for the relative importance of n items there are "n choose 2" judgments that may be collected:

$$\binom{n}{2} = \frac{n!}{2!\,(n-2)!} = \frac{n\,(n-1)}{2}$$

The judgments can be shown in a matrix where it is understood that the entry in row i, column j corresponds to the ratio of attribute i over attribute j. Unities are always present on the main diagonal as these represent ratios comparing an attribute to itself. Saaty (2006) has shown that the vector weights, w_i, which best represents these judgments is found by calculating the normalized eigenvector corresponding to the maximum eigenvalue, λ_{max}, of this reciprocal matrix. (Elliott, 2010)

Phrases used in the pairwise comparison process to indicate degree of importance of item A over item B	
1	A is **equally** important to B
2	A is **weakly or slightly** more important than B
3	A is **moderately** more important than B
4	A is **moderately plus** more important than B
5	A is **strongly** more important than B
6	A is **strongly plus** more important than B
7	A is **very strongly** more important than B
8	A is **very, very strongly** more important than B
9	A is **extremely** more important than B

Table 9 Phrases used in the pairwise comparison process

This scale is motivated by the work of Ernest Weber and Gustav Fechner. The analyst can calculate the weight vectors corresponding to the scale and then present these vectors to represent the preferences. Given this weight vectors, the different attributes can be ranked.

5.2 Group of attributes

Potentially, the majority of the vacant offices is suitable for successful transformation. The quality of the building envelope and construction are hereby largely decisive. It is almost always necessary to renew the installation of a building, partly because of the age of the installation, and on the other hand in order to adapt the installations to the current quality requirements for the indoor climate.

Decisions about property investments with the aim of transformation into housing for young people are complex in which many attributes are involved. (Jansen et al., 2011 cited in Nijenstein, 2012) The attributes used in this experiment are derived from a literature study. These attributes can be divided into the following main categories: Functional, Technical, Cultural, Legal and Financial. An example list of these attributes can be found in Appendix C (Voordt en Gereadts).

Several studies have been conducted about the influence of building characteristics and their influence on the suitability for transformation into housing. Building characteristics such as **purchase price** and **size** are thought to influence the behaviour of an investor towards an acquisition of vacant real estate.

The findings within this literature study together with the input of experts from Camelot represent the input for this experiment. Refinements of this list is done by some modifications that were necessary. Not all attributes are of influence on the decision of the investor to buy vacant property with the aim for transformation. Regarding to this part of the research, the complete list of attributes is reduced to only the key attributes that are important in the decision for the investor.

These so called gradual criteria are criteria of which the individual assessment does not lead to approval or disapproval of the property, but the sum of all these criteria gives a gradual picture of the risk of vacancy for the certain building. Not all criteria are equally important. That applies for both, location and building related criteria. Through Pairwise Comparison by different experts a weight can be given to all the criteria regarding to the impact on the transformation potential. For good use of the weights, it is important that the weighting of each attribute and its levels is normalized.

An overview of all attributes, based on hierarchical structure, can be found in figure 17. Later in this chapter the interpretation of and approach to determine the weights associated with the different attributes will be discussed. The financial aspect is not taken into account because this aspect is extensively considered during the final conclusion (financial feasibility analysis), Chapter 6 Financial feasibilty.

The intention is that the various criteria are assessed regarding to their impact on the transformation potential. Some attributes may be bad for the property but easily to improve with attractive simple means and procedures, thus the degree of correctability must be kept in mind.

According to Coupland (cited in Dam, 2013) the characteristics of the stock of buildings mostly determine whether redevelopment may take place and also the size of this redevelopment. Although there are solution for the majority of the technical difficulties that can occur during redevelopment, these are not without cost, and this may affect the financial feasibility. Some types of buildings are easier to transform than other because of their physical structure and type of construction. Important parameters in this include: the size and height of the building, the depth, structure, façade and cladding, internal layout and access, the location of the installation (spaces), acoustic properties and escape routes. (Dam, 2013)

Within the instrument “Transformatiepotentiemeter” (Voordt & Geraedts, 2007), 10 sub parameters are determined these are: dwelling type, accessibility, dwelling size, layout of the space, outdoor space, views and privacy, environmental issues, conditions, and costs. The sub parameters that have relevant influence on the office building are used in the Decision Support Model.

5.2.1 Hierarchy of attributes used within the Pairwise comparison experiment

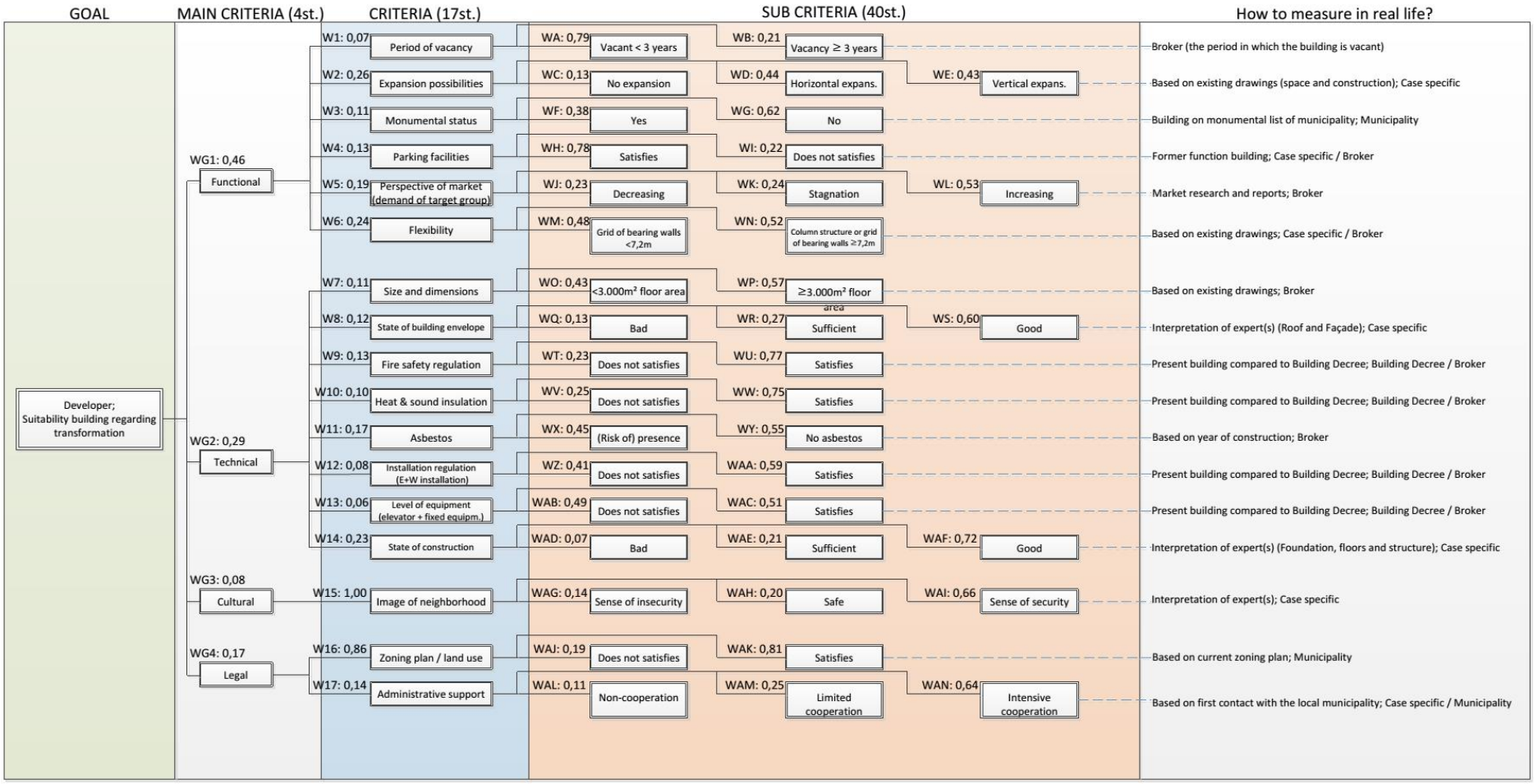


Figure 17 Hierarchy Pairwise Comparison; Group attributes

5.3 Generated design

By means of the weighting of various assessment criteria relative to each other, a relationship can be established between the various transformation attributes and the importance that is attached by the investor. Based on the assessment of the building in relation to this criteria a final judgment can be made about the transformation potential of the building . The class distribution shows with a number from 1 to 5 the potential that the office building has regarding transformation. 1 = very suitable for transformation, high level of potential; 5 = not suitable for transformation, low potential. This class distribution is based on the distribution used in the "Transformatiepotentiemeter" from Geraedts and Van der Voordt (2004).

The potential class is determined in two steps. First step is to determine the total score based on the weights resulting from the Pairwise Comparison experiment. The second step is to look up the score in the corresponding class distribution, table 10.

The score is determined by the presence of levels regarding the various attributes (multiplication and summing of the weights). The minimum score and the maximum score, which are theoretically determined, provide the total bandwidth for the five transformation classes (based on "Leegstandrisicometer" in Voordt & Geraedts, 2007). The further class division is proportional.

Transformation score	Transformation class	Result	
80 - 100	1 = Very suitable for transformation	Tot. score criteria:	X
60 – 79	2 = Suitable for transformation		
40 – 59	3 = Limited suitable for transformation		
20 - 39	4 = Hardly suitable for transformation		
0 - 19	5 = Not suitable for transformation	Transformation class:	X

Table 10 Determining transformation class

If the transformation project is not financially feasible, further plan development is pointless. This feasibility depends on the purchase price, the state of maintenance, the extent to which the building needs to be rebuilt or modified, the size and capacity of the building regarding the new housing units and the revenues after the transformation in the form of **rental income** and/or sales. (Voordt & Geraedts, 2007)

To determine the financial feasibility, answers should be given to a number of questions that are related to both the costs and the expected revenues. The most important question from the revenue side is how many housing units for which target group can be realized. For this a rough sketch must be made regarding the layout of the property. The financial feasibility can be improved by extending the building, for example by vertical expansion.

On the other hand, the most important question from the expenditure side is how high are the acquisition cost of the property including land. In addition, the **construction and installation costs** play a major role regarding the financial feasibility. How is the state of

maintenance? Which components can be reused, which should be demolished and replaced and to what extent? Particular the façade plays an important role.

5.3.1 Questionnaire

The questionnaire for every expert consists out of all attributes arising from figure 17. Given *n* objects, e.g., attributes or alternatives, we suppose that the decision maker(s) is (are) able to compare any two of them. In preference modelling, this assumption is called comparability. For any pairs (i,j), the decision maker is requested to tell how many times the i-th object is preferred (or more important) than the j-th one, which is denoted by a_{ij}. (Bozoki & Rapcsak, 2008)

So each questionnaire includes all possible judgments that could be collected:

$$\sum \frac{n\,(n-1)}{2} = \frac{4\,(4-1)}{2} + \frac{6\,(6-1)}{2} + \frac{8\,(8-1)}{2} + \frac{3\,(3-1)}{2} * 6 + \frac{2\,(2-1)}{2} * 12 = 79$$

An example (part of) the questionnaire is shown in figure 18. An entire overview of the questionnaire is attached in Appendix I.

Give your rating for each criteria

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Functional	○	○	○	○	○	○	◉	○	○	Technical
Functional	○	◉	○	○	○	○	○	○	○	Cultural
Functional	○	○	◉	○	○	○	○	○	○	Legal
Technical	○	◉	○	○	○	○	○	○	○	Cultural
Technical	○	○	◉	○	○	○	○	○	○	Legal
Cultural	○	○	○	○	○	○	○	◉	○	Legal

Figure 18 Example of pairwise comparison in questionnaire

5.3.2 Construction costs

Because construction costs are very difficult to estimate in the early stages of the transformation process, these costs are based on so called cost indicators. These cost indicators are given as average price per square meter GFA (€/m² GFA). This average price per square meter of gross floor area is based on the knowledge of "Kengetallenkompas; Bouwkosten". (bouwkostenkompas, 2014)

The costs for adjustment of a function are not only affected by the number of square meters gross floor area, but also by the level of constructive intervention which is necessary in order to realize this function within the building. (Dam, 2013) Thereby it is obvious that cost information and indicators can be attached to the correcting ability of relevant attributes of

the building. The heavier the required constructive intervention, the higher the cost and vice versa.

A quick cost-benefit analysis is based on a sketch in combination with a certain cost indicator. It concerns a broad range for costs per m² GFA concerning transformation of vacant offices into housing for young people. The data derives from table 11, based on bouwkostenkompas.nl. (bouwkostenkompas, 2014)

At this moment there is little data available about cost indicators associated with transformation projects. Van Dam (2013) stated that the construction costs can be divided in the same way as the cost indicators derived from "Kengetallenkompas; Bouwkosten". However, the price ranges for reconstruction are always cheaper than new construction; the consideration here is that certain costs, such as foundation costs and (sometimes) façade costs not need to be included. *Of course, this is only an assumption to keep comparable results.* The price ranges are set at 75% of the corresponding price for new construction. (Dam, 2013) However, these cost indicators are variable and could be adjusted at all times to keep the costs in line with the current market.

	Quality			Quality		
	1	2	3	1	2	3
	Low	Basic	High	Low	Basic	High
Functions of the building	Costs for transformation (SPI**)			Standard costs* (SPA**)		
Housing						
Student housing*	641	755	848	855	1007	1131
Student housing (high)	789	935	1087	1053	1246	1450
Apartments (social rent)	569	645	793	759	860	1057
Elderly housing	742	873	1068	990	1164	1424
Vertical expansion	997	1088	1234	1329	1451	1645
Hotel						
Immigration hotel (budget)	830	875	970	1107	1166	1293

*Geïndexeerd; basisjaar 2005 = 100,0; 2011 = 119,3; 2013 = 123,0
(bron: http://bouwkosten.bouwformatie.nl/abx/woningbouw)
** Based on Van Dam (2013)

Table 11 Construction costs per m² GFA

Assigning the most appropriate level of intervention, table 8**,** is not easy, but important because it strongly influences the height of the costs. The user should be aware that each function requires structural adjustments. The extent of presence of attributes (levels), will affect the level of intervention. Secondly, information regarding the state of maintenance of the entire building is needed. When the structural condition is still good, most interventions can take place at a lower level.

Pairwise Comparison will be used to justify the level of intervention. As mentioned before the building can be divided into different classes based on the assessment of the building regarding to the presence or absence of building related attributes. By analogy of the

intervention levels, the cost distribution is non-linear, both by type of construction as by type of function. (Vonk et al cited in Dam, 2013)

Now the determination of the transformation class is known, the translation related to influence on the transformation costs (construction costs) can be made. It is obvious that a lower transformation class, so high suitability of the building regarding transformation, has a positive impact on the construction costs, these are lower. At a high transformation class, so low suitability, it is obvious that the construction costs will be higher.

Translation of construction costs per transformation class is based on Van Dam (2013), Geraedts, Voordt & Thorn (1998) and Voordt & Geraedts (2007), calculated with known cost indicators. The translation is shown in table 12.

Transformation class	Intervention	Costs	Cost indicator transf.*
1 = Very suitable for transformation	Light	Low costs	40% * modernization
2 = Suitable for transformation	Modernization	Limited costs	50% * SPA
3 = Limited suitable for transformation	Strong	Moderate costs	145% * modernization
4 = Hardly suitable for transformation	Very strong	High costs	200% * modernization
5 = Not suitable for transformation	Strip-rebuilt	Very high costs	120% SPI

*Based on InKOS cited in Van Dam (2013)

Table 12 Building costs

The financial feasibility can be rapidly tested in an early stage of the process by using the Discounted Cash Flow method in combination with the generated (and justified) cost indicator for the transformation costs. When this results in a positive value, the investor can continue with the transformation process.

The QuickScan can be used by both the demand and supply side of the market: Property owners to determine the residual value of properties, and potential investors for calculating rental prices and necessary investment (and thereby thus the financial feasibility). However, the user has to keep in mind that this study is drawn from the perspective of an investor (Camelot).

5.4 Results pairwise comparison

In solving a multi-attribute decision problem, one needs to know the importance or weights of the not equally important attributes to evaluate alternatives with respect to the attributes.

All judgments of the various pairwise comparisons are summarized in a Comparison Matrix. In real-life decision problems, pairwise comparison matrices are rarely consistent. Nevertheless, decision makers are interested in the level of consistency of the judgments, which somehow expresses the goodness or “harmony” of pairwise comparisons totally, because inconsistent judgments may lead to senseless decisions. It was shown by Saaty

(1980) that a pairwise comparison matrix is consistent if and only if it is of rank one. When a pairwise comparison matrix is consistent, the normalized weights computed from this matrix are unique. (Bozoki & Rapcsak, 2008)

A crucial point of this methodology is to determine the inconsistency of the pairwise comparison matrices. Saaty's inconsistency ratio is an index for the departure from randomness. (Bozoki & Rapcsak, 2008) Saaty (1980) proposed the following method for calculating the average inconsistency:

$$CI_n = \frac{\lambda_{max} - n}{n - 1}$$

Let RI_n denote the average value of the randomly obtained inconsistency indices, which depend not only on *n* but on the method of generating random numbers, too. The inconsistency ratio (CR_n) of a given pairwise comparison matrix indicating inconsistency is defined by:

$$CR_n = \frac{CI_n}{RI_n}$$

Random Index (RI) is the average consistency index of 100 randomly generated (inconsistent) pairwise comparisons matrices. These values have been tabulated for differen values of n:

N	1	2	3	4	5	6	7	8	9	10
RI(n)	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

If the matrix is consistent, then $\lambda_{max} = n$, so $CI_n = 0$ and $CR_n = 0$, as well. Saaty (1980) concluded that an inconsistency ratio of about 10% or less may be considered as acceptable. It is emphasized that the inconsistency ratio CR_n is related to Saaty's scale. If only two attributes (or alternatives) are present, inconsistency is always zero, since the decision maker gives only one importance ratio. (Bozoki & Rapcsak, 2008)

If CR is not acceptable, judgments should be revised. Otherwise the decision will not be adequate.

5.5 Data collection

The data was gathered using Berg Enquête System © 2007, an on-line survey tool. The questionnaire was sent to selected experts, by Camelot. The questionnaire was excessed by 11 experts which has resulted in 8 complete responses. The overall response rate was 72,7%.

After cleaning the data can be analyzed by the method described above. Each group of attributes within the hierarchy is analyzed separately. Considering this, 21 separate analysis are needed.

5.5.1 Respondents

The respondents can be categorized based on their answers on the "personal characteristics" questions. The most important characteristics to identify the respondents for this part of the research are experience and type of actor. An overview of the respondents are given in table 13.

	Experience	
Type of actor	**Yes**	**No**
Owner	1	0
Housing corporation	0	0
Investor	2	2
Architect	0	0
(Sub)Contractor	3	0
Municipal/Government	0	0
Other	0	0
	6	*2*

Table 13 Personal characteristics experts

The most important conclusion from table 13 is that the 75% of the experts has experience with transformation projects.

5.5.2 Comparison matrix

For further analysis it is necessary that the cleaned data is converted to the Comparison matrix. An example filled in part of the survey, by just one of the respondents, is shown in figure 19. The corresponding Comparison matrix is given in figure 20.

Give your rating for each criteria

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Functional	○	○	○	○	○	○	◉	○	○	Technical
Functional	○	◉	○	○	○	○	○	○	○	Cultural
Functional	○	○	◉	○	○	○	○	○	○	Legal
Technical	○	◉	○	○	○	○	○	○	○	Cultural
Technical	○	○	◉	○	○	○	○	○	○	Legal
Cultural	○	○	○	○	○	○	○	◉	○	Legal

Figure 99 Example (part) of a filled in survey

Matrix		Functional	Technical	Cultural	Legal	normalized principal Eigenvector
		1	2	3	4	
Functional	1	-	1 5/8	6 3/8	2 1/2	46.23%
Technical	2	5/8	-	4 2/7	1 3/7	28.72%
Cultural	3	1/6	1/4	-	3/5	7.93%
Legal	4	2/5	2/3	1 2/3	-	17.13%

Figure 20 Comparison matrix corresponding with figure 19

An overview of the complete analysis (all data) with corresponding matrices and related Consistency checks can be found in Appendix J.

5.6 Data check

A quick data check is performed by analyzing the number of cases and the score of all parameters. The number of cases (79 cases per respondent) shows that all observations were filled in. Furthermore all attributes should be between 1 and 9. During this quick data check no errors have occurred.

After this it is necessary to check the obtained data by analyzing the Consistency ratio, this is done on the basis of the formula from Chapter 5.4 Results pairwise comparison.

5.7 Model estimations

Based on the consistency ratio there can be concluded that no problem has occurred during the evaluation of the attributes by the selected experts. Therefore the gathered data can be used for further analysis without any problem.

In order to keep the total score of a building regarding the Pairwise Comparison organized, the score will be rescaled to a transformation score with a range from 0 to 100.

This is done by the formula:

$$Transformation\ score = \frac{Score\ pairwise\ comparison - min.pairwise\ comparison}{max.pairwise\ comparison - min.pairwise\ comparison} * 100 = \frac{\alpha - 27}{61 - 27} * 100$$

Looking at the results, the following can be concluded. The experts found the main categories, functional (46%) and technical (29%) the most important categories in terms of transformation potential. The underlying idea to consider the category functionality so important could be that this category includes several criteria that are not able to change and on which the investor has no influence. In addition to this, the technical category is important because these criteria could bring high potential construction costs, what could make it harder to realize financial feasibility.

From a functional point of view, the criteria expansion possibilities (26%) and flexibility (24%) are the most important. Expansion possibilities, may increase the chance of financial feasibility, when basic transformation without expansion is not feasible. The investor does not need to make more acquisition costs, to realize more lettable floor area. In addition to this, it is advantageous when a vacant building consists out of large flexible rooms. In this case the investor does not need to demolish a lot of the interior and the layout of the building can be organized freely.

From a technical point of view, the criteria state of construction (23%) and asbestos (17%) are the most important. The state of construction is clearly important because it could bring high cost when the state is not good. Also asbestos plays an important role. When a building is older than 1992 there is a risk of presence. In advance an investor does not know to what extent asbestos can be present, that is why it is important to do an asbestos inventorying for building older than 1993. Another conclusion to be made is that in terms of importance all other criteria are equal to each other.

Criteria that have very little influence on the transformation potential are the main category cultural (8%) and the criteria Administrative support (14%) under the main category legal (17%). Both categories contain aspects which are less important to the transformation potential of a building, but are more important in the personal feeling towards the location and building comparing to the investor.

6. FINANCIAL FEASIBILITY

Rental of office space delivers more rent per square meter than for living space. In relation to this, a high book value of an office building can therefore constrain the economic profitability of a transformation project.

The financial feasibility is a critical success factor during a transformation process. (Voordt & Geraedts, 2007) This financial feasibility is based on an exploitation calculation. (Remoy H. , 2010) When the Net Present Value (NPV) is zero or greater than zero, the redevelopment is financially feasible.

Financial feasibility	
NPV ≥ 0	= financially feasible

When an investor invests in real estate, the goal is to making a profit. It is important to know on forehand what the budget is that could be invested in the transformation of the property. This budget can be established by using a Net Present Value (NPV) calculation. (Dam, 2013)

The NPV of an investment is the difference between the sum of the expected discounted cash flows of the investment, and the amount initially invested. It is a traditional valuation method in which the following steps are taken:

1. Calculation of the expected cash flows resulting from the investment;

2. Calculation of the cost of capital (an interest rate to adjust time and risk);

3. Subtraction of the initial investment, the end result is the Net Present Value.

6.1 Discounted Cash Flow

Income from rental for the realized function can be calculated based on the Gross Initial Yield method (GIY). This is possible by the frequently used formula in the real estate world:

$$\text{GIY} = \frac{Rental\ income\ 1st\ year}{Total\ investment}$$

When the GIY is given by a fixed percentage, based on the desired return, the formula can be used in order to calculate the maximum investment.

The rental income for the 1st year, for the function housing for young people, is calculated by multiplying the lettable floor area with the cost indicator per m² for the rental regarding to the prescribed function. This cost indicator is the result of the DCM experiment (WTP).

The project is financially feasible when the revenues are equal to the necessary investment. If the revenues are greater than the investment, there is potential profit. The investment

costs consist of costs for realizing the new function and an amount for purchase of land and building rights. Revenues are exclusively from rental or sale. Any subsidies are not included.

The next step is to calculate for a longer period of time, as mentioned earlier this is done on the basis of the Net Present Value method. NPV is a central tool in discounted cash flow (DCF) analysis and is a standard method for using the time value of money to appraise long-term projects.

The data in table 14 is required to calculate the exploitation of real estate:

Parameter	**Definition**
Gross floor area	The surface area, measured at floor level and along the circumference of the ascending construction, which will enclose the corresponding area
Investment costs	Required amount of money to include acquisition, implementation and maintenance, thereby included the return on investment
Inflation (%)	Depending on the consumer price index (CPI) that can be found at the "Centraal Bureau voor de Statistiek" (CBS)
Discount rate	The discount rate is used to determine the current value of income in the future (also called the NPV). This includes the risk and return
Exit yield	The exit yield is used to estimate the value of the property at the end of the exploitation period (residual value)
Rental income (per GFA)	This is based on the amount of floor area that is rented by one or several tenants. The rental income is calculated by multiplying the lettable floor area with the cost indicator per m^2 for the rental regarding the prescribed function. This cost indicator is based on the DCM experiment (WTP)
Owner expenses (%)	Costs for the owner on top of the investment
Construction costs (per GFA)	Construction costs in this early stage are based on available cost indicators. This cost indicator is based on the Pairwise Comparison method
Additional costs (%)	Costs such as preparation and supervision costs, insurance, taxes, finance- and risk costs, unforeseen expenses and maintenance of the acquired land
Tax (%)	Added value tax, sales tax, etc.

Table 9 Required data to calculate the exploitation of real estate

An example outline of a Net Present Value calculation is attached in Appendix K.

The aim of the discounted cash flow models is to approximate intrinsic value and the main principle of the models to find the present value of the future expected cash flows on an asset. To find the present value of an asset the models require the knowledge of the life of the asset, expected annual cash flows over the life of the asset, and an appropriate discount rate as inputs. Based on empirical evidence, these models can be found to work best when the cash flows produced by an asset are positive (Damodaran cited in Perek & Perek, 2012).

The assumption on which the discounted cash flow models are based is that the reason behind the purchase of an asset is the anticipation of collecting cash inflows from that asset in the future. Thus, in discounted cash flow valuation, the value of an asset is determined by discounting the future expected cash flows to that asset at an appropriate discount rate that reflects the riskiness involved in the cash flows (Damodaran cited in Perek & Perek, 2012).

6.1.1 Results of this research in relation to the DCF analysis

To create a discounted cash flow analysis, different data is required. The biggest part of this data is based on general requirements and needs of the investor. Next to this, through this research substantiated numbers can be given regarding potential rent and transformation costs that are necessary for the realization of the actual transformation. Both can be calculated in a quick manner so that the investor can calculate with specific numbers at an early stage of the transformation process.

The future rent can be filled in at the block tenant data. The required construction costs are shown under the block cash flow from operations, at replacement costs.

The DCF analysis is based on a lifetime of at least 10 years, accompanied by an assumption of the end value in the last year.

7. CASE STUDY

The case study will be used to include validation of the model, the case concerns the former SNS office at the Utrechtsestraat 46 in Arnhem. The model is intended to provide the developer a substantiated “Go” or “No-go” in a quick way regarding to transformation of the vacant office into housing for young people.

7.1 Characteristics and general information

Former SNS kantoor, Utrechtsestraat 46 in Arnhem.

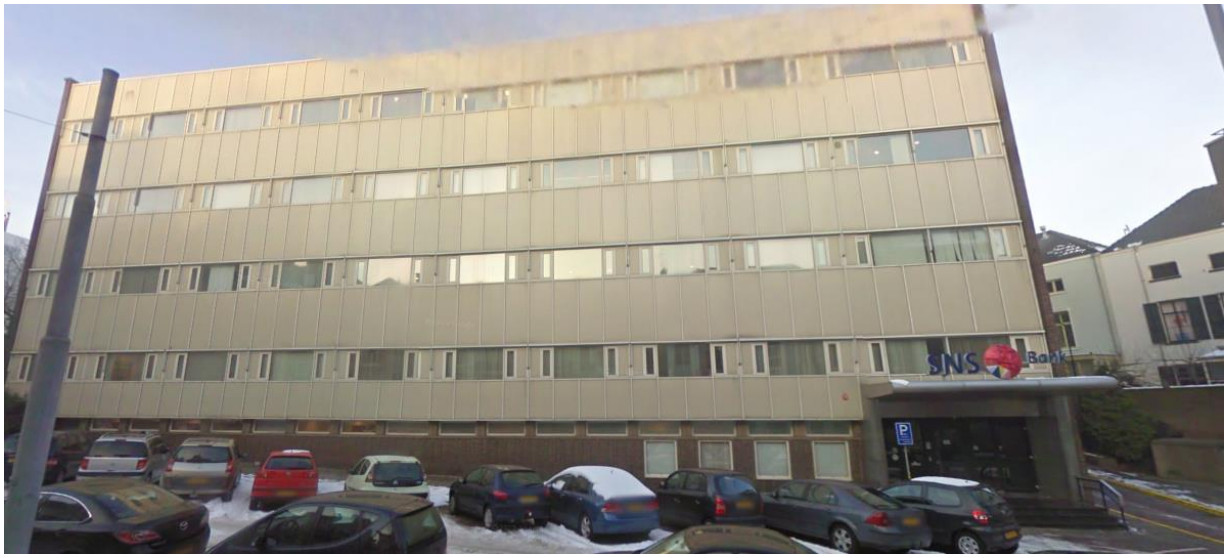


Figure 21 Current situation vacant office Arnhem

General information	Current status	Transformation
Building / renovation year	1992	2014
Building levels	5	5
GFA (m²)	±2.400m²	±2.400m²
Function	Office	Housing for young people
Amount of units		80
Size of units		46 rooms of 16 m² 29 rooms of 21 m² 4 rooms of 26 m² 1 room of 31 m²
User / investor	SNS Bank	Camelot Vastgoedbeheer

Table 15 General information SNS office

An overview of the layout is given in figure 22.

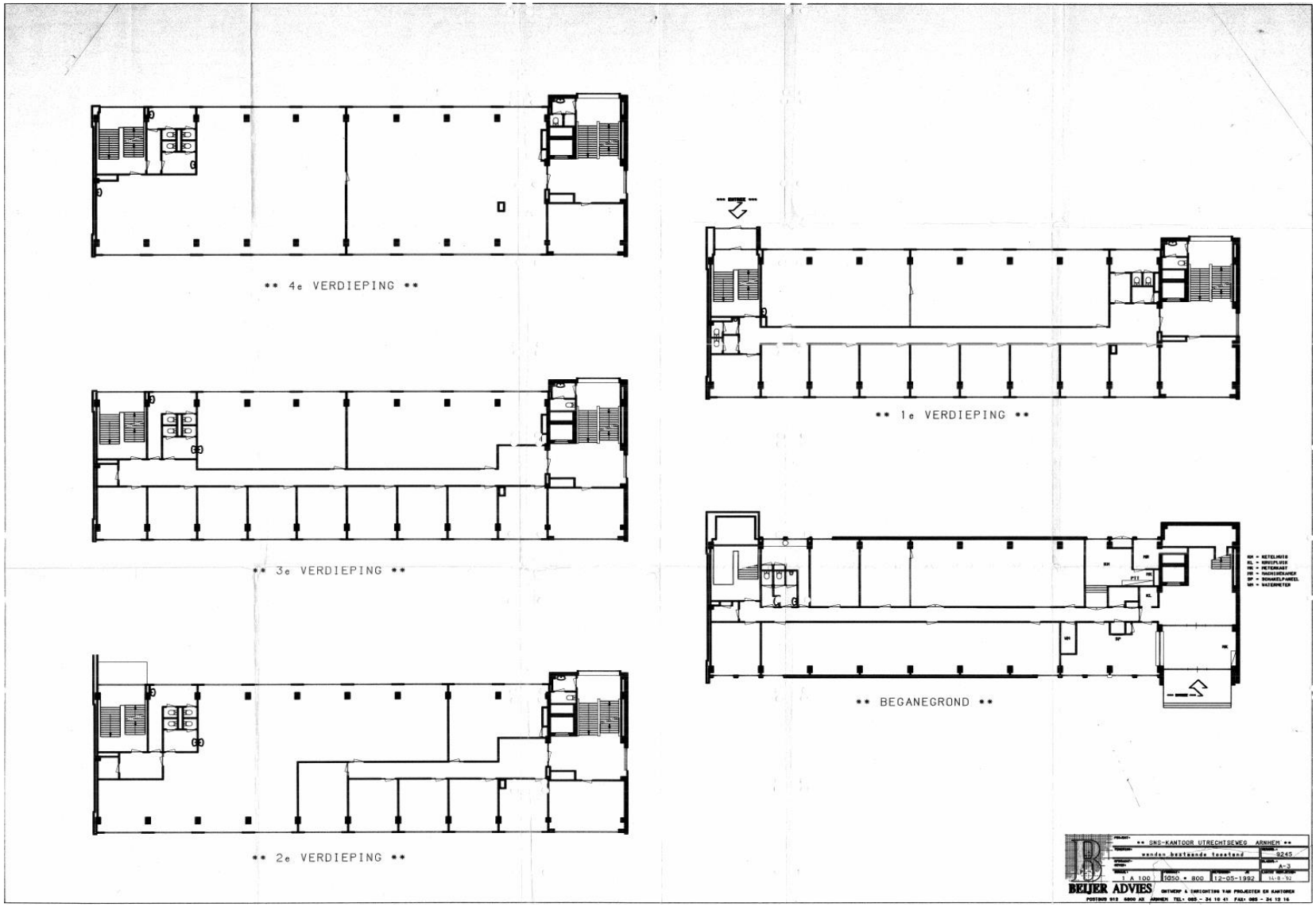


Figure 22 Lay-out SNS office Arnhem

7.1.1 Market and location

The literature study and the expertise of Camelot has revealed that housing for young people in the Netherlands is mainly feasible within the university cities. Despite the fact that Arnhem is not an university city, it is definitely a student city. There are several schools (Hogescholen) that provide education for many students, including Artez, HAN, VanHall-Larenstein en HBONederland.

In Arnhem and Velp are not sufficient rooms to accommodate all students that would like to rent a room in this region. VSA sees strong growth of young people that are searching for housing, this is also due the plans of the government to cut back on the right to travel free for students. The VSA sees that the growth also has arisen because housing accommodations where students were living temporarily will be demolished and because just a few large projects are built. (Arnhem, 2014) The VSA estimates that the housing shortage is around 400-600 houses, the basis for this statement can be found in the "Landelijke monitor studenthuisvesting" (2012).

Arnhem is located in the municipality of Arnhem in the province of Gelderland. Arnhem has a total of 149.270 inhabitants. From these inhabitants the following age distribution is known, table 16. (Obedo, 2014)

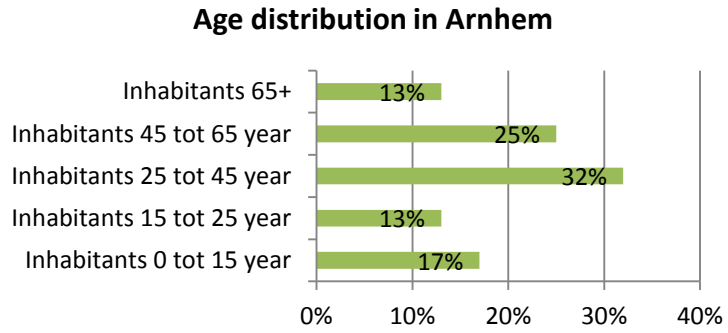


Table 16 Age distribution in Arnhem

Generally it can be assumed that there is an increasing demand for social housing in Arnhem.

The location of the vacant office is from the perspective of young people ideal, the central station of Arnhem is located at 500m (walking distance), the city center is within a range of 1.5km and the four schools (Hogescholen) are located within a radius of 5.5km of which two are within a radius of 1.0km. In addition to this, the property is easily accessible by car, with a highway exit at about 4.5km and plenty of parking spaces (±25 pieces). The building is surrounded by an urban area with shops, offices and apartments.

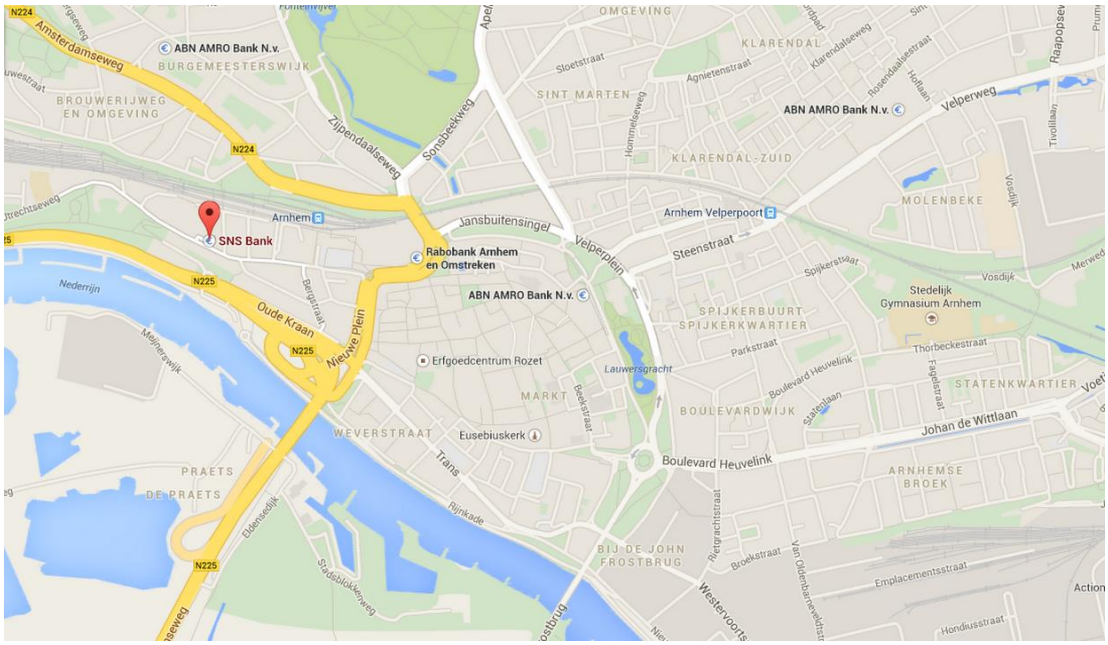


Figure 23 Location SNS office Arnhem

7.1.2 Building

Next to these positive aspects of the market and location, the layout of the building seems, at first sight, excellent for transformation into housing. Column structure with large open spaces that are easy to divide into several units. Based on an initial sketch something about 80 housing units could be created.

The housing units will be designed as independent units, with private facilities and are available in four different sizes. The existing layout will be completely stripped and will be set up as a housing accommodation. New floor and wall coverings, new sanitary facilities, etc.

The building properties that have been described above are summarized for each attribute in table 17.

Attribute	Building properties (housing for young people)
Features	Entrance, Storage space outside the building, elevator, private facilities, etc.
Service space	General installation area
Unit area (m²)	16; 21; 26 en 31 m²
Accessibility	Two stairways, including one elevator
Parking	Parking space in front and behind the building
Installations	Installation (suitable for independent living units)

Table 17 Future building characteristics SNS office

7.1.3 Opportunities and boundaries by transformation into housing for young people

The opportunities and obstacles that arise in this case study are clearly shown in table 18.

Opportunities	Boundaries
1. Good location, centrally located in a multifunctional area, many surrounding facilities and good accessibility 2. The layout of the building is good, the structure itself is suitable for transformation into housing for young people	1. The target group for Camelot is already established, young people, there is not looked at other possible target groups 2. At this moment it is difficult to estimate how the municipality thinks about housing for young people at this location 3. The construction year is 1992, this means that there is a chance of presence of asbestos. This may lead to large costs in the future, an asbestos inventory is required 4. The floor area of the building is relatively small for transformation (< 3.000m²)

Table 18 Chances and boundaries

7.1.4 Elaboration of the case study based on the developed model

The case study is finally tested on the basis of the developed model (financial feasibility). Table 19 gives an overview of the input data, arising from this research, used to calculate the present value. In addition to this, the following data is determined in consultation with Camelot, the inflation is set at 1.9% based on the consumer price index (CPI) for 2014 by the Centraal bureau voor de statistiek. The discount rate is set at 8.5%, this rate represents the risk and return that for this project will be average. The exit yield is set at 5,75%. Owner expenses in this calculation are average, which corresponds to 10% of the revenues. The final rental income is determined by means of the WTP in combination with the amount of square meters GFA (table 20) and lastly the construction cost per m2 is based on the pairwise comparison experiment (figure 24). The discounted cash flow analysis for this case can be found in Appendix K.

Input data (arising from this research)	Value
Potential rent	€17,57 / m² (basic monthly rent)
Construction costs	€504,- / m² (transformation class 2)

Table 19 Input data financial feasibility analysis arising from this research

Attributes	Levels	β_{levels}	Price [PR=0] β_{price}	WTP (β_{levels} / β_{price})	WTP per level
Facilities	Shared facilities	-1.527	-0.261	-5.85	2.77
	Semi-private facilities	-0.723	-0.261	-2.77	5.85
	Private facilities	2.250	-0.261	8.62	8.62
Housing unit	Room	-0.718	-0.261	-2.75	1.59
	Studio	-0.416	-0.261	-1.59	2.75
	Apartment	1.134	-0.261	4.34	4.34
Outdoor space	None	-0.844	-0.261	-3.23	1.07
	Balcony	-0.278	-0.261	-1.07	3.23
	Garden	1.122	-0.261	4.30	4.30
Distance to City Centre	Distance > 3km	-0.441	-0.261	-1.69	0.51
	1km < Distance ≤ 3km	-0.133	-0.261	-0.51	1.69
	Distance ≤ 1km	0.574	-0.261	2.20	2.20
Distance to Puclic Transport	Distance > 3km	-0.493	-0.261	-1.89	0.38
	1km < Distance ≤ 3km	-0.099	-0.261	-0.38	1.89
	Distance ≤ 1km	0.592	-0.261	2.27	2.27
Storage space	Not available	-0.306	-0.261	-1.17	0.37
	Available outside the building	-0.096	-0.261	-0.37	1.17
	Available inside the building	0.402	-0.261	1.54	1.54
					17.57

Table 20 Identified rental price

The identified rental price (€17,57 / m²) is the basic monthly rent. During the calculation of the financial feasibility there will be costs for furniture and service on top of this. These costs are fixed. Notable is that there is no outdoor space available, what results in a decreasing rent.

Regarding to the necessary construction costs, the transformation score of the building used for the case study is 51 (figure 24). This score needs to be normalized to rescale the score for a scale with a range from 0 to 100. The normalized transformation score is 68, which means that the building falls in transformation class 2 (Suitable for transformation). This transformation class will need transformation costs of €504,- / m² GFA. Notable is that despite that the building seems perfectly suited for transformation there are still several remarks that need to be made. In the basic concept for calculation of the financial feasibility no expansion possibilities are included, the total surface of the building is smaller than 3.000m², and the building envelope is not acceptable for housing units. Along with this there is also a risk of presence of asbestos, which could bring high cost with it.

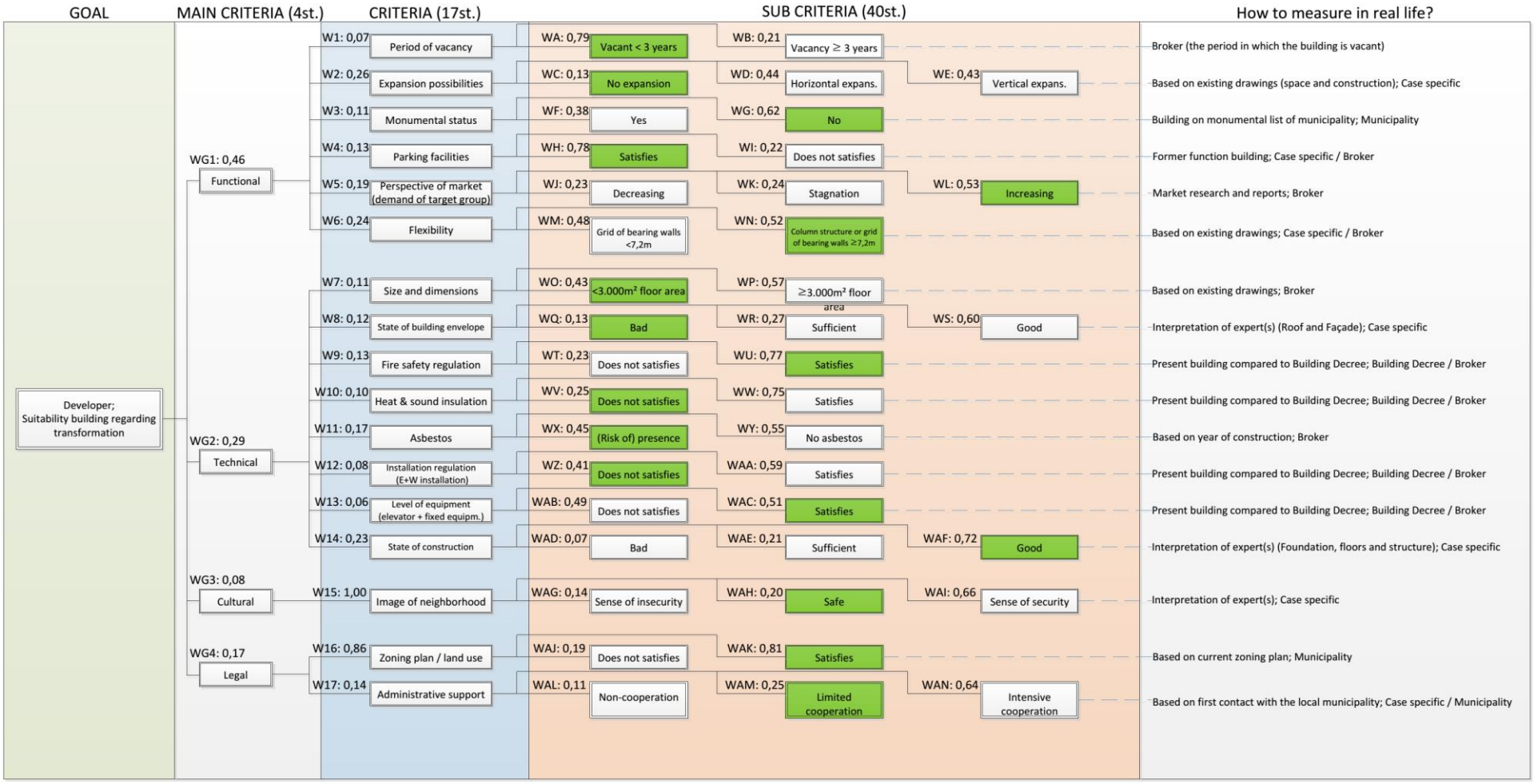


Figure 24 Hierarchy Pairwise Comparison; Determination of transformation score

7.2 (Financial) Feasibility

Resulting from the Discounted Cash Flow analysis there can be concluded that this project / case study is not feasible from financial point of view. At the end the DCF analysis gives a negative value, which means that this project is not financially feasible (Appendix K).

A reason for this could be that the potential rent (income) is too low because of the amount of housing units that could be realized (this is less than 100, what normally should be the minimum of housing units that need to be realized (prescribed rule of thumbs by Camelot). This potential rent is also lower than the maximum because it is not possible to realize housing units where young people are willing to pay the highest rent for. Another reason could be that the necessary transformation costs are too high to make this project feasible.

A possible solution could be expansion (in horizontal or vertical way) of the building, when this is possible. This can ensure that more rentable units arise what will increase the rental income, and next to this it can ensure that the necessary construction costs per square meter are lower.

CONCLUSION AND FINDINGS

8. CONCLUSION AND FINDINGS

Because not all vacant offices are suitable for transformation, it is not realistic to expect that the vacancy problem will be completely solved by transformation. Most common problems are the depreciation, the location and layout or the collaboration with the municipality.

The results of both the Discrete Choice Experiment as the Pairwise Comparison method are used in a support tool that can help an investor to give an substantiated answer to the question whether a vacant office building is suitable for transformation into housing for young people or not. So the potential of a vacant building is observed from both perspectives, demand and supply side. This ensures that the process of assessing the vacant building is more efficient. Financial feasibility plays a central role in the investing decisions of companies and investors. In the support tool the financial feasibility is tested according the Discounted Cash Flow (DCF) method. Hereby the (potential) future rent is based on a Discrete Choice Experiment that will be translated into the Willingness To Pay (WTP). Next to this, the investment costs will be based on a cost indicator which is justified by the use of a Pairwise Comparison experiment under experts.

Table 7 Target group preferences, shows the preferences for each attribute level of the target group young people. It is remarkable that not the high level of price but the attribute levels concerning shared facilities, semi-private facilities and no outdoor space have the biggest negative influence on housing choice behaviour. The attribute levels as private facilities, apartment and garden have the biggest positive influence. Of course this is also reflected in the willingness to pay.

Figure 17 shows that the experts found the main categories, functional and technical the most important categories in terms of transformation potential. From a functional point of view, the criteria expansion possibilities and flexibility are the most important. From a technical point of view, the criteria state of construction and asbestos are the most important. Criteria that have very little influence on the transformation potential are the main category cultural and the criteria Administrative support under the main category legal.

Evaluation of all these different criteria could be done efficiently with the aid of the developed support tool. Evaluation from both demand and supply side are translated into costs and revenues, by which the financial feasibility can be tested in a Discounted Cash Flow analysis. At the end, financial feasibility is the most important thing from the perspective of an investor.

By using the developed support tool, the assessment process regarding the potential of vacant offices for transformation into housing for young people can be optimized. This means that there can be determined quickly whether a property is suitable for transformation or not. Three possible conclusions could be: A property is unsuitable for transformation, so further elaboration and unnecessary costs could be omitted.

Transformation at this moment could be not feasible but with minor modifications in the design, target group or with a broader vision at the project, this project could be made feasible in the future. The last conclusion could be, that the transformation project is financially feasible from the first analysis.

These three possible conclusions indicate the remark that is necessary to be made and describes that each project has to be analyzed with common sense. When a project initially appears to be (financially) unfeasible, it does not necessarily mean that the project could not be feasible in the future (with or without any modifications in the design).

8.1 Discussion

This study adds insight into the housing preferences from young people and the requirements of an investor regarding transformation of vacant offices into housing for young people. However, this study has some limitations and thereby some opportunities for further research.

Because only a limited number of attributes could be taken into account during the DCM experiment, not all possible attributes that can influence the housing choice behaviour of young people were included during this research. Next to this a MNL model is used for measuring housing choice behaviour; this describes the preferences of all respondents by one set of utility weight parameters, not reflecting any individual differences (so the group has to be selected on forehand). (Nijenstein, 2012) Additionally, the findings can be improved by enlarging the number of homogenous groups and their representatives.

Regarding the financial aspect, there is little data available about the cost indicators associated with transformation projects. Therefore there is chosen to held the deviation of costs as described in the report of Van Dam (2013). Research on cost indicators for transformation projects is a study on itself, but an important part for an investor to calculate the financial feasibility before starting a transformation project.

The shortcoming of the financial analysis (DCF analysis) is that this model substract capital investment from operating cash flows to estimate free cash flows, and for some companies this may cause negative free cash flows for many years. (Perek & Perek, 2012)

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APPENDIX

APPENDIX A

Vastgoedvisie

Kenmerken voor succes

In dit schema zijn kenmerken weergegeven, die bepalend zijn voor de langjarige verhuurkansen van kantoorruimte

Marktspecifiek

Binnenstad	Periferie	● Kansrijk (18%)
Stedelijk gebied (>150.000 inwoners)	Niet stedelijk gebied	● Kanshebbend (54%)
Historisch ontwikkelde steden	Satellietsteden	● Kansarm (28%)
Universiteitsstad	Geen universiteitsstad	
Beroepsbevolking kantoorbanen	Beroepsbevolking niet-kantoorbanen	
Toename beroepsbevolking	Krimpende beroepsbevolking	

Locatiespecifiek

Verzorgde openbare ruimte (groen, water)	Niet verzorgde openbare ruimte
Prettige aanrijroute	Onprettige aanrijroute
'Zwaan kleef aan'	Anoniem
Weinig leegstand omgeving	Veel leegstand omgeving
Goede bereikbaarheid per OV, auto, fiets, schip, vliegtuig	Slechte bereikbaarheid per OV, auto, fiets, schip, vliegtuig
Nabij winkel-, horeca- en woonvoorzieningen	Niet nabij winkel-, horeca- en woonvoorzieningen
Goed imago van de omgeving	Slecht imago van de omgeving
Aansprekende buren	Weinig aansprekende buren

Objectspecifiek

Onderscheidende architectuur	Eenheidsworst
Multipurpose	Gebruikersspecifiek
Allure	Basic
Energielabel A	Energielabel G
Gebouw met sterke eigen identiteit	Gebouw met weinig eigen identiteit
Prijs-kwaliteit verhouding in balans	Prijs-kwaliteit verhouding uit balans
Oppervlakte gebouw passend bij vraag	Oppervlakte gebouw niet passend bij vraag
Flexibele indeelbaarheid vloeren	Geen indeelbaarheid vloeren
Hoogwaardig afwerkingsniveau (duurzame en tijdloze materialen)	Laagwaardig afwerkingsniveau (gedateerd)
Goede parkeernorm	Slechte parkeernorm
Representatieve hal- en entree	Minimale hal- en entree
Zichtbaar	Niet zichtbaar
Fiscaal gunstig	Fiscaal ongunstig
Uitbreidings- inkrimpingsmogelijkheden gebouw	Geen flexibele groei- c.q. krimpmogelijkheden
Hoogwaardige (klimaat)installaties	Verouderde (klimaat)installaties

Uit voorgaande blijkt dat naar mate een object beter scoort op zowel de markt-, omgevings- en objectspecifieke kenmerken, de verhuurkansen groter zijn. Een kansarm object kan door aanpassingen in de omgeving of het object zelf alsnog een kanshebber worden.

Scheme by DTZ Zadelhoff of specified characteristics for offices (DTZ Zadelhoff, 2013)

APPENDIX B

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	Vacant 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 errands >1 km	
	Meeting place (café, snack bar, etc) >500 m	
	Bank/post office >2 km	
	Basic medical facilities (doctor, pharmacy) >5 km	
	Sport facilities (fitness, swimming pool, sports park) >2 km	
	Educational facilities (nursery, school, university) >2 km	
Accessibility by public transport	Distance to station >2 km	
	Distance to bus, metro, tram stop >1 km	
Accessibility by car; parking	Many obstacles, limitations, poor flow	
	Distance to parking place >250 m	
	< 1 parking place/100 m^2 dwelling realisable	
Building		
Year of construction	Building was built or renovated recently (three years)	
Character of the building	Unrecognisable, non-eloquent	
	Poor maintenance	
Extensibility	Not extensible horizontally	
	Not extensible vertically	
Structure	Structure in technically bad condition	
	Dense structural grid, <3.6 m	
Dimensions	Net storey height <2.6 m	
Façade	Façade openings not adaptable	
	Impossible to create windows which can be opened manually	
	Daylight entry <10 percent of the living area	
Entrance (building, dwelling)	Impossible to create a socially secure entrance	
	Impossible to realise elevator in the building (if more than four floors)	
	Distance from dwelling to stairs/elevator >50 m	
	Impossible to realise escape stairs according to escape demands	
Installations	No or insufficient conduits realisable	
Environment	Noise level at the façade >50 dB	
	Sufficient isolation between dwellings impossible	
	Sufficient isolation of façade impossible	
	Presence of dangerous materials in construction	
	No or little sunlight	

Source: Geraedts and van der Voordt (2003)

Criteria for low transformation potential (the greater the number of checkmarks, the higher the risk and the lower the transformation potential)

List of criteria for low transformation potential (Voordt & Geraedts, 2007)

APPENDIX C

Location (living environment)	Building (houses)
1. Representativeness	1. Type of housing
a. Type of construction	2. Accessibility
b. Social image	3. Property size
c. Liveliness	a. Number of rooms
d. Green character	b. Living room
2. Facilities	c. Kitchen
a. Stores	d. Bedrooms
b. Horeca	e. Sanitary facilities
c. Schools	f. Storage space
d. Bank/Post office	4. Layout of the house
e. Medical facilities	5. Equipment level
f. Recreational facilities	6. Outside space
3. Accessibility by public transport	7. Views and privacy
a. Distance to bus stop	8. Environmental aspects
b. Frequency and times	a. Heating
c. Distance to tram or metro	b. Ventilation
d. Frequency and times	c. Sound
e. Distance to train station	d. Sun and daylight
f. Frequency and times	e. Energy use
4. Accessibility by car	f. Use of material
a. Distance to the highway	9. Terms and conditions
b. Traffic flow	a. Accessibility
c. Parking	b. Safety
	c. Ability to change
	d. Adequate management
	10. Costs
	a. Purchase price/Rent
	b. Additional costs

Relevant aspects for the demand side of the market (Voordt & Geraedts, 2007)

Step 1: Quick scan based on assessment of Vetocriteria for transformation of an office into housing

Vetocriteria
1. Market
a. Demand for housing
2. Location
a. Urban location
3. Building
a. Dimensions of the building
4. Organization
a. Initiator
b. Internal vetocriteria
c. Owner/investor

Vetocriteria for transformation (Voordt & Geraedts, 2007)

Step 2: Quick scan based on assessment of Gradual criteria for transformation of an office into housing

Location	**Building**
1. Functional	1. Functional
a. Urban location	a. Construction and renovation year
b. Distance and quality facilities	b. Vacancy
c. Accessibility by public transport	c. New housing units
d. Accessibility by car and parking facilities	d. Extensibility
2. Cultural	2. Technical
a. Representativeness	a. State of maintenance
3. Legal	b. Dimensions of the building
a. Urban location	c. Bearing structure
	d. Façade
	e. Installations
	3. Cultural
	a. Representativeness
	b. Accessibility (entrance/elevators/stairs)
	4. Legal
	Environmental aspects (light/air/sound)
	Requirements Building Decree

Gradual criteria for transformation (Voordt & Geraedts, 2007)

APPENDIX D

Treatment combinations	*Design Matrix* BU	FA	HO	PR	OU	CE	AP	ST
1	0	0	0	0	0	0	0	0
2	0	0	1	1	1	2	1	2
3	0	0	2	2	2	1	2	1
4	0	1	0	0	1	1	2	2
5	0	1	1	1	2	0	0	1
6	0	1	2	2	0	2	1	0
7	0	2	0	0	2	2	1	1
8	0	2	1	1	0	1	2	0
9	0	2	2	2	1	0	0	2
10	1	0	0	1	1	1	1	1
11	1	0	1	2	2	0	2	0
12	1	0	2	0	0	2	0	2
13	1	1	0	1	2	2	0	0
14	1	1	1	2	0	1	1	2
15	1	1	2	0	1	0	2	1
16	1	2	0	1	0	0	2	2
17	1	2	1	2	1	2	0	1
18	1	2	2	0	2	1	1	0
19	2	0	0	2	2	2	2	2
20	2	0	1	0	0	1	0	1
21	2	0	2	1	1	0	1	0
22	2	1	0	2	0	0	1	1
23	2	1	1	0	1	2	2	0
24	2	1	2	1	2	1	0	2
25	2	2	0	2	1	1	0	0
26	2	2	1	0	2	0	1	2
27	2	2	2	1	0	2	2	1

Design Matrix by using (Hahn and Shapiro (1966))

* If a two-level variable is assigned to a three-level column then all number 2's are changed to 0's (see section 3C for further discussion); referred to as "Collapsing the variable"

Correlation matrix

	BU	FA	HO	PR	OU	CE	AP	ST
BU	1							
FA	0	1						
HO	0	0	1					
PR	0	0	0	1				
OU	0	0	0	0	1			
CE	0	0	0	0	0	1		
AP	0	0	0	0	0	0	1	
ST	0	0	0	0	0	0	0	1

Design and Correlation matrix Discrete Choice Experiment

APPENDIX E

Generated choice sets					*Attribute levels for Alternative 1*								*Attribute levels for Alternative 2*								*Attribute levels for Alternative 3*							
Choice set	**Set**	**Alt 1**	**Alt 2**	**Alt 3**	**1_BU**	**1_FA**	**1_HO**	**1_PR**	**1_OU**	**1_CE**	**1_AP**	**1_ST**	**2_BU**	**2_FA**	**2_HO**	**2_PR**	**2_OU**	**2_CE**	**2_AP**	**2_ST**	**3_BU**	**3_FA**	**3_HO**	**3_PR**	**3_OU**	**3_CE**	**3_AP**	**3_ST**
1	*1*	4	25	19	0	1	0	0	1	1	2	2	2	2	0	2	1	1	0	0	2	0	0	2	2	2	2	2
2	*1*	21	8	18	2	0	2	1	1	0	1	0	0	2	1	1	0	1	2	0	1	2	2	0	2	1	1	0
3	*1*	16	27	11	1	2	0	1	0	0	2	2	2	2	2	1	0	2	2	1	1	0	1	2	2	0	2	0
4	*1*	12	26	17	1	0	2	0	0	2	0	2	2	2	1	0	2	0	1	2	1	2	1	2	1	2	0	1
5	*1*	15	10	22	1	1	2	0	1	0	2	1	1	0	0	1	1	1	1	1	2	1	0	2	0	0	1	1
6	*1*	24	6	3	2	1	2	1	2	1	0	2	0	1	2	2	0	2	1	0	0	0	2	2	2	1	2	1
7	*1*	1	13	2	0	0	0	0	0	0	0	0	1	1	0	1	2	2	0	0	0	0	1	1	1	2	1	2
8	*1*	20	23	5	2	0	1	0	0	1	0	1	2	1	1	0	1	2	2	0	0	1	1	1	2	0	0	1
9	*1*	14	9	7	1	1	1	2	0	1	1	2	0	2	2	2	1	0	0	2	0	2	0	0	2	2	1	1
10	*2*	25	15	23	2	2	0	2	1	1	0	0	1	1	2	0	1	0	2	1	2	1	1	0	1	2	2	0
11	*2*	7	6	12	0	2	0	0	2	2	1	1	0	1	2	2	0	2	1	0	1	0	2	0	0	2	0	2
12	*2*	14	1	5	1	1	1	2	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0	1
13	*2*	2	18	16	0	0	1	1	1	2	1	2	1	2	2	0	2	1	1	0	1	2	0	1	0	0	2	2
14	*2*	19	9	27	2	0	0	2	2	2	2	2	0	2	2	2	1	0	0	2	2	2	2	1	0	2	2	1
15	*2*	17	11	13	1	2	1	2	1	2	0	1	1	0	1	2	2	0	2	0	1	1	0	1	2	2	0	0

Choice sets Discrete Choice Experiment

APPENDIX F

Berg Enquête Systeem

Introductie

Geachte heer/mevrouw,

Mijn naam is Mark van Swam en ik studeer aan de Technische Universiteit Eindhoven. Dit onderzoek is deel van mijn afstudeerscriptie over de **potentie van leegstaande kantoorgebouwen voor transformatie naar huisvesting**. Het doel van deze studie is het begrijpen van gebruikers voorkeuren met betrekking tot verschillende huisvestingaspecten.

Graag nodig ik u uit deel te nemen aan dit onderzoek. Het bestaat uit 2 delen en zal niet langer dan 10 minuten duren om in te vullen.
Het eerste deel bestaat uit 6 vragen met betrekking tot uw huidige situatie (zoals leeftijd, huidige woonlocatie en opleidingsniveau).
Het tweede gedeelte bestaat uit 9 vergelijkingen van verschillende alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Wanneer u vragen of opmerkingen heeft kunt u contact met mij opnemen via m.g.m.v.swam@student.tue.nl

Door deelname aan dit onderzoek helpt u mij met mijn afstudeerscriptie. Daarvoor wil ik u alvast hartelijk danken!

Uw gegevens zullen niet gepubliceerd of voor commerciële doeleinden gebruikt worden. Ze worden vertrouwelijk en anoniem verwerkt en enkel voor dit afstudeeronderzoek gebruikt.

Volgende

Kies de kenmerken die bij u van toepassing zijn.

Wat is uw geslacht?

- Man
- Vrouw

Wat is uw leeftijd?

- Jonger dan 20 jaar
- 20 - 24 jaar
- 25 - 29 jaar
- 30 - 34 jaar
- Ouder dan 34 jaar

Wat is uw huidige woonlocatie?

- Universiteitsstad (als Amsterdam, Delft, Eindhoven, Enschede, Groningen, Leeuwarden, Leiden, Maastricht, Nijmegen, Rotterdam, Tilburg, Utrecht of Wageningen)
- Overige stad
- Overige dorpen

Wat is uw huidige postcode? (alleen cijfers)

Wat is het hoogste opleidingsniveau dat u hebt voltooid?

- Lager beroepsonderwijs
- Voortgezet onderwijs
- Middelbaar beroepsonderwijs - MBO
- Hoger beroepsonderwijs - HBO
- Wetenschappelijk onderwijs - WO
- Wetenschappelijke promotie - PhD

Wat is uw huidige situatie met betrekking tot uw carrière?

- Student
- Zonder werk
- Werknemer voor minder dan 2 jaar
- Werknemer voor meer dan 2 jaar

Vorige Volgende

Berg Enquête Systeem

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Scenario

Het volgende gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het **alternatief selecteert** dat het meest voldoet aan uw wensen.

Binnen deze verschillende alternatieven zijn er een aantal *constante aspecten* waarmee u in uw achterhoofd rekening moet houden tijdens het maken van uw keuze. Deze aspecten zijn als volgt:

1) U bevindt zich op de **huurdersmarkt**, dus alle alternatieven omvatten huurwoningen;

2) Het type woning wordt ingepast in leegstaande kantoorpanden/industriegebouwen/bejaarden-/verzorgingshuizen. Hierdoor bestaat het aanbod uit **flats of appartementscomplexen**;

3) Alle woningen worden **op z'n minst voorzien van energie label B**;

4) Alle woningen worden **volledig gemeubileerd** aangeboden (keukenuitrusting, bed, tafel met stoelen, kast, wasruimte, etc.).

Vorige | Volgende

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Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u een ***voorbeeldvraag***.

Welk huisvesting alternatief heeft uw voorkeur?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig verzorgingshuis*	*Voormalig kantoor*	
Faciliteiten	*Semi-zelfstandig*	*Gezamenlijk*	*Semi-zelfstandig*	
Woningtype	*Studio*	*Appartement*	*Appartement*	
Prijs (euro/m2)	*21-24 euro/m2*	*25-28 euro/m2*	*21-24 euro/m2*	
Buitenruimte	*Tuin*	*Geen*	*Tuin*	
Nabijheid stadscentrum of gelijkwaardig	*Afstand >3km*	*Afstand <=1km*	*1km< Afstand <=3km*	
Bereikbaarheid met OV	*Afstand >3km*	*Afstand >3km*	*Afstand >3km*	
Bergingsruimte	*Beschikbaar buiten het gebouw*	*Beschikbaar binnen het gebouw*	*Beschikbaar binnen het gebouw*	
UW KEUZE:	O	**X**	O	O

Uitleg van de mogelijkheden:

De *Gebouwtype*: heeft betrekking op de voormalige gebruiksfunctie van het gebouw.
* **Voormalig industriële functie**
* **Voormalig verzorgingshuis**
* **Voormalig kantoorfunctie**

Faciliteiten: geeft aan of de faciliteiten voor meerdere personen zijn (gezamenlijk) of dat men beschikt over zelfstandige faciliteiten.
* **Gezamenlijk** (Alle faciliteiten worden gedeeld)
* **Semi-zelfstandig** (Zelfstandige badkamer, gedeelde wasruimte en keuken)
* **Zelfstandig** (Alle faciliteiten zijn zelfstandig)

Woningtype: mogelijkheden van indeling met betrekking tot huisvestingsalternatieven.
* **Kamer** (Alternatief waarin de zelfstandige ruimte bestaat uit een slaapkamer met gemeenschappelijke woon- en/of eetkamer)
* **Studio** (Alternatief waarin woonkamer, eetkamer en slaapkamer zijn gecombineerd (open plattegrond))
* **Appartement** (Alternatief met aparte woonkamer en slaapkamer, beide zelfstandig)

Prijs (€/m²): verdeling van (marktconforme) huurprijzen, inclusief servicekosten en inrichtingskosten.
* **25-28 €/m²**
* **21-24 €/m²**
* **17-20 €/m²**

Buitenruimte: heeft betrekking tot beschikking over buitenruimte.
* **Geen**
* **Balkon**
* **Tuin**

Nabijheid stadscentrum of gelijkwaardig: heeft betrekking op de afstand van het gebouw tot het centrum of een gelijkwaardige omgeving (van toepassing in een stad met meerdere centra).
* **Afstand > 3 km**
* **1 km < Afstand <= 3 km**
* **Afstand <= 1 km**

Bereikbaarheid met openbaar vervoer (OV): heeft betrekking op de afstand van het gebouw tot trein/bus/metro/tram station en/of halte.
* **Afstand > 3 km**
* **1 km < Afstand <= 3 km**
* **Afstand <= 1 km**

Bergingsruimte: heeft betrekking op de beschikbaarheid van bergruimte.
* **Niet beschikbaar**
* **Beschikbaar: buiten het gebouw**
* **Beschikbaar: binnen het gebouw**

Er volgen nu 9 keuzesets.

Vorige | **Volgende**

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig kantoor*	*Voormalig kantoor*	
Faciliteiten	*Zelfstandig*	*Semi-zelfstandig*	*Zelfstandig*	
Woningtype	*Studio*	*Studio*	*Appartement*	
Prijs (€/m²)	*21-24 euro/m2*	*25-28 euro/m2*	*21-24 euro/m2*	
Buitenruimte	*Geen*	*Balkon*	*Geen*	
Nabijheid stadscentrum of gelijkwaardig	*1km< Afstand <=3km*	*Afstand <=1km*	*Afstand <=1km*	
Bereikbaarheid met OV	*Afstand <=1km*	*Afstand <=1km*	*Afstand <=1km*	
Bergingsruimte	*Niet beschikbaar*	*Niet beschikbaar*	*Beschikbaar buiten gebouw*	
UW KEUZE:	○	○	○	○

Vorige | **Volgende**

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig verzorgingshuis*	*Voormalig kantoor*	*Voormalig verzorgingshuis*	
Faciliteiten	*Semi-zelfstandig*	*Semi-zelfstandig*	*Semi-zelfstandig*	
Woningtype	*Appartement*	*Appartement*	*Kamer*	
Prijs (€/m²)	*25-28 euro/m2*	*21-24 euro/m2*	*21-24 euro/m2*	
Buitenruimte	*Balkon*	*Tuin*	*Tuin*	
Nabijheid stadscentrum of gelijkwaardig	*Afstand >3km*	*1km< Afstand <=3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*Afstand <=1km*	*Afstand >3km*	*Afstand >3km*	
Bergingsruimte	*Beschikbaar buiten gebouw*	*Beschikbaar binnen gebouw*	*Niet beschikbaar*	
UW KEUZE:	○	○	○	○

Vorige | **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig verzorgingshuis*	*Voormalig kantoor*	*Voormalig verzorgingshuis*	
Faciliteiten	*Gezamenlijk*	*Zelfstandig*	*Gezamenlijk*	
Woningtype	*Kamer*	*Studio*	*Appartement*	
Prijs (€/m²)	*21-24 euro/m2*	*25-28 euro/m2*	*25-28 euro/m2*	
Buitenruimte	*Balkon*	*Tuin*	*Geen*	
Nabijheid stadscentrum of gelijkwaardig	*1km< Afstand <=3km*	*Afstand >3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*1km< Afstand <=3km*	*1km< Afstand <=3km*	*Afstand >3km*	
Bergingsruimte	*Beschikbaar buiten gebouw*	*Beschikbaar binnen gebouw*	*Beschikbaar binnen gebouw*	
UW KEUZE:	◉	○	○	○

Vorige | **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig kantoor*	*Voormalig verzorgingshuis*	
Faciliteiten	*Zelfstandig*	*Gezamenlijk*	*Zelfstandig*	
Woningtype	*Kamer*	*Appartement*	*Kamer*	
Prijs (€/m²)	*25-28 euro/m2*	*21-24 euro/m2*	*21-24 euro/m2*	
Buitenruimte	*Tuin*	*Balkon*	*Geen*	
Nabijheid stadscentrum of gelijkwaardig	*Afstand <=1km*	*Afstand >3km*	*Afstand >3km*	
Bereikbaarheid met OV	*1km< Afstand <=3km*	*1km< Afstand <=3km*	*Afstand <=1km*	
Bergingsruimte	*Beschikbaar buiten gebouw*	*Niet beschikbaar*	*Beschikbaar binnen gebouw*	
UW KEUZE:	◉	○	○	○

Vorige | **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig kantoor*	*Voormalig verzorgingshuis*	
Faciliteiten	*Semi-zelfstandig*	*Zelfstandig*	*Zelfstandig*	
Woningtype	*Studio*	*Kamer*	*Studio*	
Prijs (€/m²)	*21-24 euro/m2*	*17-20 euro/m2*	*17-20 euro/m2*	
Buitenruimte	*Tuin*	*Balkon*	*Balkon*	
Nabijheid stadscentrum of gelijkwaardig	*Afstand >3km*	*1km< Afstand <=3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*Afstand >3km*	*Afstand >3km*	*Afstand >3km*	
Bergingsruimte	*Beschikbaar buiten gebouw*	*Niet beschikbaar*	*Beschikbaar buiten gebouw*	
UW KEUZE:	◉	○	○	○

Vorige | **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig verzorgingshuis*	*Voormalig kantoor*	*Voormalig industrieel*	
Faciliteiten	*Gezamenlijk*	*Semi-zelfstandig*	*Gezamenlijk*	
Woningtype	*Studio*	*Kamer*	*Studio*	
Prijs (€/m²)	*17-20 euro/m2*	*17-20 euro/m2*	*21-24 euro/m2*	
Buitenruimte	*Tuin*	*Geen*	*Balkon*	
Nabijheid stadscentrum of gelijkwaardig	*Afstand >3km*	*Afstand >3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*Afstand <=1km*	*1km< Afstand <=3km*	*1km< Afstand <=3km*	
Bergingsruimte	*Niet beschikbaar*	*Beschikbaar buiten gebouw*	*Beschikbaar binnen gebouw*	
UW KEUZE:	◉	○	○	○

Vorige | **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig verzorgingshuis*	*Voormalig industrieel*	
Faciliteiten	*Semi-zelfstandig*	*Semi-zelfstandig*	*Semi-zelfstandig*	
Woningtype	*Kamer*	*Studio*	*Appartement*	
Prijs (€/m²)	*25-28 euro/m2*	*17-20 euro/m2*	*17-20 euro/m2*	
Buitenruimte	*Balkon*	*Geen*	*Geen*	
Nabijheid stadscentrum of gelijkwaardig	*1km< Afstand <=3km*	*1km< Afstand <=3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*Afstand <=1km*	*1km< Afstand <=3km*	*1km< Afstand <=3km*	
Bergingsruimte	*Beschikbaar binnen gebouw*	*Beschikbaar binnen gebouw*	*Niet beschikbaar*	
UW KEUZE:	◉	○	○	○

Vorige **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig verzorgingshuis*	*Voormalig industrieel*	*Voormalig kantoor*	
Faciliteiten	*Zelfstandig*	*Zelfstandig*	*Gezamenlijk*	
Woningtype	*Appartement*	*Appartement*	*Kamer*	
Prijs (€/m²)	*25-28 euro/m2*	*17-20 euro/m2*	*17-20 euro/m2*	
Buitenruimte	*Tuin*	*Balkon*	*Tuin*	
Nabijheid stadscentrum of gelijkwaardig	*1km< Afstand <=3km*	*Afstand >3km*	*Afstand <=1km*	
Bereikbaarheid met OV	*1km< Afstand <=3km*	*Afstand >3km*	*Afstand <=1km*	
Bergingsruimte	*Niet beschikbaar*	*Beschikbaar binnen gebouw*	*Beschikbaar binnen gebouw*	
UW KEUZE:	◉	○	○	○

Vorige **Volgende**

(Readonly)

Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende huisvesting alternatieven. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Als u geen voorkeur heeft kiest u voor de optie "Geen voorkeur".

Hieronder ziet u uw *keuzemogelijkheden*.

Welk huisvesting alternatief voldoet het meest aan uw wensen?

Kenmerken	Alternatief 1	Alternatief 2	Alternatief 3	Geen voorkeur
Gebouwtype	*Voormalig industrieel*	*Voormalig industrieel*	*Voormalig kantoor*	
Faciliteiten	*Gezamenlijk*	*Gezamenlijk*	*Gezamenlijk*	
Woningtype	*Appartement*	*Kamer*	*Studio*	
Prijs (€/m²)	*17-20 euro/m2*	*25-28 euro/m2*	*25-28 euro/m2*	
Buitenruimte	*Tuin*	*Geen*	*Geen*	
Nabijheid stadscentrum of gelijkwaardig	*1km< Afstand <=3km*	*Afstand >3km*	*1km< Afstand <=3km*	
Bereikbaarheid met OV	*Afstand <=1km*	*Afstand >3km*	*Afstand >3km*	
Bergingsruimte	*Beschikbaar buiten gebouw*	*Niet beschikbaar*	*Beschikbaar buiten gebouw*	
UW KEUZE:	☐	◉	○	○

Vorige | Volgende

Berg Enquête Systeem

Hartelijk bedankt voor uw tijd!

Met vriendelijke groet,

Mark van Swam
m.g.m.v.swam@student.tue.nl

APPENDIX G

Correlation matrix

	id	Voorkeur	BU	FA	HO	PR	OU	CE	AP	ST
id	1.000	-,021*	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Voorkeur	-,021*	1.000	0.004	-0.016	-0.002	-0.007	-0.006	0.006	0.004	0.006
BU	0.000	0.004	1.000	0.002	-0.001	0.000	0.001	-0.002	-0.002	-0.001
FA	0.001	-0.016	0.002	1.000	-0.001	-0.001	0.001	-0.001	-0.001	-0.001
HO	0.001	-0.002	-0.001	-0.001	1.000	0.000	0.001	0.000	0.001	-0.001
PR	0.000	-0.007	0.000	-0.001	0.000	1.000	0.000	0.001	0.001	-0.002
OU	0.000	-0.006	0.001	0.001	0.001	0.000	1.000	-0.001	0.002	0.000
CE	0.000	0.006	-0.002	-0.001	0.000	0.001	-0.001	1.000	0.001	0.001
AP	0.000	0.004	-0.002	-0.001	0.001	0.001	0.002	0.001	1.000	0.002
ST	0.000	0.006	-0.001	-0.001	-0.001	-0.002	0.000	0.001	0.002	1.000

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation matrix results Discrete Choice Experiment

APPENDIX H

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1120,995			
Final	167,206	953,789	16	,000

Pseudo R-Square

Cox and Snell	,102
Nagelkerke	,143
McFadden	,086

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	167,206[a]	,000	0	.
BU	169,355	2,149	2	,342
FA	776,266	609,059	2	,000
HO	315,660	148,454	2	,000
PR	265,158	97,952	2	,000
OU	342,797	175,591	2	,000
CE	222,366	55,159	2	,000
AP	228,179	60,973	2	,000
ST	194,338	27,132	2	,000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Results Discrete Choice Experiment

APPENDIX I

Berg Enquête Systeem

Welkom!

Geachte heer/mevrouw,

Mijn naam is Mark van Swam en ik studeer aan de Technische Universiteit Eindhoven. Dit onderzoek is deel van mijn afstudeerscriptie over de potentie van leegstaande kantoorgebouwen voor transformatie naar huisvesting. Deze enquête is bedoeld voor professionals op het gebied van transformatie van vastgoed binnen Nederland. U wordt beschouwd als expert en uw mening wordt zeer op prijs gesteld.
Het doel van deze studie is **het inzichtelijk maken van de belangrijkste aspecten/criteria met betrekking tot de transformatie van leegstaande kantoren.**

Graag nodig ik u uit om deze vragenlijst te beantwoorden. Het bestaat uit 2 delen en zal niet langer dan 15 minuten duren om in te vullen.
Het eerste deel bestaat uit algemene vragen om uw achtergrond en ervaring te achterhalen.
Het tweede gedeelte bestaat uit paarsgewijze vergelijkingen ("pairwise comparison"). Hierbij worden twee criteria tegenover elkaar gezet en wordt verwacht dat u een waarde geeft voor het belang van de specifieke criteria op basis van uw kennis en ervaring. De mate van voorkeur kunt u aangeven door middel van de waarde die u toekent aan dit criterium.

Wanneer u vragen of opmerkingen heeft kunt u contact met mij opnemen via m.g.m.v.swam@student.tue.nl

Door deelname aan dit onderzoek helpt u mij met mijn afstudeerscriptie. Daarvoor wil ik u alvast hartelijk danken!

Uw gegevens zullen niet gepubliceerd of voor commerciële doeleinden gebruikt worden. Ze worden vertrouwelijk en anoniem verwerkt en enkel voor dit afstudeeronderzoek gebruikt.

Vorige | Volgende

Deze vragen zijn bedoeld om inzicht te krijgen m.b.t. de achtergronden van de respondenten.
Voor de analyse van de onderzoeksresultaten is het van belang het perspectief mee te wegen waar vanuit uw bedrijf of uzelf opereert.

Hieronder worden verschillende actoren genoemd, die betrokken (kunnen) zijn bij transformatieprojecten. Selecteer het type actor dat het meest correspondeert met uw positie.

- ☐ Eigenaar
- ○ Woningcorporatie
- ○ Investeerder / Belegger
- ○ Architect
- ○ Aannemer / Onderaannemer
- ○ Gemeente / Overheid
- ○ Overig

Hoeveel jaar bent u al werkzaam m.b.t. uw huidige functie?

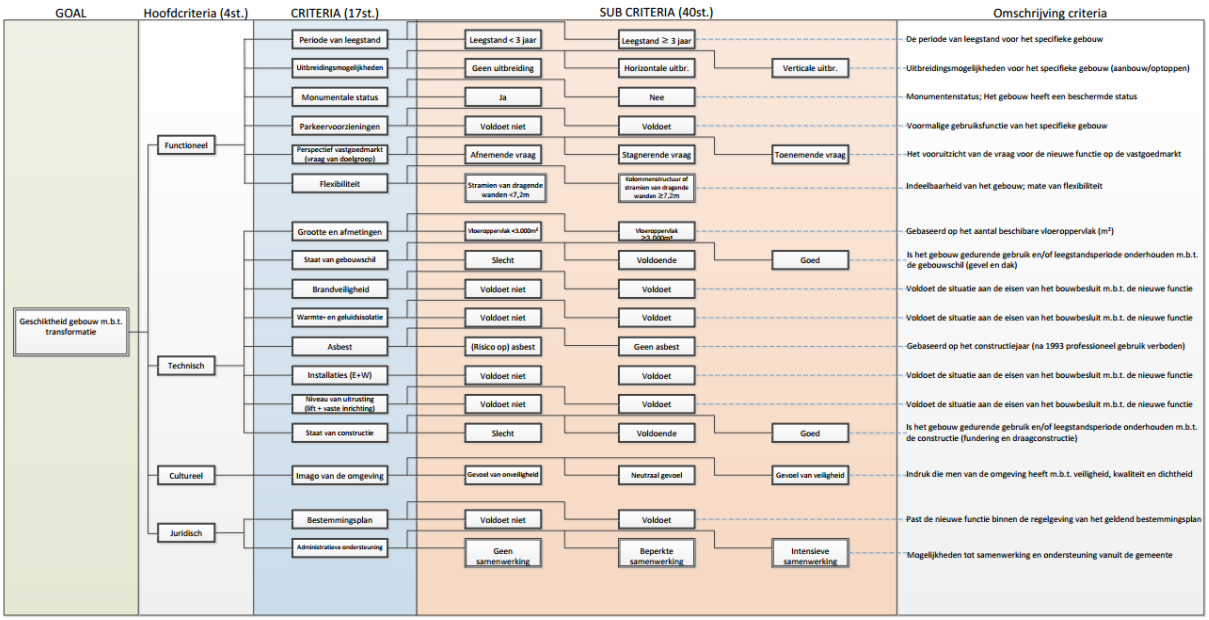
Bent u ooit betrokken geweest bij een project waarin vastgoed werd getransformeerd?

- ○ Ja
- ○ Nee

Vorige | Volgende

Uitleg criteria

In deze enquête worden u vragen gesteld over een aantal criteria. In onderstaande hiërarchische weergave vindt u de gebruikte criteria en omschrijving.



Pairwise comparison

De methode "pairwise comparison" wordt gebruikt in de wetenschappelijke studie om voorkeuren of het belang van criteria over elkaar vast te stellen met behulp van een interval schaal.

Kies bij iedere vergelijking het criterium waarvan u vindt dat deze belangrijker is dan het andere criterium. De mate van voorkeur kunt u aangeven door middel van de score die u toekent aan dit criterium. De betekenis van deze waarde kunt u terug vinden in "The Fundamental Scale for Pairwise Comparisons"

The Fundamental Scale for Pairwise Comparisons:

Intensiteit	Definitie	Toelichting
1	Even belangrijk	Twee criteria dragen in gelijke mate bij aan de doelstelling
3	Gematigd belang	Ervaring en het oordeel geven het ene criteria gematigd belang over het andere criteria
5	Serk belang	Ervaring en het oordeel pleiten sterk voor het ene criteria over het andere criteria
7	Zeer sterk belang	Een element krijgt zeer sterk de voorkeur boven de andere, de dominatie is in de praktijk bewezen
9	Extreem belang	Het bewijs dat het ene criteria boven de andere stelt is van de hoogste orde van bevestiging

Hoofdcriteria

Geef uw waardering voor ieder criteria.

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Functioneel	○	○	○	○	○	○	○	○	○	Technisch
Functioneel	○	○	○	○	○	○	○	○	○	Cultureel
Functioneel	○	○	○	○	○	○	○	○	○	Juridisch
Technisch	○	○	○	○	○	○	○	○	○	Cultureel
Technisch	○	○	○	○	○	○	○	○	○	Juridisch
Cultureel	○	○	○	○	○	○	○	○	○	Juridisch

Functioneel

Geef uw waardering voor ieder criteria

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Periode van leegstand	○	○	○	○	○	○	○	○	○	Uitbreidingsmogelijkheden
Periode van leegstand	○	○	○	○	○	○	○	○	○	Monumentale status
Periode van leegstand	○	○	○	○	○	○	○	○	○	Parkeervoorzieningen
Periode van leegstand	○	○	○	○	○	○	○	○	○	Perspectief vastgoedmarkt
Periode van leegstand	○	○	○	○	○	○	○	○	○	Flexibiliteit
Uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Monumentale status
Uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Parkeervoorzieningen
Uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Perspectief vastgoedmarkt
Uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Flexibiliteit
Monumentale status	○	○	○	○	○	○	○	○	○	Parkeervoorzieningen
Monumentale status	○	○	○	○	○	○	○	○	○	Perspectief vastgoedmarkt
Monumentale status	○	○	○	○	○	○	○	○	○	Flexibiliteit
Parkeervoorzieningen	○	○	○	○	○	○	○	○	○	Perspectief vastgoedmarkt
Parkeervoorzieningen	○	○	○	○	○	○	○	○	○	Flexibiliteit
Perspectief vastgoedmarkt	○	○	○	○	○	○	○	○	○	Flexibiliteit

Vorige **Volgende**

Functioneel

Geef uw waardering voor ieder criteria

Periode van leegstand

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Leegstand <3 jaar	○	○	○	○	○	○	○	○	○	Leegstand =>3 jaar

Uitbreidingsmogelijkheden

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Geen uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Horizontale uitbreiding
Geen uitbreidingsmogelijkheden	○	○	○	○	○	○	○	○	○	Verticale uitbreiding
Horizontale uitbreiding	○	○	○	○	○	○	○	○	○	Verticale uitbreiding

Monumentale status

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Ja	○	○	○	○	○	○	○	○	○	Nee

Parkeervoorzieningen

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoen	○	○	○	○	○	○	○	○	○	Voldoen niet

Perspectief vastgoedmarkt

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Afnemende vraag	○	○	○	○	○	○	○	○	○	Stagnatie van vraag
Afnemende vraag	○	○	○	○	○	○	○	○	○	Toenemende vraag
Stagnatie van vraag	○	○	○	○	○	○	○	○	○	Toenemende vraag

Flexibiliteit

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Stramien van dragende wanden <7,2m	○	○	○	○	○	○	○	○	○	Kolommenstructuur of stramien van dragende wanden =>7,2m

Vorige **Volgende**

Technisch

Geef uw waardering voor ieder criteria

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Staat van gebouwschil
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Brandveiligheid
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Warmte- en geluidsisolatie
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Asbest
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Installaties (E+W)
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Grootte en afmetingen	○	○	○	○	○	○	○	○	○	Staat van constructie
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Brandveiligheid
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Warmte- en geluidsisolatie
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Asbest
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Installaties (E+W)
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Staat van gebouwschil	○	○	○	○	○	○	○	○	○	Staat van constructie
Brandveiligheid	○	○	○	○	○	○	○	○	○	Warmte- en geluidsisolatie
Brandveiligheid	○	○	○	○	○	○	○	○	○	Asbest
Brandveiligheid	○	○	○	○	○	○	○	○	○	Installaties (E+W)
Brandveiligheid	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Brandveiligheid	○	○	○	○	○	○	○	○	○	Staat van constructie
Warmte- en geluidsisolatie	○	○	○	○	○	○	○	○	○	Asbest
Warmte- en geluidsisolatie	○	○	○	○	○	○	○	○	○	Installaties (E+W)
Warmte- en geluidsisolatie	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Warmte- en geluidsisolatie	○	○	○	○	○	○	○	○	○	Staat van constructie
Asbest	○	○	○	○	○	○	○	○	○	Installaties (E+W)
Asbest	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Asbest	○	○	○	○	○	○	○	○	○	Staat van constructie
Installaties (E+W)	○	○	○	○	○	○	○	○	○	Niveau van uitrusting
Installaties (E+W)	○	○	○	○	○	○	○	○	○	Staat van constructie
Niveau van uitrusting	○	○	○	○	○	○	○	○	○	Staat van constructie

Vorige **Volgende**

Technisch

Geef uw waardering voor ieder criteria

Grootte en afmetingen

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Vloeroppervlak <3.000m2	○	○	○	○	○	○	○	○	○	Vloeroppervlak =>3.000m2

Staat van gebouwschil

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Slecht	○	○	○	○	○	○	○	○	○	Voldoende
Slecht	○	○	○	○	○	○	○	○	○	Goed
Voldoende	○	○	○	○	○	○	○	○	○	Goed

Brandveiligheid

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoet niet	○	○	○	○	○	○	○	○	○	Voldoet

Warmte- en geluidsisolatie

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoet niet	○	○	○	○	○	○	○	○	○	Voldoet

Asbest

Criteria	9	7	5	3	1	3	5	7	9	Criteria
(Risico op) aanwezigheid asbest	○	○	○	○	○	○	○	○	○	Geen asbest aanwezig

Installaties (E+W)

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoet niet	○	○	○	○	○	○	○	○	○	Voldoet

Niveau van uitrusting

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoet niet	○	○	○	○	○	○	○	○	○	Voldoet

Staat van constructie

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Slecht	○	○	○	○	○	○	○	○	○	Voldoende
Slecht	○	○	○	○	○	○	○	○	○	Goed
Voldoende	○	○	○	○	○	○	○	○	○	Goed

Vorige Volgende

Cultureel

Geef uw waardering voor ieder criteria

Imago van de omgeving

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Gevoel van onveiligheid	○	○	○	○	○	○	○	○	○	Neutraal
Gevoel van onveiligheid	○	○	○	○	○	○	○	○	○	Gevoel van veiligheid
Neutraal	○	○	○	○	○	○	○	○	○	Gevoel van veiligheid

Juridisch

Geef uw waardering voor ieder criteria

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Bestemmingsplan	○	○	○	○	○	○	○	○	○	Administratieve ondersteuning

Juridisch

Geef uw waardering voor ieder criteria

Bestemmingsplan

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Voldoet niet	○	○	○	○	○	○	○	○	○	Voldoet

Administratieve ondersteuning

Criteria	9	7	5	3	1	3	5	7	9	Criteria
Geen samenwerking	○	○	○	○	○	○	○	○	○	Beperkte samenwerking
Geen samenwerking	○	○	○	○	○	○	○	○	○	Intensieve samenwerking
Beperkte samenwerking	○	○	○	○	○	○	○	○	○	Intensieve samenwerking

Allereerst wil ik u bedanken voor uw tijd en moeite om deze enquête in te vullen.

Voor mijn onderzoek ben ik op zoek naar zo veel mogelijk deskundigen die ervaring hebben met transformatie van vastgoed.
Mocht u nog collega's kennen die mee willen doen met dit onderzoek, wilt u dan zo vriendelijk zijn om deze link door te sturen.

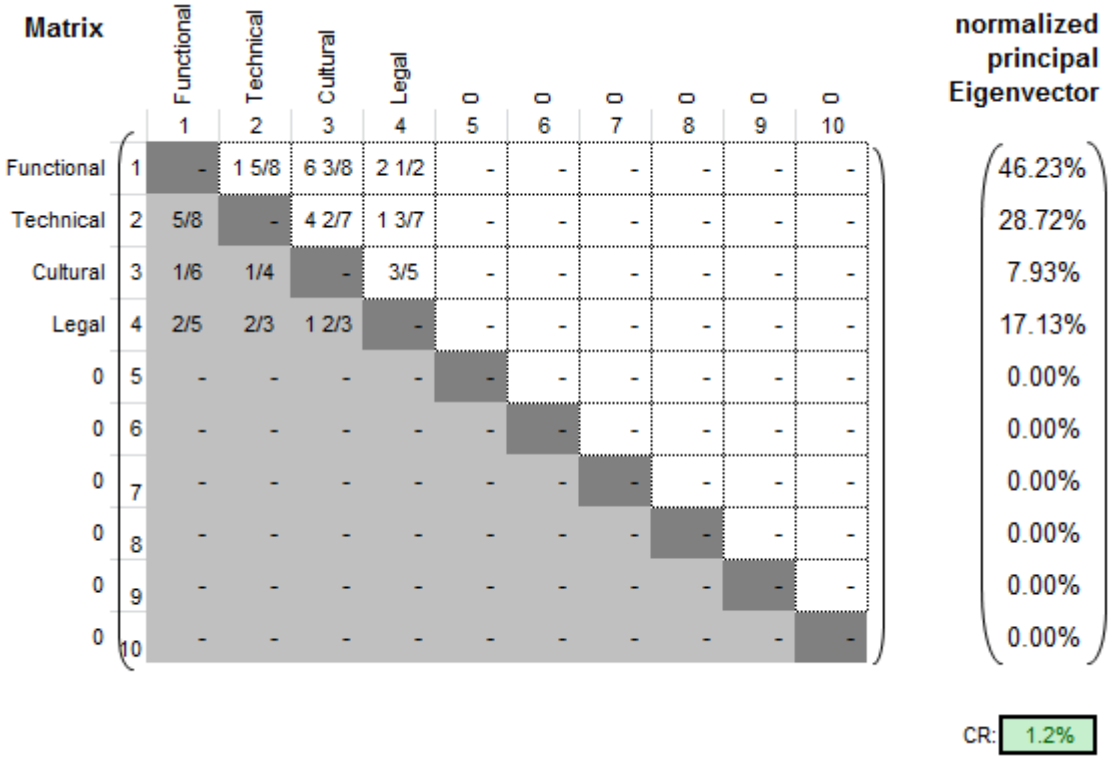
Dank u voor uw medewerking!

Mark van Swam
Masterstudent Construction Management & Engineering

Als u nog **vragen** heeft dan kunt u een e-mail sturen naar: **m.g.m.v.swam@student.tue.nl**

APPENDIX J

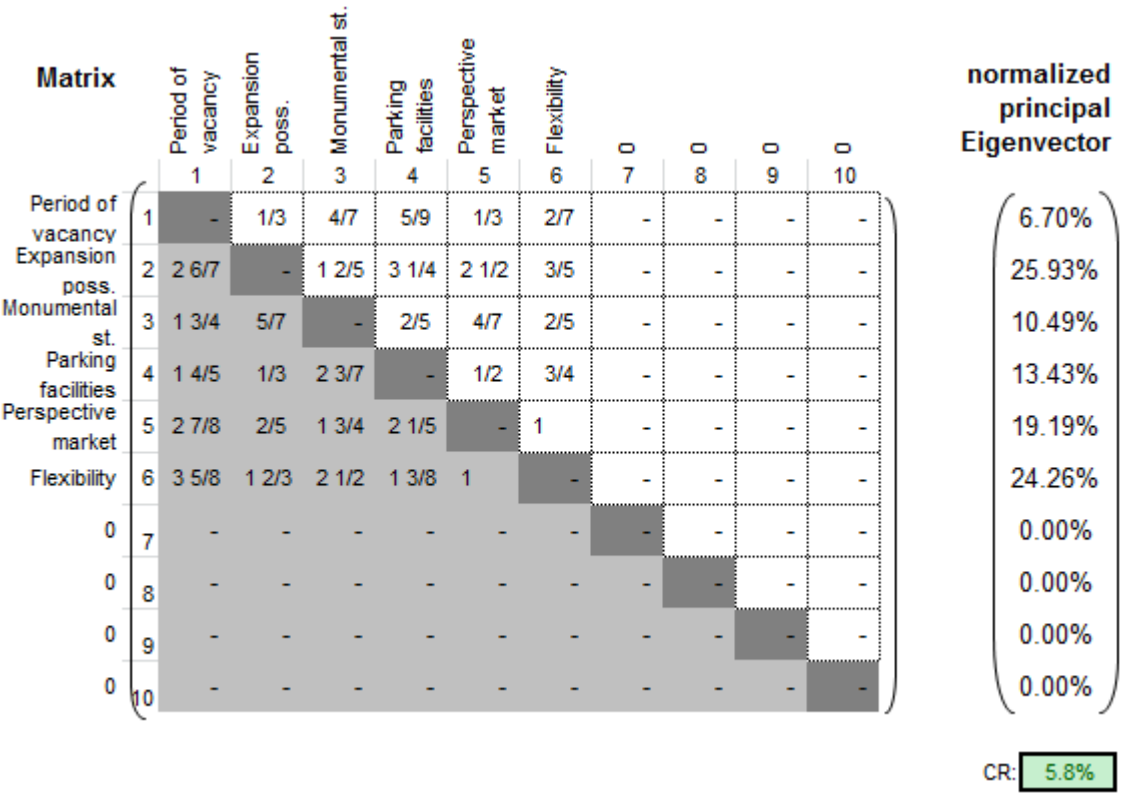
Comparison matrix Main criteria



Matrix	1 Functional	2 Technical	3 Cultural	4 Legal	5 0	6 0	7 0	8 0	9 0	10 0	normalized principal Eigenvector
1 Functional	-	1 5/8	6 3/8	2 1/2	-	-	-	-	-	-	46.23%
2 Technical	5/8	-	4 2/7	1 3/7	-	-	-	-	-	-	28.72%
3 Cultural	1/6	1/4	-	3/5	-	-	-	-	-	-	7.93%
4 Legal	2/5	2/3	1 2/3	-	-	-	-	-	-	-	17.13%
5 0	-	-	-	-	-	-	-	-	-	-	0.00%
6 0	-	-	-	-	-	-	-	-	-	-	0.00%
7 0	-	-	-	-	-	-	-	-	-	-	0.00%
8 0	-	-	-	-	-	-	-	-	-	-	0.00%
9 0	-	-	-	-	-	-	-	-	-	-	0.00%
10 0	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 1.2%

Comparison matrix Functional



Matrix	1 Period of vacancy	2 Expansion poss.	3 Monumental st.	4 Parking facilities	5 Perspective market	6 Flexibility	7 0	8 0	9 0	10 0	normalized principal Eigenvector
1 Period of vacancy	-	1/3	4/7	5/9	1/3	2/7	-	-	-	-	6.70%
2 Expansion poss.	2 6/7	-	1 2/5	3 1/4	2 1/2	3/5	-	-	-	-	25.93%
3 Monumental st.	1 3/4	5/7	-	2/5	4/7	2/5	-	-	-	-	10.49%
4 Parking facilities	1 4/5	1/3	2 3/7	-	1/2	3/4	-	-	-	-	13.43%
5 Perspective market	2 7/8	2/5	1 3/4	2 1/5	-	1	-	-	-	-	19.19%
6 Flexibility	3 5/8	1 2/3	2 1/2	1 3/8	1	-	-	-	-	-	24.26%
7 0	-	-	-	-	-	-	-	-	-	-	0.00%
8 0	-	-	-	-	-	-	-	-	-	-	0.00%
9 0	-	-	-	-	-	-	-	-	-	-	0.00%
10 0	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 5.8%

Comparison matrix Technical

Matrix	Size and dimensions	Building envelope	Fire safety	Insulation	Asbestos	Installation (E+W)	Equipment	Construction	0	0	normalized principal Eigenvector
	1	2	3	4	5	6	7	8	9	10	
Size and dimensions 1	-	1 1/2	1 1/9	1	5/7	1 2/7	1 1/3	2/5	-	-	11.39%
Building envelope 2	2/3	-	1 2/7	2	5/9	1 2/3	2 1/5	2/5	-	-	12.17%
Fire safety 3	8/9	7/9	-	1 2/5	2/3	1 6/7	3 1/3	1/2	-	-	12.66%
Insulation 4	1	1/2	5/7	-	5/7	1 1/2	2 1/3	3/7	-	-	10.17%
Asbestos 5	1 2/5	1 4/5	1 5/9	1 2/5	-	2 1/3	2 5/8	5/8	-	-	16.70%
Installation (E+W) 6	7/9	3/5	1/2	2/3	3/7	-	1 1/3	4/9	-	-	7.68%
Equipment 7	3/4	4/9	2/7	3/7	3/8	3/4	-	1/3	-	-	5.80%
Construction 8	2 1/2	2 1/2	1 6/7	2 1/3	1 4/7	2 1/5	3 1/8	-	-	-	23.43%
0 9	-	-	-	-	-	-	-	-	-	-	0.00%
0 10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 2.0%

Comparison matrix Legal

Matrix	Zoning plan	Administrative support	0	0	0	0	0	0	0	0	normalized principal Eigenvector
	1	2	3	4	5	6	7	8	9	10	
Zoning plan 1	-	6 2/9	-	-	-	-	-	-	-	-	86.17%
Administrative support 2	1/6	-	-	-	-	-	-	-	-	-	13.83%
0 3	-	-	-	-	-	-	-	-	-	-	0.00%
0 4	-	-	-	-	-	-	-	-	-	-	0.00%
0 5	-	-	-	-	-	-	-	-	-	-	0.00%
0 6	-	-	-	-	-	-	-	-	-	-	0.00%
0 7	-	-	-	-	-	-	-	-	-	-	0.00%
0 8	-	-	-	-	-	-	-	-	-	-	0.00%
0 9	-	-	-	-	-	-	-	-	-	-	0.00%
0 10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Period of vacancy

Matrix		Vacant < 3 years	Vacant ≥ 3 years	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Vacant < 3 years	1	-	3 5/7	-	-	-	-	-	-	-	-	78.76%
Vacant ≥ 3 years	2	1/4	-	-	-	-	-	-	-	-	-	21.24%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Expansion possibilities

Matrix		No expansion	Horizontal exp.	Vertical exp.	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
No expansion	1	-	1/3	2/7	-	-	-	-	-	-	-	12.96%
Horizontal exp.	2	3 1/5	-	1	-	-	-	-	-	-	-	43.60%
Vertical exp.	3	3 1/2	1	-	-	-	-	-	-	-	-	43.44%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.3%

Comparison matrix Monumental status

Matrix

		Yes	No	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Yes	1	-	3/5	-	-	-	-	-	-	-	-	37.85%
No	2	1 2/3	-	-	-	-	-	-	-	-	-	62.15%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

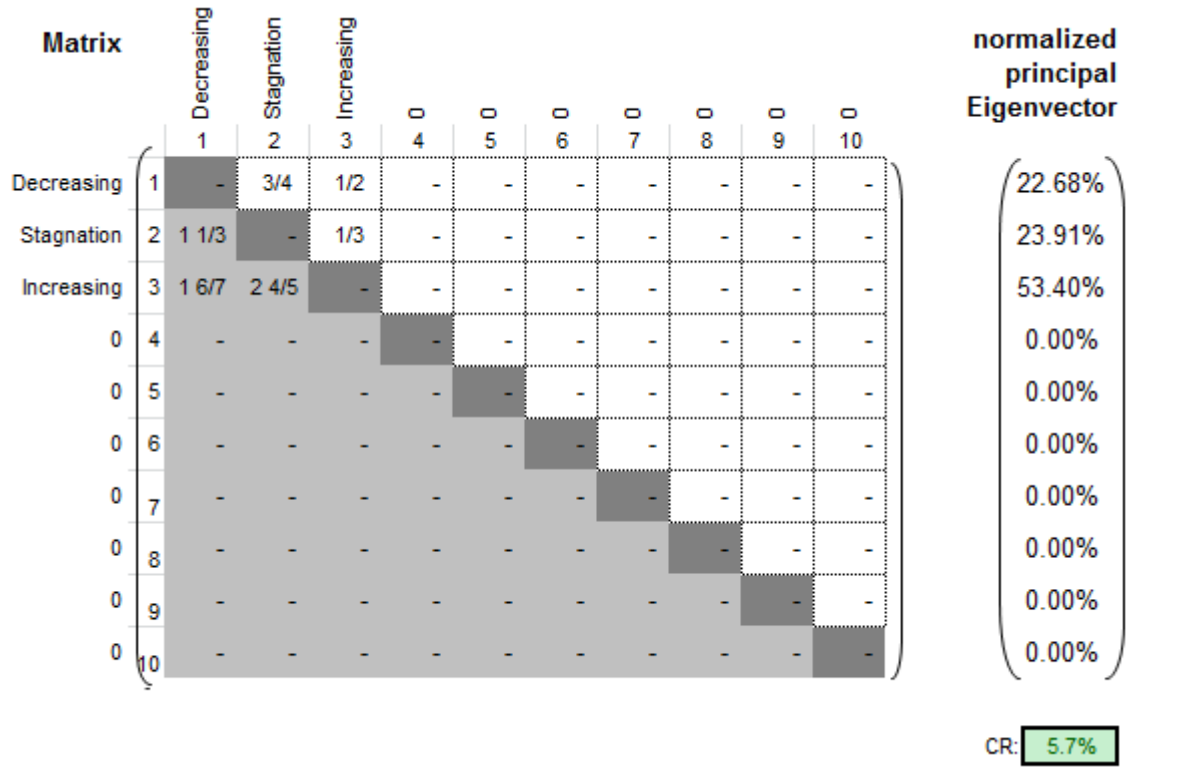
Comparison matrix Parking facilities

Matrix

		Satisfies	Doesn't satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Satisfies	1	-	3 1/2	-	-	-	-	-	-	-	-	77.72%
Doesn't satisfies	2	2/7	-	-	-	-	-	-	-	-	-	22.28%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

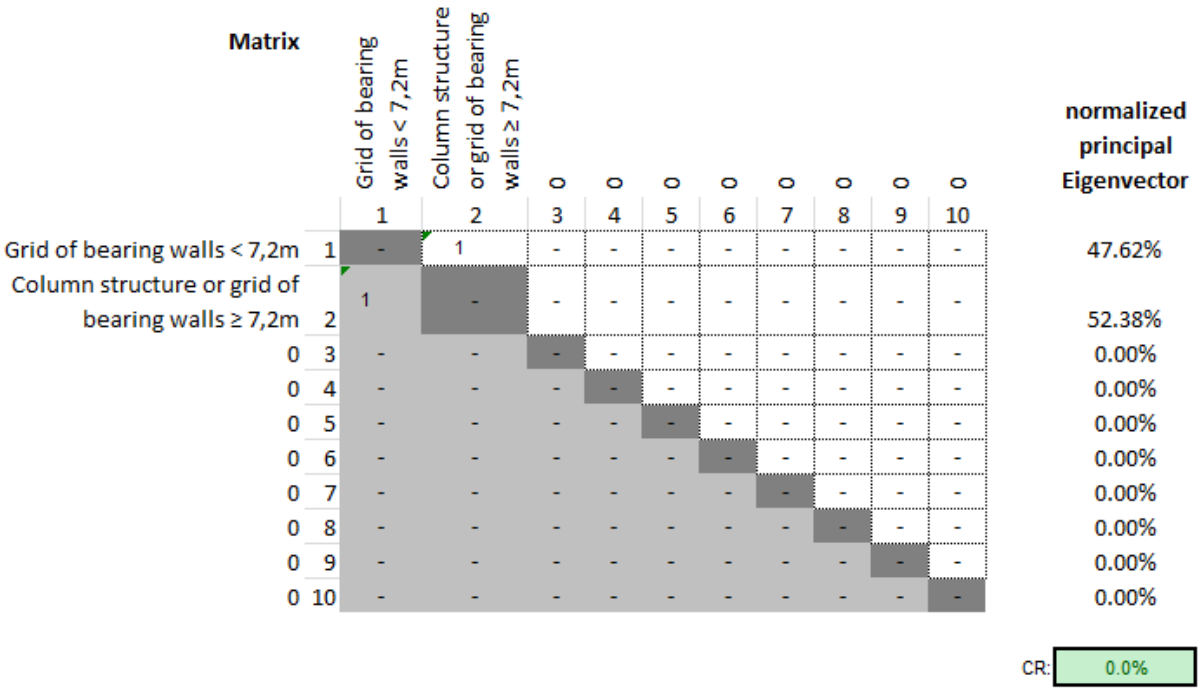
Comparison matrix Perspective of market



Matrix		Decreasing	Stagnation	Increasing	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Decreasing	1	-	3/4	1/2	-	-	-	-	-	-	-	22.68%
Stagnation	2	1 1/3	-	1/3	-	-	-	-	-	-	-	23.91%
Increasing	3	1 6/7	2 4/5	-	-	-	-	-	-	-	-	53.40%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 5.7%

Comparison matrix Flexibility



Matrix		Grid of bearing walls < 7,2m	Column structure or grid of bearing walls ≥ 7,2m	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Grid of bearing walls < 7,2m	1	-	1	-	-	-	-	-	-	-	-	47.62%
Column structure or grid of bearing walls ≥ 7,2m	2	1	-	-	-	-	-	-	-	-	-	52.38%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Size and dimensions

Matrix		< 3000m2 floor area	≥ 3000m2 floor area	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
< 3000m2 floor area	1	-	3/4	-	-	-	-	-	-	-	-	43.18%
≥ 3000m2 floor area	2	1 1/3	-	-	-	-	-	-	-	-	-	56.82%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix State of building envelope

Matrix		Bad	Sufficient	Good	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Bad	1	-	4/9	1/4	-	-	-	-	-	-	-	13.06%
Sufficient	2	2 2/7	-	2/5	-	-	-	-	-	-	-	26.62%
Good	3	4 1/8	2 1/2	-	-	-	-	-	-	-	-	60.32%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 1.3%

Comparison matrix Fire safety regulation

Matrix		Doesn't satisfies	Satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Doesn't satisfies	1	-	2/7	-	-	-	-	-	-	-	-	22.85%
Satisfies	2	3 3/8	-	-	-	-	-	-	-	-	-	77.15%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR:	0.0%

Comparison matrix Heat and sound insulation

Matrix		Doesn't satisfies	Satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Doesn't satisfies	1	-	1/3	-	-	-	-	-	-	-	-	25.18%
Satisfies	2	3	-	-	-	-	-	-	-	-	-	74.82%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR:	0.0%

Comparison matrix Asbestos

Matrix		(Risk of) presence	No asbestos	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
(Risk of) presence	1	-	4/5	-	-	-	-	-	-	-	-	44.75%
No asbestos	2	1 1/4	-	-	-	-	-	-	-	-	-	55.25%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Installation regulation

Matrix		Doesn't satisfies	Satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Doesn't satisfies	1	-	5/7	-	-	-	-	-	-	-	-	41.38%
Satisfies	2	1 2/5	-	-	-	-	-	-	-	-	-	58.62%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Level of equipment

Matrix		Doesn't satisfies	Satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Doesn't satisfies	1	-	1	-	-	-	-	-	-	-	-	49.21%
Satisfies	2	1	-	-	-	-	-	-	-	-	-	50.79%
0	3	-	-	-	-	-	-	-	-	-	-	0.00%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

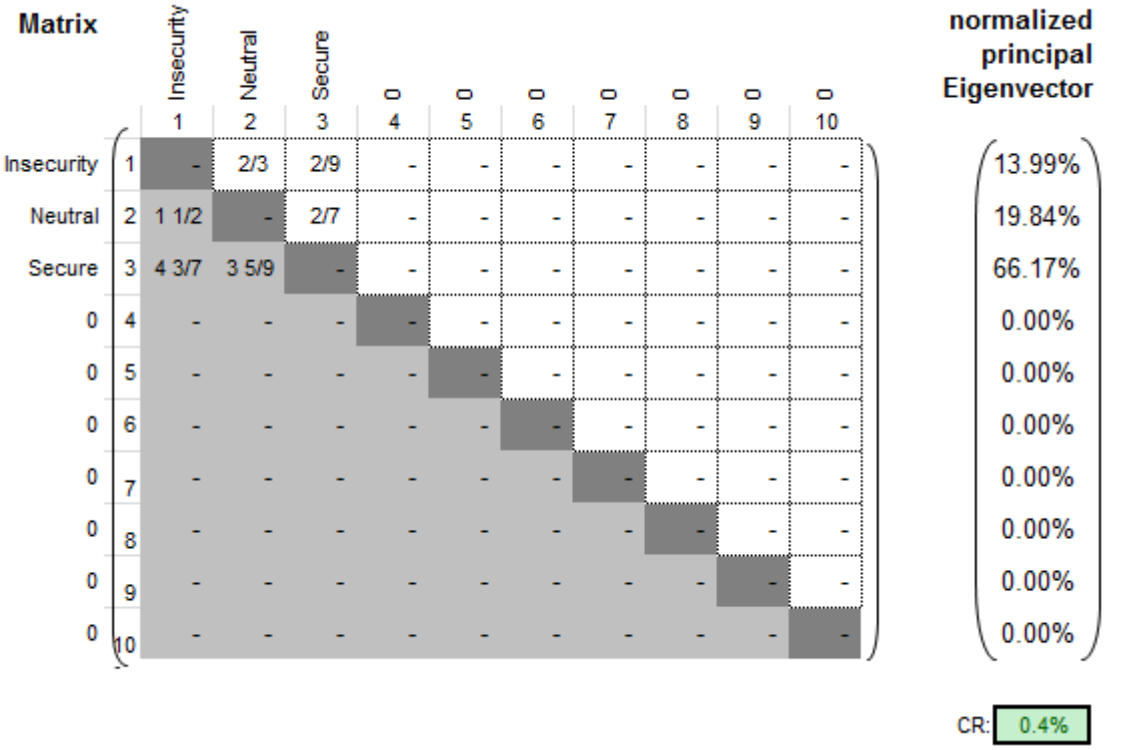
CR: 0.0%

Comparison matrix State of construction

Matrix		Bad	Sufficient	Good	0	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
Bad	1	-	2/9	1/8	-	-	-	-	-	-	-	6.53%
Sufficient	2	4 1/3	-	1/5	-	-	-	-	-	-	-	20.97%
Good	3	8 1/5	4 2/3	-	-	-	-	-	-	-	-	72.50%
0	4	-	-	-	-	-	-	-	-	-	-	0.00%
0	5	-	-	-	-	-	-	-	-	-	-	0.00%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 9.7%

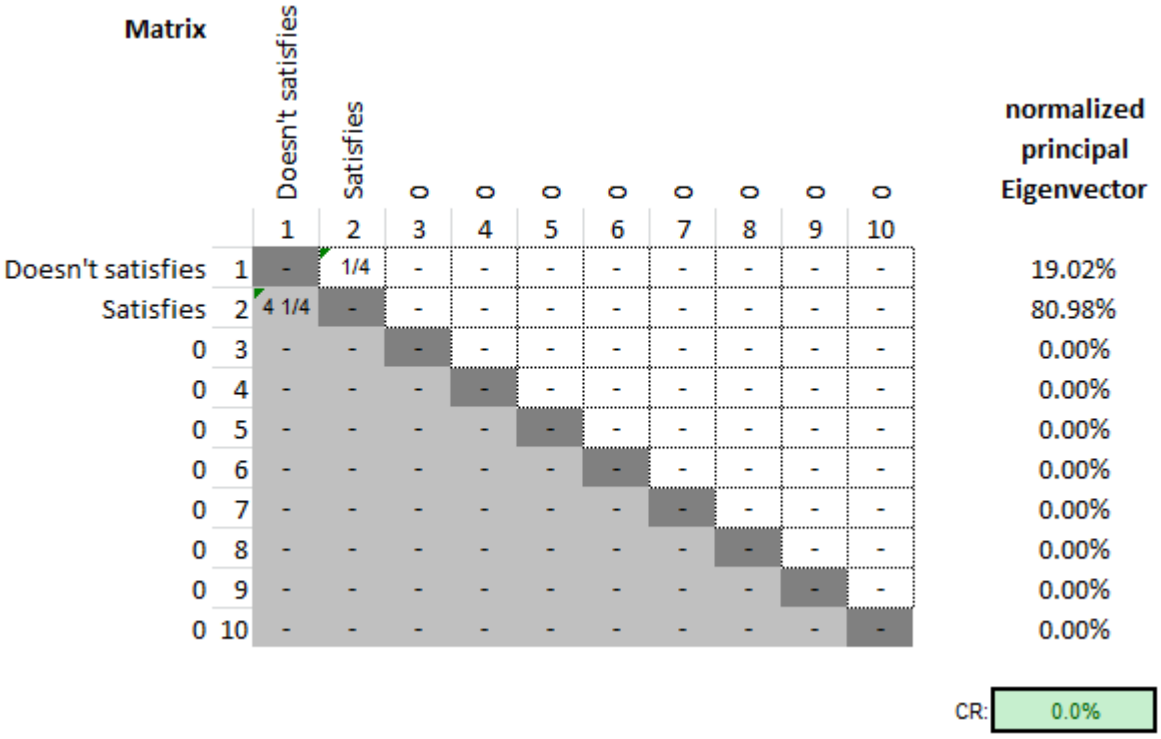
Comparison matrix Image of neighborhood



Matrix	Insecurity	Neutral	Secure	0	0	0	0	0	0	0	normalized principal Eigenvector
	1	2	3	4	5	6	7	8	9	10	
Insecurity 1	-	2/3	2/9	-	-	-	-	-	-	-	13.99%
Neutral 2	1 1/2	-	2/7	-	-	-	-	-	-	-	19.84%
Secure 3	4 3/7	3 5/9	-	-	-	-	-	-	-	-	66.17%
0 4	-	-	-	-	-	-	-	-	-	-	0.00%
0 5	-	-	-	-	-	-	-	-	-	-	0.00%
0 6	-	-	-	-	-	-	-	-	-	-	0.00%
0 7	-	-	-	-	-	-	-	-	-	-	0.00%
0 8	-	-	-	-	-	-	-	-	-	-	0.00%
0 9	-	-	-	-	-	-	-	-	-	-	0.00%
0 10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.4%

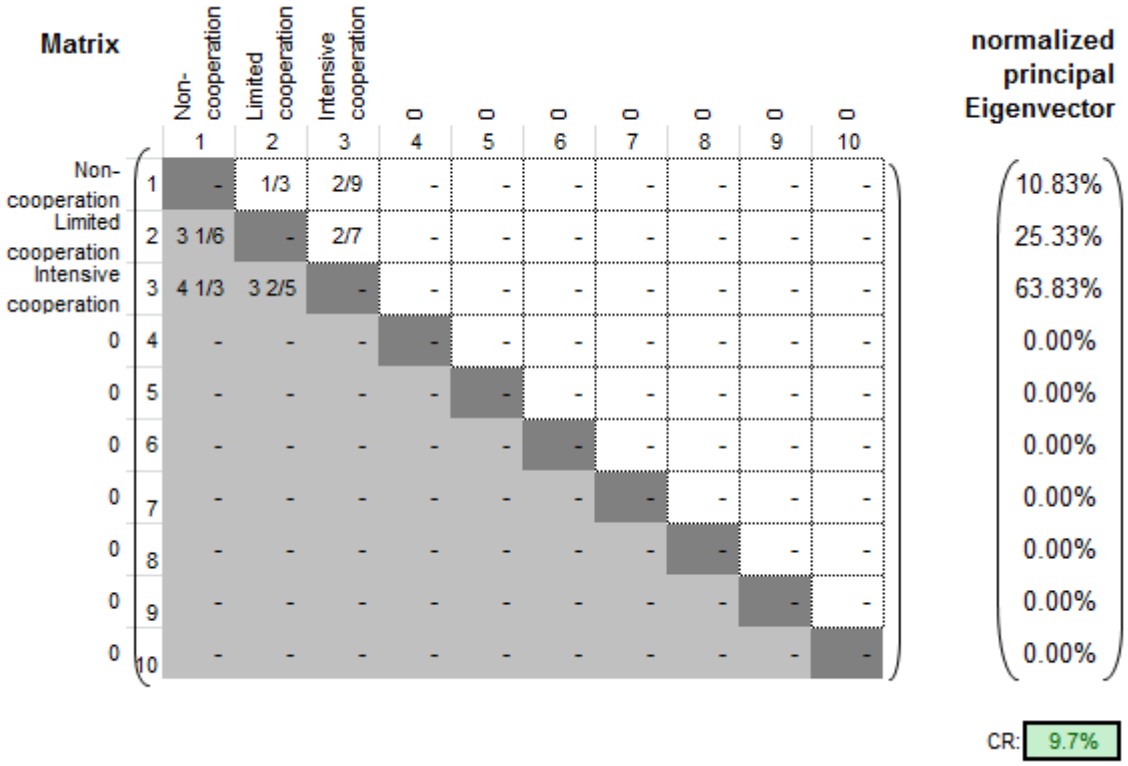
Comparison matrix Zoning plan



Matrix	Doesn't satisfies	Satisfies	0	0	0	0	0	0	0	0	normalized principal Eigenvector
	1	2	3	4	5	6	7	8	9	10	
Doesn't satisfies 1	-	1/4	-	-	-	-	-	-	-	-	19.02%
Satisfies 2	4 1/4	-	-	-	-	-	-	-	-	-	80.98%
0 3	-	-	-	-	-	-	-	-	-	-	0.00%
0 4	-	-	-	-	-	-	-	-	-	-	0.00%
0 5	-	-	-	-	-	-	-	-	-	-	0.00%
0 6	-	-	-	-	-	-	-	-	-	-	0.00%
0 7	-	-	-	-	-	-	-	-	-	-	0.00%
0 8	-	-	-	-	-	-	-	-	-	-	0.00%
0 9	-	-	-	-	-	-	-	-	-	-	0.00%
0 10	-	-	-	-	-	-	-	-	-	-	0.00%

CR: 0.0%

Comparison matrix Administrative support



APPENDIX K

DCF VALUATION

1. GENERAL DATA

CLIENT NAME	Camelot Vastgoedbeheer
CLIENT OBJECT REFRENCE NUMBER	
OBJECT NAME	SNS Bank
CITY/TOWN	Arnhem
ADDRESS	Utrechtsestraat 46
POSTAL CODE	6811LZ

2. PARAMATERS ESTIMATIONS

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
INFLATION % (CPI)	1.90%	2.20%	2.20%	2.30%	2.20%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
RENTAL GROWTH %	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
OPERATING COSTS % INCREASE	1.90%	2.20%	2.20%	2.30%	2.20%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

DISCOUNT RATE, CONSISTING OF :	8.50%
RISKFREE RATE	1.60%
REAL ESTATE RISK PREMIUM	6.40%
OBJECT SPECIFIC RISK	0.50%
INITIAL YIELD	0.00%
EXIT YIELD	5.75%

3. TENANT DATA

TENANT NAME	SQUARE METERS	AMOUNT	RENT 2014	STARTING DATE	EXPIRATION DATE	MARKET RENT PER SQ.M.	COST FOR FURNITURE	SERVICE COSTS	TOTAL RENT
TENANT A (46x Small rooms)	16	46	424	1-6-2015	31-10-2017	18	2.50	6.00	27
TENANT B (29x Large rooms)	21	29	557	1-6-2015	31-10-2017	18	2.50	6.00	27
TENANT C (4x Rooms in the corner)	26	4	689	1-6-2015	31-10-2017	18	2.50	6.00	27
TENANT D (1x (Double) Room ground floor)	31	1	822	1-6-2015	31-10-2017	18	2.50	6.00	27
-	-	-	-		-	-	-	-	-

4. CASH FLOW FIGURES FROM OPERATIONS

CASH FLOW YEARS	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
TENANT A	0	19,875	20,312	20,759	21,236	21,703	22,137	22,580	23,032	23,492	23,962	24,441	24,930	25,429	25,937	26,456
TENANT B	0	16,445	16,807	17,177	17,572	17,958	18,317	18,684	19,058	19,439	19,827	20,224	20,628	21,041	21,462	21,891
TENANT C	0	2,808	2,870	2,933	3,001	3,067	3,128	3,191	3,254	3,320	3,386	3,454	3,523	3,593	3,665	3,738
TENANT D	0	837	856	874	894	914	932	951	970	989	1,009	1,029	1,050	1,071	1,092	1,114
-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THEORETICAL RENTAL INCOME	0	39,965	40,844	41,743	42,703	43,643	44,515	45,406	46,314	47,240	48,185	49,149	50,132	51,134	52,157	53,200
INCENTIVES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VACANCY	0	1,998	2,042	2,087	2,135	2,182	2,226	2,270	2,316	2,362	2,409	2,457	2,507	2,557	2,608	2,660
GROSS RENTAL INCOME	0	37,967	38,802	39,656	40,568	41,460	42,290	43,135	43,998	44,878	45,776	46,691	47,625	48,577	49,549	50,540
PROPERTY TAX	2,101	2,141	2,188	2,236	2,288	2,338	2,385	2,432	2,481	2,531	2,581	2,633	2,686	2,739	2,794	2,850
SEWERAGE TAX	1,535	1,564	1,598	1,634	1,671	1,708	1,742	1,777	1,813	1,849	1,886	1,923	1,962	2,001	2,041	2,082
INSURANCE	5,000	5,095	5,207	5,322	5,444	5,564	5,675	5,789	5,904	6,022	6,143	6,266	6,391	6,519	6,649	6,782
WATER TAXES	2,580	2,629	2,687	2,746	2,809	2,871	2,928	2,987	3,047	3,108	3,170	3,233	3,298	3,364	3,431	3,500
SUBTOTAL FIXED COSTS	11,216	11,429	11,680	11,937	12,212	12,481	12,730	12,985	13,245	13,509	13,780	14,055	14,336	14,623	14,916	15,214
PROPERTY MANAGEMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROKERAGE FEE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL MANAGEMENT COSTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE COSTS	0	12,096	12,362	12,634	12,925	13,209	13,473	13,743	14,018	14,298	14,584	14,875	15,173	15,476	15,786	16,102
REPLACEMENT	1,209,600															
UNRECOVERABLE VAT	0	210	214	219	224	229	234	238	243	248	253	258	263	268	274	279
UNRECOVERABLE SERVICE CHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL OTHER COSTS	0	210	214	219	224	229	234	238	243	248	253	258	263	268	274	279
TOTAL OPERATING COSTS	1,220,816	23,735	24,257	24,791	25,361	25,919	26,437	26,966	27,505	28,055	28,616	29,189	29,773	30,368	30,975	31,595
OTHER CASH FLOW																
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM FUTURE COSTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RENOVATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OTHER CASHFLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5. END VALUE

RENTAL INCOME YEAR 16	54,264
EXIT YIELD, REQUIRED RATE OF RETURN BUYER	5.75%
VALUE EXCLUDING PURCHASE COSTS	943,722
PURCHASE COSTS	61,739
END VALUE	881,983

6. VALUATION

6a. RECAP CASHFLOWS	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
GROSS RENTAL INCOME	0	37,967	38,802	39,656	40,568	41,460	42,290	43,135	43,998	44,878	45,776	46,691	47,625	48,577	49,549	50,540
TOTAL OPERATING COSTS	1,220,816	23,735	24,257	24,791	25,361	25,919	26,437	26,966	27,505	28,055	28,616	29,189	29,773	30,368	30,975	31,595
TOTAL OTHER CASHFLOWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
END VALUE																881,983
TOTAL CASHFLOWS	-1,220,816	14,232	14,545	14,865	15,207	15,542	15,852	16,170	16,493	16,823	17,159	17,502	17,852	18,210	18,574	900,928
6b. DISCOUNTED VALUE INCOME/OUTGOINGS	-1,172,021	12,593	11,862	11,173	10,534	9,923	9,328	8,769	8,244	7,750	7,286	6,849	6,439	6,053	5,691	254,407
DISCOUNTED VALUE END VALUE																239,103
TOTAL ALL DISCOUNTED VALUES		-556,015														
PURCHASE COSTS		-36,375														
VALUE		-519,640														
ROUNDED		-520,000		8.5%	INTERNAL RATE OF RETURN											

DATE : 4-aug-14

Discounted Cash Flow analysis case study

KENWIB SUMMARIES

POTENTIAL TRANSFORMATION OF VACANT OFFICES INTO HOUSING FOR YOUNG PEOPLE: Optimization of Decision Making Process

Author: Mark van Swam

Graduation program

Construction Management and Urban Development 2013 – 2014

Graduation committee

Prof. dr. ir. W.F. Schaefer (Chairman TU/e)
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Prof. dr. ir. B. van Weenen (Graduation Supervisor TU/e)

Date of graduation

13-08-2014

ABSTRACT

Both vacancy and transformation of existing buildings are of all ages. However the last few years the market is changed into a so called replacement market. The office stock in use is fairly stable, there is no demand for expansion. So the new buildings are mainly built to replace the old stock. This construction of new real estate leads to oversupply and so we can speak of a buyer's market. An increasing proportion of this supply is outdated and will be difficult to rent without any adjustments, even with a strong economic recovery. In order to prevent extended vacancy, it is necessary that a substantial portion of the outdated stock on the market will be removed. (Voordt & Geraedts, 2007) This imbalance can be explained due the fact that the labor force stops growing, the “new way of working” is gaining popularity and the surface area per workplace per employee decreases. (Besselaar, 2011) Transformation of existing offices is a sustainable way of addressing vacancy; either through residential conversion or within use adaption. The solution for vacancy can be different for each case because not every property is vacant for the same reason. Transformation of vacant offices is related to multiple factors and actors with many conflicting interests, involvment or investments, which results in a complicated process. But the most important part is that transformation only makes sense when the new function(s) provide in need. The supply must match demand, in terms of characteristics and location of building. This research gives an overview of the most important factors and barriers that influence the transformation potential of vacant offices into housing for young people, from both supply and demand side. The results of this research form the input for a support tool which allows an investor to make a substantiated financial feasibility study in a quick way at an early stage of the transformation process.

Keywords: Office vacancy, transformation, housing choice behaviour, decision making process, Discrete Choice Experiment, Pairwise Comparison, DCF

INTRODUCTION

A small oversupply within the office market is necessary to react on the dynamics of the market. A “healthy” vacancy rate should be around 5% till 7% of the stock (Besselaar, 2011). It is well known that the vacancy rate in the Netherlands related to the office market is “unhealthy” for several years. To indicate the size of this problem, some facts will be addressed. The office stock within the Netherlands consists of 49,4 million m² of which 7,3 million m² is vacant. This means a vacancy rate of 14,7%. (Zadelhoff, 2013)

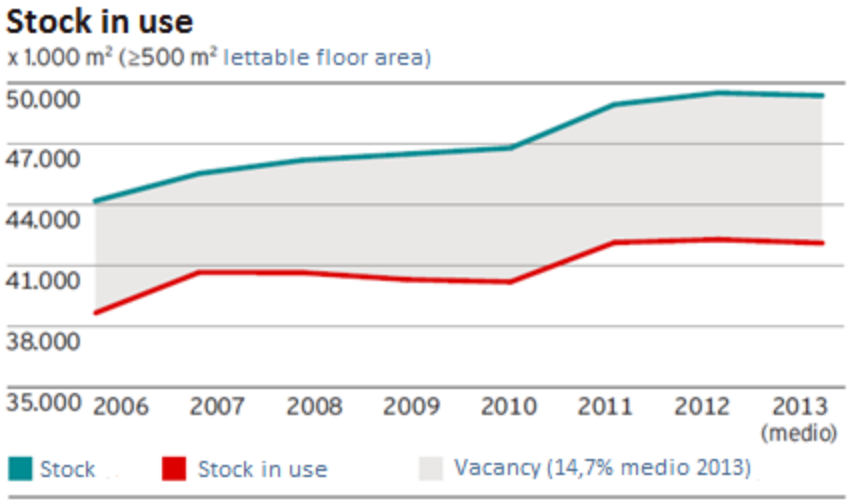

Figure 1 Office stock in use (source: Bak, DTZ Zadelhoff)

This imbalance can be explained due the fact that the labor force stops growing, the "new way of working" is gaining popularity and the surface area per workplace per employee decreases. (Besselaar, 2011) In order to prevent extended vacancy, it is necessary that a substantial portion of the outdated stock on the market will be removed. (Voordt & Geraedts, 2007) One way to do this is through transformation of vacant real estate. However it is not realistic to expect that the vacancy problem will be completely solved by transformation. Location and quality play a crucial role in this issue. For example transformation of one building located on a mono-functional office locations into housing units will not be feasible in both financial and social way. (Besselaar, 2011) Most common problems that ensure that a project is not feasible are depreciation, the location and layout or the collaboration with the municipality. (Besselaar, 2011; Heath, 2001; Houtveen, July 2002)

Problem definition and research question

For an investor it is important to distinguish vacant buildings with potential for transformation as early as possible in the process. This is important because feasibility studies during the initiative and definition phase need a large investment of both time and money, while there is no guarantee for success. An large amount of vacant real estate is “available” for transformation, but an investor must determine quickly whether the vacant offices are suitable for other purposes and if transformation is financially feasible.

An investor has the goal to optimize the exploitation of vacant offices by maximizing returns and minimizing risks. A lot of vacant offices are "available" for transformation which gives difficulties in the quick assessment process regarding the potential for transformation into housing for young people.

This potential is based on many parameters and sub-parameters, for example market, location, building and finance. All these factors collectively determine the possibilities and potential of transformation. Despite everything, transformation of vacant offices only makes sense when the new function(s) provide in need. The supply must match demand, in terms of their characteristics and location of the building. (Dam, 2013; Voordt & Geraedts, 2007)

So successful transformation of vacant real estate depends on several factors and characteristics. Physical attributes as building depth, accessibility, facades and the structural frame are important factors but also location, age and legal and social attributes are important factors to take into account. (Voordt & Geraedts, 2007) Besides these building characteristics there is a significant influence through the dynamic working of the market, tenants wishes, the risk factor, requirements and the strategy of the investor. Because of these multiple factors and actors the process is complicated which makes it difficult for an investor to investigate whether a project / transformation is feasible or how to minimize the risks. (Besselaar, 2011) It is obvious that the financial aspect is one of the many factors that influence this process. This context leads to the following research question:

"How can the process of assessing the suitability of vacant offices for transformation into housing for young people be optimized?"

In order to understand the problem better, the problem is divided into sub-questions:

Sub question one: Which factors have influence on the transformation potential of vacant offices?

Sub question two: What are the main preferences / needs of the target group (young people) regarding transformation and housing?

Sub question three: Which (success-) factors need to be examined regarding the suitability for transformation into housing for young people before a justified and non-binding offer can be made on a property?

Sub question four: How could a (structural) vacant office be evaluated regarding the suitability for transformation into housing for young people? Suitability on technical, geographical, legislative and financial level.

Sub question five: What is the best way to optimize the project management with respect to the process of transformation to maximize the returns and minimize the risks that these kind of investments entails? How can a Decision Support Tool be composed to support this decision from the perspective of the investor?"

TRANSFORMATION PROCESS

The biggest differences between the traditional construction process and the transformation process occur during the initiative phase. The goal during this research is to optimize the decision making process at the beginning of the actual transformation process, within the initiative phase. This means that the right information is generated at an early stage of the initiative phase, so that it is easier to control the process and risks can be reduced.

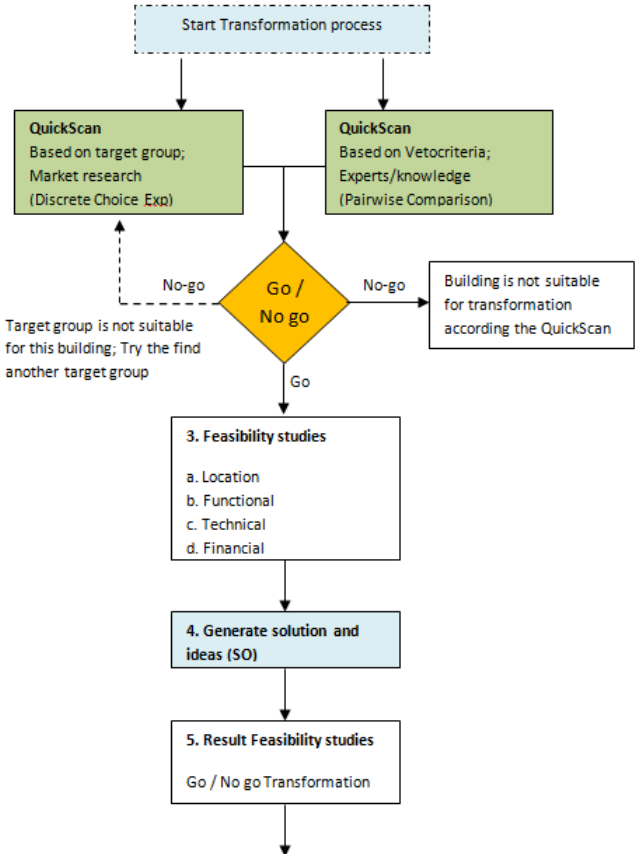

Figure 2 Optimalisation initiative phase

The available knowledge and experience of experts can be used during the transformation process through a QuickScan that effectively assesses the building on building related factors and attributes. By using the experience and knowledge of experts, the influence of these factors and attributes on the potential of the building regarding transformation may be determined. Combined with the housing needs of a specific target group, the feasibility of a specific building can be tested by using a QuickScan. Hereby it is important that the decisive criteria (called Vetocriteria) of a building are tested in the earliest stage that is possible. (Andriessen cited in Voordt & Geraedts, 2007) This optimization of the initiative phase is included in figure 2.

When the housing needs and demands of the potential target group are known, based on a market research (Discrete Choice Model), a housing alternative can be assembled that gains the highest utility. Also the Willingness To Pay for this specific alternative could be calculated, the WTP will be used as a guideline for the potential rent. On the other hand the building can be evaluated based on criteria set by various experts, arising from the literature study and by using Pairwise Comparison.

Financial feasibility plays a central role in the investing decisions of companies and investors. During this research the Discounted Cash Flow (DCF) model will be used to calculate this financial feasibility. The conclusion of the QuickScan (Go or No-go) is based on this financial result. The (potential) rent is based on the Willingness To Pay arising from the DCM and the investment costs are based on a cost indicator which is justified by the use of a Pairwise Comparison experiment under experts.

DISCRETE CHOICE ANALYSIS

Housing choice decisions are complex in which many attributes are involved (Jansen et al., 2011 cited in Nijenstein, 2012). However, not all attributes are equally important from the perspective of the different actors in the transformation process. For example attributes regarding the Dutch building decree and other necessary permits are (most of the times) only concerning the developer and investor. Next to this there are also certain attributes and characteristics that will give the potential tenant (target group) sufficient utility so that they are more willing to rent certain housing units. These attributes depend upon the defined target group(s), but will always include price and location. Overall, these attributes can be divided into the following categories: Functional, Technical, Cultural, Legal and Financial.

The aim of this Discrete Choice Experiment is understanding the preferences of future tenants regarding possible housing units realized with transformation. Knowing the desired mix of attributes that a target group is looking for, might guarantee the success of the transformation project. As previously indicated in the report the focus is on the market segment existing of young people, a rapidly mutating and moving target group.

Influencing attributes

In housing choice decision research, four life-course careers are defined: labour career, family career, educational career, and housing career. Changes in each of these life-course careers influence the probability of moving: households will reconsider their housing situation because of changing needs. Young people, are in a unique life stage which is very dynamic with many occurring life events in all career paths (Coulter et al., 2010; Geist & McManus, 2008; Lee & Waddel, 2010 cited in Nijenstein, 2012).

Several studies have been conducted about the influence of housing characteristics and their influence on the choice to live somewhere or not. Housing characteristics such as **price** and **size** are thought to influence housing preferences and housing choice behaviour substantially (Dieleman, 2001; Lee & Waddell, 2010; Lindberg et al., 1989; Louviere & Timmermans, 1990; Molin et al., 1996; Molin, Oppewal, & Timmermans, 2001; Timmermans, Borgers, Van Dijk, & Oppewal, 1992 cited in Nijenstein, 2012; Voordt & Geraedts, 2007). Next to that, aspects of the residential environment and **location aspects** as **green areas**, parking facilities and **accessibility** are from a lesser extent but still influential on the housing choice behaviour (Kim, Pagliara, & Preston, 2005; Lee & Waddell, 2010; Louviere & Timmermans, 1990; Molin et al., 1996; Lindberg et al., 1989 cited in Nijenstein, 2012; Bouwmeester, 2006)

More functional attributes that are mentioned often within the different literature are the **type of housing units** (apartments, studio, etc.) and the **outdoor space** (garden, balcony, etc.) (Voordt & Geraedts, 2007; Nijenstein, 2012; Vasilache, 2013; Beurden, 2013). Student housing providers and organisations in the Netherlands have conducted quite some research on students' housing choice behaviour in the Netherlands (e.g. Gjaltema, Vijncke & Poulus, 2009; Laagland'advies, 2009; Poulus, 2011; Rabobank, 2006; Van Alphen, 2010; WonenBreburg,

2009, 2011 cited in Nijenstein, 2012) (Voordt & Geraedts, 2007). In these studies, price, size, condition of the complex, **shared versus private facilities** and accessibility of city centre, facilities and campus were found to be important in housing choice decisions for students. In addition to these frequently mentioned attributes, it is interesting to see if the **formerly use** of the building influence the housing choice behaviour of the potential user. The formerly use influences the exterior, the appearance and the layout of the building. But does the former use of the building also affects the housing choice behaviour of the potential target group. Preferences and wishes of each individual within the target group can be translated into a choice. Choices are based on income combined with the degree of satisfaction, utility, that the product offers. (Hensher, Rose, & Greene, 2005)

A common objective in the use of discrete choice models is the derivation of measures designed to determine the amount of money individuals are willing to forfeit in order to obtain some benefit from the undertaking of some specific action or task. Such measures are referred to as measures of willingness to pay (WTP). Hensher, Rose, & Greene (2005) state that the WTP can be calculated as the ratio of two parameters estimates, holding all else constant. Provided at least one attribute is measured in monetary units, the ratio of the two parameters will provide a financial indicator of WTP. (Hensher, Rose, & Greene, 2005)

The attributes that are used within the Discrete choice experiment to calculate the Willingness To Pay are given in table 1. The attribute levels represent the levels assigned to an attribute as part of the experimental design process. These are represented by numbers that will have no meaning to the decision maker being surveyed. That is why, attribute level labels are assigned. These labels may be numbers (quantitative) or words (qualitative). (Hensher, Rose, & Greene, 2005)

For the complete explanation of the research method Discrete Choice Modeling (DCM) and the application of DCM within this research it is recommended to read chapter 4 of the complete report.

Results

The WTP table should be read as follows. Each attribute has a basic level, which is level 1. This gives the basic value that a potential tenant is willing to pay for this attribute level. The WTP for the 2 remaining levels of each attribute are values that a potential tenant is willing to pay more or less comparing to the base level. Within the column WTP per level, the real price is given that young people are willing to pay when this level occurs in the offered housing alternative.

			Price [PR=0]	WTP	WTP per level
Attributes	**Levels**	**β_{levels}**	**β_{price}**	**(β_{levels} / β_{price})**	
Facilities	Shared facilities	-1.527	-0.261	-5.85	2.77
	Semi-private fac.	-0.723	-0.261	-2.77	5.85
	Private facilities	2.250	-0.261	8.62	8.62
Housing unit	Room	-0.718	-0.261	-2.75	1.59
	Studio	-0.416	-0.261	-1.59	2.75
	Apartment	1.134	-0.261	4.34	4.34
Outdoor space	None	-0.844	-0.261	-3.23	1.07
	Balcony	-0.278	-0.261	-1.07	3.23
	Garden	1.122	-0.261	4.30	4.30
Distance to City Centre	3km < Distance	-0.441	-0.261	-1.69	0.51
	1km < Dist. ≤ 3km	-0.133	-0.261	-0.51	1.69
	Distance ≤ 1km	0.574	-0.261	2.20	2.20
Distance to Puclic Transport	3km < Distance	-0.493	-0.261	-1.89	0.38
	1km < Dist. ≤ 3km	-0.099	-0.261	-0.38	1.89
	Distance ≤ 1km	0.592	-0.261	2.27	2.27
Storage space	Not available	-0.306	-0.261	-1.17	0.37
	Outside the building	-0.096	-0.261	-0.37	1.17
	Inside the building	0.402	-0.261	1.54	1.54

Table 1 WTP Calculation attribute levels

PAIRWISE COMPARISON

It is often desirable in decision analysis problems to elicit from an individual, the rankings of attributes according to the individuals preference and to understand the degree to which each attribute is preferred to the others. A common method for obtaining this information involves the use of pairwise comparisons, which allows an analyst to convert subjective expressions of preference between two attributes into numerical values indicating preferences across the entire group of attributes. (Ozgur, Catak, Karabas & Yildirim, 2012)

By means of the weighting of various assessment criteria relative to each other, a relationship can be established between the various transformation attributes and the importance that is attached by the investor. Based on the assessment of the building in relation to this criteria a final judgment can be made about the transformation potential of the building . The class distribution shows with a number from 1 to 5 the potential that the office building has regarding transformation. 1 = very suitable for transformation, high level of potential; 5 = not suitable for transformation, low potential. This class distribution is based on the distribution used in the “Transformatiepotentiemeter” from Geraedts and Van der Voordt (2004). Pairwise Comparison will be used to justify the level of intervention.

Translation of construction costs per transformation class is based on Van Dam (2013), Geraedts, Voordt & Thorn (1998) and Voordt & Geraedts (2007), calculated with known cost indicators. The translation is shown in table 2.

Transformation class	Intervention	Costs	Cost indicator transf.*
1 = Very suitable for transformation	Light	Low costs	40% * modernization
2 = Suitable for transformation	Modernization	Limited costs	50% * SPA
3 = Limited suitable for transformation	Strong	Moderate costs	145% * modernization
4 = Hardly suitable for transformation	Very strong	High costs	200% * modernization
5 = Not suitable for transformation	Strip-rebuilt	Very high costs	120% SPI

Table 3 Building costs

In solving a multi-attribute decision problem, one needs to know the importance or weights of the not equally important attributes to evaluate alternatives with respect to the attributes. All judgments of the various pairwise comparisons are summarized in a Comparison Matrix. In real-life decision problems, pairwise comparison matrices are rarely consistent. Nevertheless, decision makers are interested in the level of consistency of the judgments, which somehow expresses the goodness or “harmony” of pairwise comparisons totally, because inconsistent judgments may lead to senseless decisions. It was shown by Saaty (1980) that a pairwise comparison matrix is consistent if and only if it is of rank one. When a pairwise comparison matrix is consistent, the normalized weights computed from this matrix are unique. (Bozoki & Rapcsak, 2008) In order to keep the total score of a building regarding the Pairwise Comparison organized, the score will be rescaled to a transformation score with a range from 0 to 100.

Results

Looking at the results, the following can be concluded. The experts found the main categories, functional (46%) and technical (29%) the most important categories in terms of transformation potential. The underlying idea to consider the category functionality so important could be that this category includes several criteria that are not able to change and on which the investor has no influence. In addition to this, the technical category is important because these criteria could bring high potential construction costs, what could make it harder to realize financial feasibility.

From a functional point of view, the criteria expansion possibilities (26%) and flexibility (24%) are the most important. Expansion possibilities, may increase the chance of financial feasibility, when basic transformation without expansion is not feasible. The investor does not need to make more acquisition costs, to realize more lettable floor area. In addition to this, it is advantageous when a vacant building consists out of large flexible rooms. In this case the investor does not need to demolish a lot of the interior and the layout of the building can be organized freely.

From a technical point of view, the criteria state of construction (23%) and asbestos (17%) are the most important. The state of construction is clearly important because it could bring

high cost when the state is not good. Also asbestos plays an important role. When a building is older than 1992 there is a risk of presence. In advance an investor does not know to what extent asbestos can be present, that is why it is important to do an asbestos inventorying for building older than 1993. Another conclusion to be made is that in terms of importance all other criteria are equal to each other.

Criteria that have very little influence on the transformation potential are the main category cultural (8%) and the criteria Administrative support (14%) under the main category legal (17%). Both categories contain aspects which are less important to the transformation potential of a building, but are more important in the personal feeling towards the location and building comparing to the investor.

FINANCIAL FEASIBILITY

Rental of office space delivers more rent per square meter than for living space. In relation to this, a high book value of an office building can therefore constrain the economic profitability of a transformation project.

The financial feasibility is a critical success factor during a transformation process. (Voordt & Geraedts, 2007) This financial feasibility is based on an exploitation calculation. (Remoy H. , 2010) When the Net Present Value (NPV) is zero or greater than zero, the redevelopment is financially feasible.

The aim of the discounted cash flow models is to approximate intrinsic value and the main principle of the models to find the present value of the future expected cash flows on an asset. To find the present value of an asset the models require the knowledge of the life of the asset, expected annual cash flows over the life of the asset, and an appropriate discount rate as inputs. Based on empirical evidence, these models can be found to work best when the cash flows produced by an asset are positive (Damodaran cited in Perek & Perek, 2012).

CONCLUSION AND FINDINGS

The results of both the Discrete Choice Experiment as the Pairwise Comparison method are used in a support tool that can help an investor to give an substantiated answer to the question whether a vacant office building is suitable for transformation into housing for young people or not. So the potential of a vacant building is observed from both perspectives, demand and supply side. This ensures that the process of assessing the vacant building is more efficient. Financial feasibility plays a central role in the investing decisions of companies and investors. In the support tool the financial feasibility is tested according the Discounted Cash Flow (DCF) method. Hereby the (potential) future rent is based on a Discrete Choice Experiment that will be translated into the Willingness To Pay (WTP). Next to this, the investment costs will be based on a cost indicator which is justified by the use of a Pairwise Comparison experiment under experts.

Regarding the target group preferences it is remarkable that not the high level of price but the attribute levels concerning shared facilities, semi-private facilities and no outdoor space have the biggest negative influence on housing choice behaviour. The attribute levels as private facilities, apartment and garden have the biggest positive influence. Of course this is also reflected in the willingness to pay.

Resulting from the Pairwise Comparison method the experts found the main categories, functional and technical the most important categories in terms of transformation potential. From a functional point of view, the criteria expansion possibilities and flexibility are the most important. From a technical point of view, the criteria state of construction and asbestos are the most important. Criteria that have very little influence on the transformation potential are the main category cultural and the criteria Administrative support under the main category legal.

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POTENTIËLE TRANSFORMATIE VAN LEEGSTAANDE KANTOREN NAAR JONGEREN HUISVESTING: Optimalisatie van het besluitvormingsproces

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SAMENVATTING

Zowel leegstand als transformatie van bestaande gebouwen zijn van alle tijden. Echter is de laatste jaren de kantorenmarkt in Nederland verandert in een zogeheten vervangingsmarkt. De kantorenvoorraad in gebruik is redelijk stabiel, dus is er geen behoefte aan uitbreiding. Nieuwe gebouwen zijn hierdoor voornamelijk bedoeld om de oude voorraad te vervangen. De constructie van nieuw onroerend goed leidt hierdoor tot overaanbod en dus kunnen we ook spreken van een kopersmarkt. Een toenemend deel van dit aanbod is verouderd en zal moeilijk te verhuren zijn zonder enige aanpassing, zelfs met een sterk economisch herstel. Om uitbreiding van deze leegstand te voorkomen is het noodzakelijk dat een aanzienlijk deel van de verouderde voorraad van de markt wordt verwijderd. (Voordt & Geraedts, 2007) Deze onevenwichtigheid tussen vraag en aanbod kan worden verklaard vanwege het feit dat de beroepsbevolking stopt met groeien, de “nieuwe manier van werken” wint aan populariteit en de oppervlakte per werkplek per werknemer daalt. (Besselaar, 2011) Transformatie van bestaande kantoren is een duurzame manier om deze leegstand aan te pakken; hetzij door middel van residentiele conversie of hergebruik binnen eenzelfde functie. De oplossing voor de leegstand kan per geval verschillen omdat niet ieder doordat niet ieder gebouw om dezelfde reden leegstaat. Transformatie van leegstaande kantoren heeft betrekking op meerdere factoren en actoren met veel tegenstrijdige belangen, betrokkenheid en/of investeringen, waardoor een gecompliceerd proces ontstaat. Daarentegen is transformatie alleen zinvol wanneer de nieuwe functie voorziet in behoefte. Het aanbod moet overeenkomen met de vraag, in termen van kenmerken en locatie van het gebouw. Dit onderzoek geeft een overzicht van de belangrijkste factoren en barrières die het transformatie potentieel van kantoren naar jongerenhuisvesting beïnvloeden, van zowel de aanbod- als de vraagzijde. De resultaten van dit onderzoek vormen de input voor een ondersteuningsmodel waarmee een investeerder een onderbouwde (financiële) haalbaarheidsstudie op een snelle manier in een vroeg stadium van het transformatieproces kan uitvoeren.

Keywords: Leegstand kantoren, transformatie, huisvestingkeuzegedrag, besluitvormingsproces, Discrete Choice Experiment, Pairwise Comparison, DCF

PROBLEEMOMSCHRIJVING

Voor een investeerder is het belangrijk om zo vroeg mogelijk gebouwen te onderscheiden die potentie hebben voor transformatie. Dit is belangrijk omdat haalbaarheidsstudies die benodigd zijn gedurende de initiatief en definitie fase grootte investeringen vragen van zowel tijd als geld, terwijl er geen garantie voor succes is. Een grote hoeveelheid leegstaande kantoren is “beschikbaar” voor transformatie, maar een investeerder moet snel kunnen beoordelen of dit leegstaande vastgoed geschikt is voor transformatie en of transformatie financieel haalbaar is.

Een investeerder heeft als doel de exploitatie van leegstaande kantoren te optimaliseren door de inkomsten te maximaliseren en de risico’s te minimaliseren. Een grote hoeveelheid leegstaande kantoren is “beschikbaar” voor transformatie naar jongerenhuisvesting, wat moeilijkheden geeft in de snelle beoordelingsprocedure met betrekking tot het transformatiepotentieel.

Dit potentieel is gebaseerd op veel verschillende parameters en sub-parameters, bijvoorbeeld markt, locatie, gebouw en financiële parameters. Al deze factoren samen bepalen the mogelijkheden en de potentie met betrekking tot transformatie. Ondanks alles, heeft transformatie alleen zin wanneer de nieuwe functie voorziet in behoefte. Het aanbod moet overeenkomen met de vraag, in termen van kenmerken en locatie van het gebouw. (Dam, 2013; Voordt & Geraedts, 2007)

Al met al hangt succesvolle transformatie af van verschillende factoren en karakteristieken. Fysieke attributen als gebouwdiepte, toegankelijkheid, gevels en draagstructuur zijn belangrijk, maar ook locatie, bouwjaar en juridische en sociale attributen zijn belangrijke factoren om rekening mee te houden. (Voordt & Geraedts, 2007) Naast deze gebouw gebonden karakteristieken hebben ook de dynamische werking van de markt, wensen van de huurders, risico factoren, rendementseisen en de visie van de investeerder een significante invloed op het transformatiepotentieel. Vanwege de vele verschillende actoren en factoren is het proces gecompliceerd waardoor het moeilijker is voor een investeerder om te onderzoeken of een transformatieproject haalbaar is waarbij de risico’s zo laag mogelijk zijn. (Besselaar, 2011) Het is overduidelijk dat het financiële aspect een belangrijke factor in het gehele proces is. Bovenstaande context leidt tot de volgende onderzoeksvraag:

“**Hoe kan het beoordelingsproces van leegstaande kantoren ten opzichte van de geschiktheid voor transformatie naar jongerenhuisvesting worden geoptimaliseerd?”**

Om het probleem beter te kunnen begrijpen, is het probleem verdeeld over de volgende deelvragen:

Deelvraag een: Welke factoren hebben invloed op de transformatiepotentie van leegstaande kantoren?

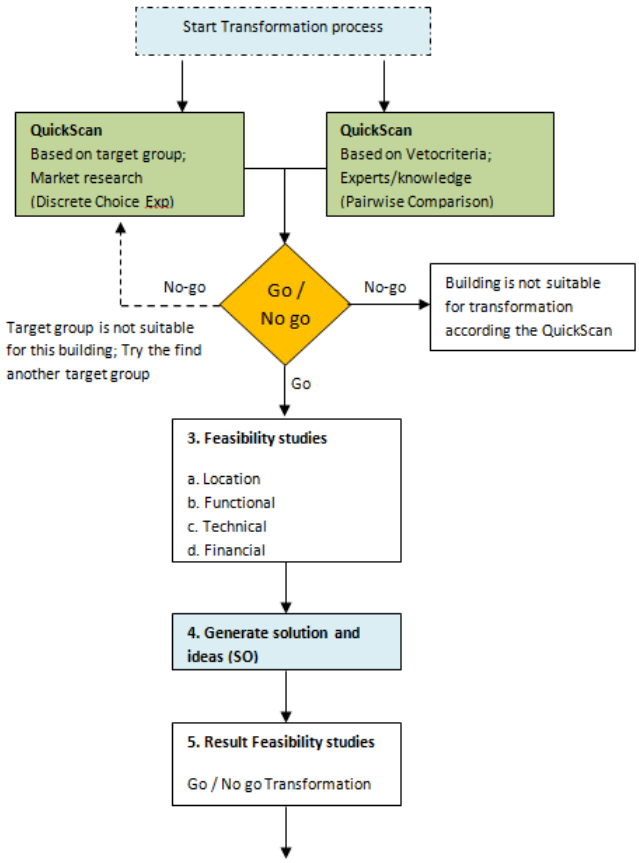
Deelvraag twee: Wat zijn de voorkeuren / wensen van de doelgroep (jongeren) met betrekking tot transformatie en huisvesting?

Deelvraag drie: Welke (succes-)factoren moeten met betrekking tot de geschiktheid voor transformatie naar huisvesting voor jongeren worden beoordeeld voor een gerechtvaardigd en niet-bindend bod kan worden gedaan op het kantoor?

Deelvraag vier: Hoe kan een (structureel) leegstaand kantoor worden beoordeeld met betrekking tot de geschiktheid voor transformatie naar huisvesting voor jongeren? Geschiktheid op technisch, geografisch, juridisch en financieel niveau.

Deelvraag vijf: Wat is de beste manier om het transformatieproces te optimaliseren waardoor het rendement wordt gemaximaliseerd en de risico's geminimaliseerd worden? Hoe kan een ondersteuningsmodel worden samengesteld die de beslissing vanuit het perspectief van de investeerder kan onderbouwen?

TRANSFORMATIEPROCES



Figuur 2 Optimalisatie van de initiatief fase

De aanwezige kennis en ervaring van experts kan tijdens het transformatieproces worden gebruikt om een gebouw effectief te beoordelen op gebouw gebonden aspecten. Door gebruik te maken van deze kennis en ervaring kan de invloed van deze aspecten op het transformatiepotentieel van het gebouw worden vastgesteld. Gecombineerd met de huisvestings-behoefte van een specifieke doelgroep, kan de haalbaarheid van een gebouw getoetst worden door middel van een QuickScan. Hierbij is het belangrijk dat bepalende criteria (Vetocriteria) van een gebouw zo vroeg mogelijk worden beoordeeld. (Andriessen geciteerd in Voordt & Geraedts, 2007) Deze optimalisatie van de initiatieffase van het transformatieproces wordt weergegeven in figuur 2.

Wanneer de huisvestingswensen en eisen

van de doelgroep bekend zijn, gebaseerd op een marktonderzoek (Discrete Choice Model), kan er een huisvestingsalternatief worden opgesteld die de hoogste utiliteit voor deze specifieke groep biedt. Daarnaast kan ook de Willingness To Pay (WTP) voor mogelijke alternatieven worden berekend. De WTP zal als richtlijn worden gebruikt voor de toekomstige huur. Aan de andere kant kan het gebouw beoordeeld worden op basis van criteria gesteld door verschillende experts, deze criteria komen voort uit de literatuur studie en beoordeeld door middel van Pairwise Comparison.

Financiële haalbaarheid speelt een centrale rol bij de investeringsbeslissingen van een investeerder. Gedurende dit onderzoek wordt de financiële haalbaarheid berekend door middel een Discounted Cash Flow (DCF) model. De conclusie van de QuickScan (Go of No-go) is gebaseerd op het financiële resultaat. De (potentiële) huur is gebaseerd op de WTP verkregen via het DCM, daarnaast zijn de benodigde bouwkosten voor de transformatie gebaseerd op een kostenkengetal wat is onderbouwd door het Pairwise Comparison onderzoek onder de experts.

FINANCIËLE HAALBAARHEID

De huurinkomsten van kantoorruimte levert per vierkante meter meer op voor een investeerder dan een vierkante meter woonruimte. In relatie tot dit, kan een relatief hoge boekwaarde van een kantoorgebouw de economische rendabiliteit van een transformatieproject beperken. De financiële haalbaarheid is een cruciale succesfactor gedurende een transformatieproject. (Voordt & Geraedts, 2007) De financiële haalbaarheid is gebaseerd op een exploitatie berekening. (Remoy, H., 2010) Wanneer de Net Present Value (NPV) gelijk of groter is dan nul, is de herontwikkeling financieel haalbaar.

CONCLUSIES EN BEVINDINGEN

De resultaten van beide experimenten, Discrete Choice Experiment en Pairwise Comparison, worden gebruikt in een ondersteuningsmodel dat een investeerder kan gebruiken om een onderbouwd antwoord te geven op de vraag of een leegstand kantoorgebouw geschikt is voor transformatie naar huisvesting voor jongeren of niet. Het leegstaande gebouw wordt dus van twee perspectieven benaderd, vraag- en aanbodzijde. Dit zorgt voor een efficiënter beoordelingsproces van het gebouw. Financiële haalbaarheid speelt een centrale rol bij de investeringsbeslissingen van een investeerder. Binnen het ondersteuningsmodel wordt deze financiële haalbaarheid getoetst door middel van de Discounted Cash Flow (DCF) methode.

Kijkend naar de voorkeuren van de doelgroep valt het op dat niet een hoog niveau van de huurprijs, maar de attribuut levels met betrekking tot gedeelde faciliteiten, semi-privé faciliteiten en geen buiten ruimte de meeste negatieve invloed hebben op de

huisvestingsvoorkeur. De attribuut levels als privé faciliteiten, appartement en een tuin hebben de grootste positieve invloed. Deze voorkeuren vertalen zicht uiteraard ook in de Willingness To Pay (WTP).

Voortkomend uit het Pairwise Comparison experiment komt dat de verschillende experts, de hoofdcategorieën functioneel en technisch de meest belangrijke categorieën vinden kijkend naar het de invloed op het transformatiepotentieel. Vanuit het functionele perspectief, worden de criteria uitbreidingsmogelijkheden en flexibiliteit het meest belangrijk geacht. Vanuit technisch perspectief zijn dit de criteria staat van constructie en asbest. Criteria die de minste invloed hebben op het transformatiepotentieel zijn de hoofdcategorieën cultureel en de administratieve ondersteuning onder de hoofdcategorie juridisch.

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