The Value of Cultural Heritage

Measurement of the indirect economic added value
of the adaptive re-use of cultural heritage

Tessa Persoon | Master thesis | 30-01-2019 | TU Delft

"Cultural Heritage is a capital of irreplaceable cultural, social, environmental and economic value. This is true for Europe, as it is for the rest of the world. We know this in our hearts and minds, but the policies and investments necessary to sustain our heritage have to be based on more than profound feelings or strong beliefs. We also need facts and figures to prove and illustrate those convictions. Articulating the value of our heritage by providing quantitative and qualitative evidence of its benefits and impacts, will indeed give more strength to the voice of cultural heritage in Europe."

- Placido Domingo, President of Europa Nostra –
(Consortium, 2015)

Colophon

The Value of Cultural Heritage

*Measurement of the indirect economic added value
of the adaptive re-use of cultural heritage*

Graduation master thesis
January 30th, 2019

Delft University of Technology
Faculty of Architecture and the Built Environment
Master track Management in the Built Environment
Domains: Adaptive re-use and Building economics

Supervisors

First mentor: P.W. Koppels
Second mentor: H.T. Remøy
External examiner P5:   P.A. Koorstra
External examiner P2 & P4: L. Qu

Author

Name: Tessa Persoon
Student number: 4218086
Address: -

Phone number: -
Contact: Persoon.tessa@gmail.com

All non referenced pictures at the cover and subsections are made by Tim Koning

Preface

This final thesis is part of the completion of my master "Management in the Built Environment" at the Faculty of Architecture and the Built Environment, at the Delft University of technology. This thesis called "The Value of Cultural Heritage" is founded within the domains of adaptive re-use and building economics.

This thesis is about the value of cultural heritage and the added value for the neighbourhood that is created by the adaptive re-use of cultural heritage. In this research a mixed method approach is used where the value of cultural heritage is analysed with a qualitative approach including semi structured interviews and the added value of the neighbourhood is measured with a hedonic pricing model, the quantitative approach.

By completing my graduation, my time at the Delft university will also come to an end. It seems odd that after six years of studying, I am leaving the university and will go in a new direction. I still have to figure out what to do next, however I think this has always been the case. When I graduated high school, I neither knew what I wanted to do, which study I wanted to start. Architecture had my interest and when I first visited the architecture faculty of the TU Delft I was amazed by the study, but most of all I was amazed by the building itself. The building shows what the adaptive re-use of heritage can do and how much character a historic building has. This is where my love for the adaptive re-use of heritage buildings was founded. I soon experienced that I wanted to orient myself more broadly than purely design, so I decided to do the master of Management in the Built Environment. During my master and partly because of my student assistant job at the faculty, I became more aware that I wanted to focus on existing buildings. Transformation and adaptive re-use of existing buildings still fascinate me the most. This is why I focused my graduation research on this topic and combined this with economics, another topic that has always had my interest.

In this thesis I combined the re-use of a couple of case studies in Amsterdam with statistical models. This seemed a very good idea in the beginning, but it turned out it could also be very frustrating at times. However, I am very glad I got the opportunity to do this and when looking back, I would have still chosen the same topic with the same methods.

I would like to take this opportunity to thank my supervisors Philip Koppels and Hilde Remøy. Philip, thank you for all the help, time and patience with my statistical model. Hilde, thank you for your feedback and for giving me the opportunity to work for you this last few years.

Furthermore, I would like to thank all my interviewees for their input and time. My friends and family for their support and help. In particular I would like to thank Rosan Pallada and Stuart Hawkins for checking my grammar, comments and giving advice. Tim Vleeshouwer and Joep Hoeijmakers for their help with the start of my statistical model, as I had to learn this while doing my thesis. And above all, I want to thank André Persoon and Tim Koning for their input, patience and trust in me!

I would like to dedicate this thesis to my mum, who would have wanted me to finish my studies.

Tessa Persoon
January, 2019

Content

Summary

Because of the loss of function, the vacancy levels of cultural heritage are rising. This leads to all kind of (societal) problems. Meanwhile, the value of cultural heritage is difficult to qualify and quantify in terms of economic benefits, which makes it hard to define the added value of cultural heritage and the value created by the adaptive re-use of cultural heritage. Consequently, cultural heritage is sometimes unnecessarily demolished or abandoned. This research therefore aims firstly, to identify the values of cultural heritage in general, to capture its unique and impossible to recreate identity. Secondly, this research aims to prove the indirect added economic value of transforming industrial cultural heritage into hubs of social and/or cultural integration within inner cities. By proving this added value for the neighbourhood, the awareness about the value of cultural heritage and hopefully the investments made in the adaptive re-use of cultural heritage will be increased.

To identify the value of cultural heritage a qualitative approach is used following a value division made based on the literature study. This approach contained two explorative interviews and three semi-structured interviews. The perspective of five experts with a design, marketing and governmental background were compared. The interviews showed the different views on the value of cultural heritage within different working fields.

To prove the added value of the adaptive reuse of cultural heritage a quantitative approach is used, the hedonic pricing method. The hedonic pricing method focusses on different characteristics of the building to determine the market value of the building based on a statistical model. The characteristics function as variables for the model. Based on previous research a variables list is defied as input to the hedonic pricing model. This method is used because it assumes that the difference in market value is caused by the difference in characteristics. By separating these characteristics, it can be determined if and how much impact one characteristic, in this case the proximity of transformed cultural heritage site, has on the market value. To do this four cases studies in Amsterdam are used, De Hallen, NDSM site, Pakhuis De Zwijger and the Westergasfabriek. Three out of the four case studies show a significant outcome. The highest heritage premium that was found is displayed in the figure below.
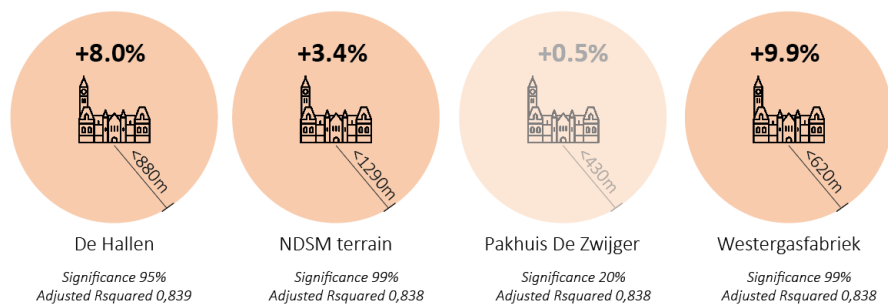
+8.0%	+3.4%	+0.5%	+9.9%
<880m	<1290m	<430m	<620m
De Hallen	NDSM terrain	Pakhuis De Zwijger	Westergasfabriek
Significance 95%	*Significance 99%*	*Significance 20%*	*Significance 99%*
Adjusted Rsquared 0,839	*Adjusted Rsquared 0,838*	*Adjusted Rsquared 0,838*	*Adjusted Rsquared 0,838*

Figure 1 Heritage premium (Own illustration)

In the conclusion the answer to the first research question "What is the value of cultural heritage?" is given. It is concluded that cultural heritage is unique and irreplaceable, this creates its value. This value is recognised by people, mostly in an emotional and social context. However, the value of cultural heritage cannot be described in one sentence or in one value. The value of cultural heritage is plural and is partly subjective. A distinction is made between estimating the value of cultural heritage in price (economic value) and appreciating the value of cultural heritage in content (non-economic value). The adaptive re-use of cultural heritage has a positive impact on the market price of the cultural heritage buildings. But above all, the narrative of a building, the story behind the building, is the most important value of cultural heritage and separates it from new built. The narrative is an overarching concept that incorporates all the non-economic values, architectural, emotional and social. It is seen as a heritage premium above the normal market price of a building.

The second main research question "What is the indirect added economic value of transforming industrial cultural heritage into hubs of social and cultural integration within cities?" is answered by comparing four heritage models per case study. Three main aspects can be concluded when proving the existence of a heritage premium with the use of a hedonic pricing model. First, in two of the four case studies a negative price premium is found before transformation. This is probably due to the poverty and construction before transformation of some buildings.

Secondly, an overall pattern is observed where the highest heritage premium is not found directly next to the case study, but a few hundred meters away. This can be explained by the possibly nuisance that is caused by the activities of the case studies.

Finally, an overall average price premium of 7.1% within a radius of 620-1290 meters was found in the three case studies that had a significant outcome. It can thus be concluded that the adaptive reuse of cultural heritage has a positive effect on the surrounding houses by creating an extra house price premium.

However this research also has some limitations:
- The study is only applicable to one city, other cities might differ in outcome.
- This research only focusses on inner-city cases, in outdoor areas it is probably harder to transform to social and cultural integration and the positive influence will be less.
- Amsterdam is already booming, which makes it hard to separate this value.
- If the buildings would have had another function after transformation the outcome might differ.
- Only four case studies, thus the conclusions in this research might not apply to other cases.
- The heritage premiums found can probably not entirely be attributed to the case study projects. Other developments, activities and growing popularity of the neighbourhood could also play a role.

The value of cultural heritage is plural. Its unique and irreplaceable character is recognised by people in the narrative of a building, which touches people mostly in a social and emotional sense. This value and the added value created by the adaptive re-use of cultural heritage is expressed by the average 7.1% price premium observed for houses located within a 1500 meters radius from the cultural heritage site for three out of four case studies.

Table of Contents

Research aim & Methodology

1. Introduction

The dictionary defines heritage as something inherit from the past. Greffe (1999) states that in some way, everything that already exists is cultural heritage. He also states that the definition of cultural heritage changes over time. Throsby (2006) defines cultural heritage differently, he states that "It means we are talking about inherited things that have some cultural significance, where the term "cultural" is used both in its anthropological or sociological sense and also in its more specific artistic or aesthetic interpretation". However, this research focusses more specifically on the built heritage. Remøy (2014) states that "Heritage has been defined as the expression or representation of the cultural identity of a society in a particular period, as well as the contribution to the community's cultural capital." Cultural capital is seen by the president of Europa Nostra as cultural, social, environmental and economic value (Domingo, 2015). This is also acknowledged by Paula de Coelho (2018), Dean of the European Investment Bank Institute. Heritage buildings can also represent a tangible continuation of the past and can visualise the identity of a place. They often have a remarkable appearance, create a point of reference and sense of belonging that other buildings cannot (Pallada, 2017). For this research cultural heritage is therefore defined as *"Historic buildings that represent a tangible continuation of the past and are of cultural, social, economic and environmental significance to the society by offering identity, a sense of belonging and a point of reference.".*

Research shows that heritage buildings contribute to the cultural attractiveness of a city. This is expressed in terms of increased tourism numbers, sales, employment, visits to museums, shops and the catering industry (Haasdonk, 2013; van Dommelen & Pen, 2013). However, the survival of cultural heritage is under pressure due to the high vacancy levels and governmental spending cuts.

*-- Cultural heritage is not an economic **or** cultural **or** social **or** environmental issue. It is an economic **and** social **and** cultural **and** environmental issue. – Paula de Coelho, 2018 --*

1.1 Problem analysis

Value cultural heritage

The value created by cultural heritage is difficult to define. Although the contribution of cultural heritage to society is recognised (Ahlfeldt & Maennig, 2010; Domingo, 2015; Gram, 2018), it is still hard to measure the exact benefits of cultural heritage, especially when heritage has lost its function. Nevertheless, the value of cultural heritage is widely recognised, therefore the preservation of cultural heritage provides a considerable value to society (Ahlfeldt & Maennig, 2010; Domingo, 2015; Navrud & Ready, 2002). To preserve the cultural heritage buildings, adaptive re-use is an option. However, transformation or adaption of cultural heritage is not possible without taking into account the "story of the place" (Haasdonk, 2013). This story is also defined as cultural or historic value of a place. Due to this cultural and historic value, national governments and international bodies developed strategies, methodologies and criteria in the past to protect cultural heritage (Remøy, 2014). These strategies and methodologies are not only to sustain cultural heritage, they are increasingly used as a local economic driver. Nevertheless, cultural heritage faces an increasing amount of vacancy (Haasdonk, 2013).

Vacancy leads to (societal) problems

Upcoming trends, new demands and a changing environment, from industrial driven to service driven economy, has caused vacancy among heritage buildings by losing their current function. The exact vacancy rate of cultural heritage is hard to pinpoint. There is no precise data available about the extent of vacancy (Harmsen, n.d.; Pallada, 2017). However, in 2016 stichting BOEi, National Company for the Conservation, Development and Exploitation of Industrial Heritage, stated that 2000 monuments are empty in the Netherlands which together amounts to approximately two million square meters of vacancy. This only includes national monuments, it does not even include the municipal monuments or protected cityscapes (Stichting BOEi, cited in Redactie in renovatie, 2016, Sylvester, 2015). Hence these two million square meters are probably only the tip of the iceberg.

This increase in vacancy has a negative impact on the buildings, by being disastrous for the maintenance condition of the buildings (van Dommelen & Pen, 2013). Besides the negative consequences for the buildings itself, the vacancy of cultural heritage, just like other vacant buildings, is also a societal problem. Due to an adversely effect on the surrounding community, increased crime rates and risk of fire, vacancy can lead to societal problems (Kraut, 1999). The municipality of Amsterdam (n.d.) declares that "Empty buildings form a 'dead' place in a neighbourhood. A place that is quickly impoverished, can become a landfill or worse. In short, an undesirable situation for a neighbourhood". Vacant buildings are also often threatened by occupancy of (anti-)squatters, vandalism, premature deterioration and related damage (Douglas, 2006, as cited in Pallada, 2017). Furthermore, research shows that vacant office buildings have a negative influence on the rent price of the nearby (office) buildings, which can also be considered a societal problem (Koppels, Remøy, & El Messlaki, 2011). So (re)using heritage buildings is significant to prevent these societal problems.

Difference public and private actors

It is essential to understand the challenges that face built cultural heritage. It is important to be aware of the difference between public and private interests and thus public and private values. Preserving heritage creates some benefits, like recreational perception values to the general public and being a local economic driver, which thus serves the public interest. Private stakeholders, however, do not necessary derive cashflows from this and have therefore less interest. So this raises the question "Who benefits and who pays?" (Haasdonk, 2013; Remøy, 2014). Institutes whose mission it is to protect and preserve cultural heritage compete for the needed resources with other societal goals. The President of Europa Nostra Domingo (2015) stresses the importance of facts and figures based on qualitative and quantitative evidence about the importance of cultural heritage. This is needed to support policies and investments to sustain cultural heritage.

Adaptive re-use to fulfil societal needs

A new trend where heritage is seen as an important factor to fulfil a demand for cultural experience and leisure, can be interesting for both private and public parties. When a building reaches the end of its economic or functional lifespan, demolishing or adaption to new use will be considered. If people are aware of the potential qualities of a building or its environment (it is more likely that) adaption will be chosen , as stated by Remøy (2014). By putting a price tag on the qualities of cultural heritage, these buildings will be better valued and therefore preserved (Ruijgrok, 2006). BOEi (in Redactieinrenovatie (2016), states that based on the high vacancy numbers of cultural heritage there is enough space to solve all kinds of social needs by the transformation of monument-listed buildings. Therefore, it is the adaptive re-use of cultural heritage that is needed. Due to its symbolic and cultural value, cultural heritage has a high potential to be transformed. Upcoming creative sectors, digital technologies, social innovation and the sharing and 'maker' economy create opportunities to transform cultural heritage into hubs of creativity, innovation, entrepreneurship, new lifestyles and social and cultural integration (EuropeanCommission, 2018). This research therefore stresses the importance of preserving and adapting cultural heritage, and by doing this, fulfil a demand for cultural experience and leisure.

European Cultural Heritage summit Berlin

The European Heritage summit in Berlin, which motto was "Sharing heritage-Sharing values", was the largest European event taking place during the European Year of Cultural Heritage 2018. Within this summit there were two events in which I participated that stressed the importance of this research and led to new insights.

The European Policy Debate is a platform where high-level decision and policy makers discussed the values of cultural heritage and how to best use cultural heritage as a strategic recourse with multiple benefits for the future of Europe.

Figure 2 Policy debate Berlin (Own picture, 2018)

The most interesting topics of the European Policy Debate will be briefly elaborated. Most experts talked about the vulnerability of heritage (Costa, 2018). The experts pointed out that heritage is about the identity of a place, a place where people can connect to (Amreus, 2018 & Münster, 2018), "If you cannot connect to a place, you have to live as a stranger the rest of your life" (Amreus, 2018). It was stated that heritage is not so much about the object itself, but more about the story behind the object (Dutkiewicz, 2018).

One speech that stood out, was the speech of Fransisco de Paula Coelho, the Dean of the European Investment Bank Institute. He stressed the contribution of cultural heritage to social and economic cohesion. He declared that cultural heritage plays a huge role in the attraction of tourists to Europe. The tourism industry contributes 415 billion Euros to the EU GDP and employs more than 15 million people, making it the third largest socioeconomic activity in the EU. Besides this, cultural heritage also generates good returns on investments and can be used as catalyst for sustainable heritage-led regeneration. This is for example seen in Krakow, Lille, Liverpool and Manchester (de Paula Coelho, 2018).

However, also De Paula Coelho, mentioned the fragility of Cultural Heritage. It is vulnerable to over exploitation, under funding, pollution, mass tourism, neglect and even terrorism. Often the potential of cultural heritage is not recognised and monetising and capturing economic benefits is difficult. Consequently, funding for these projects often comes from the public sector. However, public funding is scarce. Therefore, De Paula Coelho mentioned two options, see the site disappear or bring in corporate interests. He therefore stresses the need for more private investments (de Paula Coelho, 2018).

1.2 Short problem statement

Because of the loss of function, the vacancy levels of cultural heritage are rising. This leads to all kind of (societal) problems. Meanwhile, the value of cultural heritage is difficult to qualify and quantify in terms of economic benefits, which makes it hard to define the added value of cultural heritage and the value created by the adaptive re-use of cultural heritage. Consequently, cultural heritage is sometimes unnecessarily demolished or abandoned.

1.3 Aim

This research aim is divided into two parts. The first aim is to identify the values of cultural heritage in general, to capture its unique and impossible to recreate identity. Secondly, this research aims to prove the indirect added economic value of transforming industrial cultural heritage into hubs of social and/or cultural integration within inner cities. By proving this added value for the neighbourhood, the awareness about the value of cultural heritage and hopefully the investments made in the adaptive re-use of cultural heritage will be increased.

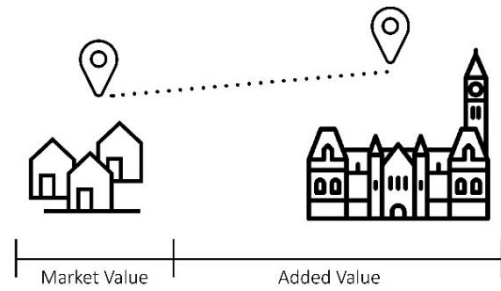Figure 4 Expression of aim 1: Definition Values (own illustration)

Figure 3 Expression of aim 2: Price premium caused by the proximity of cultural heritage (own illustration)

1.4 Conceptual model

This conceptual model derives from the problem analysis and aim described before. A loss of function causes vacancy among heritage buildings, this leads to negative consequences for the building and its surroundings. Therefore, a choice between demolishing and adaptive re-use has to be made. It is stated by Remøy (2014) that "Adaptation of a building takes place when one or more players are aware of the (potential) qualities of a building and/or it environment." Similar statements are made in practise, MMnews (2018), for example reports that monument-listed buildings have a unique character and attractiveness, but the possibilities of these often heavily deteriorated buildings must be seen". To achieve this awareness, this research contributes to defining the different values of cultural heritage, its unique identity that is impossible to recreate. Following this, the value of transforming cultural heritage for the neighbourhood will be focused on. This added value for the neighbourhood will be proved by measuring the indirect economic impact of transforming cultural heritage.
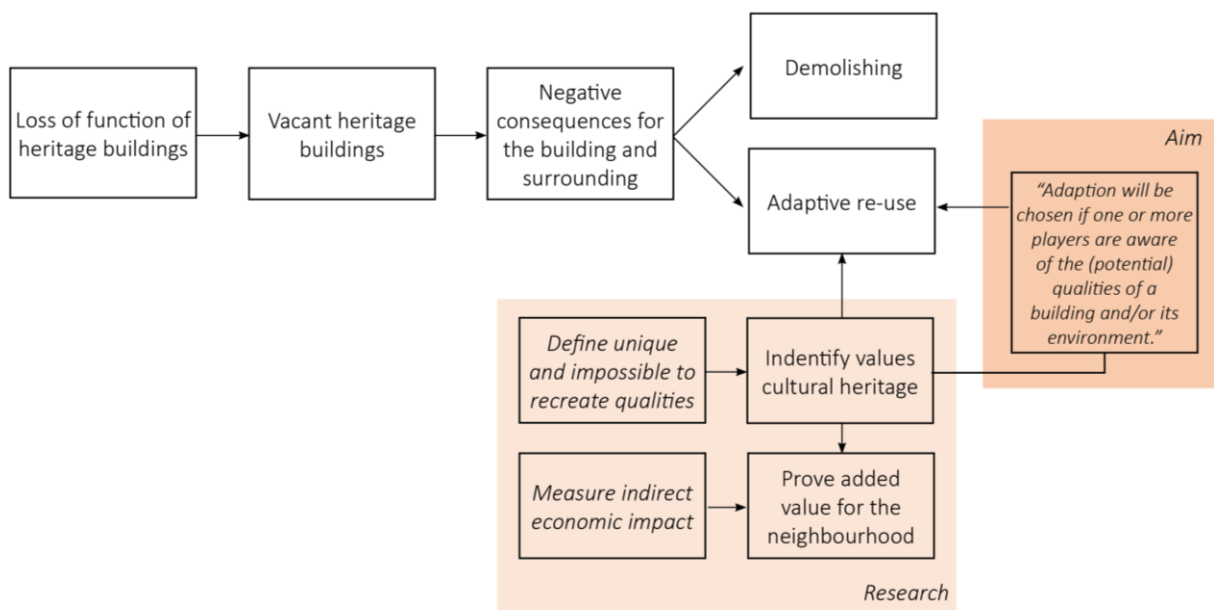

Figure 5 Conceptual model (Own illustration)

1.5 Research questions

Main research questions:
- What is the value of cultural heritage?
- What is the indirect added economic value for the neighbourhood of transforming industrial cultural heritage into hubs of social and cultural integration within cities?

Theoretical sub questions:
- Which values of cultural heritage are described in literature?
- Which methods are used to measure economic value of cultural heritage?
- How does the hedonic pricing model work and in what way is the hedonic pricing model used?

Empirical sub questions:
- Do actors in the field of cultural heritage experience the same values of cultural heritage that are explained in literature?
- Does the view on the value of cultural heritage differ between actors with different work backgrounds within the field of cultural heritage?
- What is the effect of transformed cultural heritage on house prices in the neighbourhood?

1.6 Expected results

For the first aim of this research, defining the values of cultural heritage, it is expected that one clear definition of the value of cultural heritage cannot be given. The value of cultural heritage includes so many concepts that one definition probably will not suffice. Additionally, the value of cultural heritage is partly subjective. However, it is expected that the defined values of cultural heritage can be categorised, therefore an overview scheme will be given.

The second aim is to prove that the added value of cultural heritage for the neighbourhood, is more quantitative. Therefore, the second part of this research is about proving or disproving the following hypothesis: "The adaptive re-use of cultural heritage buildings into hubs of social and cultural integration will not only increase the value of the building itself but will also positively influence the property values of the houses in the surrounding area."

It is thus expected that the adaptive re-use of cultural heritage has a positive effect on the neighbourhood, which will also be shown in the property values of houses in the nearby area. Previous research shows the significant indirect effect of cultural heritage. It is therefore, expected that a percentage of price increase of properties nearby can be determined for each case study. This price increase is quite certain to be found at De Hallen and the Westergasfabriek, based on news articles. It is expected that this price increase will also be found for the NDSM terrain and Pakhuis De Zwijger, but due to their more remote location, to a lesser extent.

1.7 Impact

This research aims to identify the value of cultural heritage and raise awareness about the added value of the adaptive re-use of cultural heritage. This research shows that the transformation of "endangered monuments with a suitable re-use is often a better way to ensure a lasting and sustained perseveration of historic sites" (Paula de Coelho, 2018). With this research, I hope to reach both private stakeholders, including citizens, and public stakeholders, including municipalities and other governmental institutions. The research result will, in line with the SC5-20-2019 Horizon 2020 call, contribute to the reversing trends of abandonment and neglected historic heritage in urban areas and boost heritage and cultural-relevant innovation, creativity and entrepreneurship.

1.8 Societal relevance

As described before, the vacancy level of cultural heritage is rising and accounts for at least two million square metres in 2016 (Stichting BOEi, cited in Redactie in renovatie, 2016, Sylvester, 2015). This

vacancy can be fatal for the maintenance condition of these buildings (van Dommelen & Pen, 2013) and has a negative effect on its surroundings. Research performed by Ecorys, an international research and policy consultancy firm, shows the positive effects of restoration. This is seen in the value increase of the monuments, the attractiveness of such neighbourhoods and growing employment rates (Sylvester, 2015). Therefore, the transformation of cultural heritage is highly relevant.

Research done by the National Restauration Fund (2014) shows how Dutch citizens rate the importance of persevering monuments. Over 80% of citizens view the preservation of monuments important and 38% even as very important. 88% of citizens state that the presence of monuments has a clear positive influence on the attraction of a city or village. The research also shows that almost 72% of citizens are concerned about the vacancy, decrease or even disappearance of monuments. Over 75% of citizens are therefore positive on investments made by municipalities, provinces and government to preserve monuments. Over half of all citizens even considers contributing financially when necessary. This shows the societal relevance among citizens to preserve cultural heritage.

Municipalities have even a bigger interest in the preservation of cultural heritage. Research of van Duijn and Rouwendal (2013) state that in historical cities, such as Haarlem and Amsterdam, cultural heritage is part of the image of the city. Their research shows that households are tempted to settle in or in the surrounding of cultural heritage. This means that there is an increasing demand for houses in neighbourhoods where cultural heritage is present. An increasing demand leads automatically to an increase in house prices. Municipalities with cultural heritage are therefore encouraged to properly maintain their heritage. Research of the National Restauration Fund (2013) looked into the concern of municipal civil servants with cultural heritage. In all participating 191 municipalities national monuments are located, 80% of these municipalities also allocate municipal monuments and 60% had one or more protected cityscapes. This shows that preserving cultural heritage is definitely of relevance for municipalities.

1.9 Scientific relevance

Throsby (2006) stated that arguments about the preservation of cultural heritage are mainly based on the historical, archaeological, artistic and cultural assessment of cultural heritage. Meanwhile, there are significant economic dimensions to the decisions made concerning the preservation, transformation or demolishment of cultural heritage, even if economic in this sense is just financial. Therefore, Throsby states that there are likely to be tools and concepts in the economic assessment that will be useful when decisions about cultural heritage have to be made. Other authors, came to the same conclusion. Remøy (2014) developed a framework about the values of cultural heritage. She stated that until now the importance of heritage is mostly analysed from a cultural point of view, while the value of cultural heritage from an economical point of view should also be investigated.

Cultural Heritage influences the attractiveness of cities as a place of residence and business location. Nevertheless, it is hard to quantify the benefits of cultural heritage. This led to the destruction of historic buildings because the re-use costs were considered too high. Therefore Barentsen, Koppels, and Remøy (2015) state that that quantification of the benefits of cultural heritage might provide the justification and extra incentive to preserve and maintain cultural heritage.

Bowitz and Ibenholt (2009) state that, in their opinion, there is a need for a total economic impact overview of investing in culture. Other researchers also address the need for a more full-scale assessment which also measures the indirect effect. In many cases these effects might overshadow the direct revenue created by the project (Throsby, 2006). So far only a few studies have been undertaken to give cultural heritage an economic value, despite the debate about their value to society, the growth of research and education in this field and the level of governmental support and funding to cultural heritage (Choi, Ritchie, Papandrea, & Bennett, 2010).

It is worth noting that Greffe (1999) starts by looking from the opposite point of view. He states that economist have for a long time neglected the economic impact of cultural activities, that these are a "prototype of the non-economic commodity" which means non-reproducible and non-substitutable. He

states that we must integrate economic activities, such as heritage protection, in the economic debate, to show that heritage can be a new lever of economic and social development.

Lastly the European Commission also acknowledge the relevance of this topic by introducing a Horizon 2020 call about "Transforming historic urban areas and/or cultural landscapes into hubs of entrepreneurship and social and cultural integration"(EuropeanCommission, 2018) .

This research contributes to the body of knowledge about cultural heritage with a special focus on the value of transforming cultural heritage. Until now, only a few studies looked into the economic benefits of cultural heritage and made them quantifiable. This research follows up on this previous research by looking into the effect of adaptive re-use. The results will probably support the results of earlier conducted research that the preservation of cultural heritage has a positive impact on property values.

2. Methodology

2.1 Type of research

The research method used in this study is a mixed method, it consists of quantitative research and qualitative research. The figure below shows the relationship between the two techniques. The qualitative research serves as a foundation and explanation for the quantitative part.

2.2 Research method

The methodology of this research is divided into five parts. The first part is the theoretical framework which includes the research proposal and literature study. The second part contains the data collection both qualitative and quantitative. The third part focusses on defining values of cultural heritage and creating the basic hedonic pricing model. In the fourth part, the indirect added value of transforming monuments is determined by adding the specific case variables to the heritage models. In the last part the output of the model will be used to draw conclusions about the value of cultural heritage and the economic indirect effect. Also conclusions about the values of cultural heritage will be drawn.

The figure below might indicate a strict division between the five parts, however this is not necessarily the case, they might overlap a bit. The division is just to set some milestones and make the methodology more logical and easier to understand.
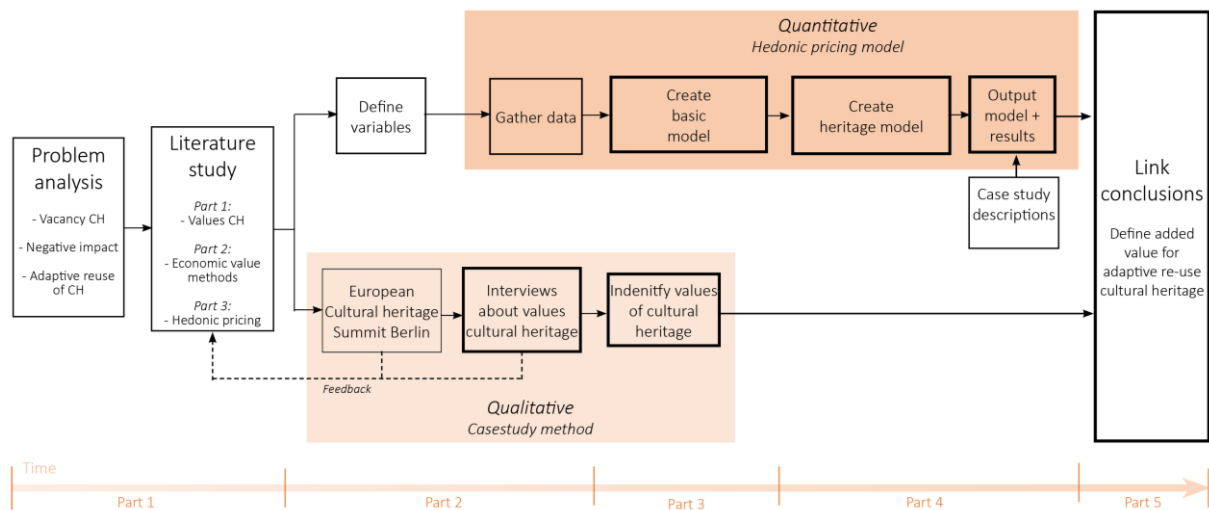
Figure 6 Research model (Own illustration)

Part 1 - Theoretical

This research starts with a problem analysis, in this analysis the growing vacancy of built cultural heritage is addressed. The negative impact of this vacancy is emphasised and the need for adaptive re-use to bring positive influences to the building and its surroundings is described. The research focusses on built cultural heritage within cities that are transformed into hubs of social and cultural integration.

Following up on the problem analysis, the literature review of this study consists of three parts. The first part is about the values of cultural heritage. It is clear that there is not only one value to define, but that the value of cultural heritage is plural (Bazelmans, 2013). Because of this, a more in-depth research about the described values of cultural heritage is done. A distinction between economic and non-economic values is made. The second part of the literature review is focussed on the economic values of cultural heritage and especially on the

Figure 7 Method part 1
(Own illustration)

economic valuation methods that measure the indirect economic value of cultural heritage, which is also the main focus of this re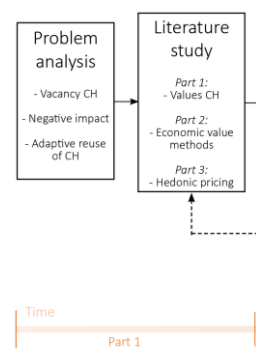search. This part also argues why the application of the hedonic pricing model is the best fit for this research. The third part therefore emphasises on the hedonic pricing model by explaining the method and looking into previous findings. The hedonic price method links house prices to the proximity of cultural heritage as an indicator to measure the willingness to pay for the nearness of cultural heritage on the basis of different house characteristics (van Duijn & Rouwendal, 2013). The characteristics used in different studies are compared and the most common and relevant ones are listed as input for the data collection and analysis of this research.

Part 2 –Data collection

Following up on the theoretical framework, the data collection starts. For the qualitative analysis input was gathered during the European Cultural Heritage Summit Berlin, where also feedback was given on the value division made in part one of the theoretical framework by participants.

Following up on this, two explorative interviews and three semi-structured interviews about the values of cultural heritage and the important characteristics were held. Experts from different work fields were approached. Their input was used to generate feedback on the establishment of the value division made and as input for the final variables list that is used for the hedonic pricing model.

For the quantitative analysis a variables list was defined based on the values identified in literature. Data was gathered from the NVM database about house transactions in Amsterdam. The characteristics of the houses in the NVM data base that match the predefined variables are used in the model.
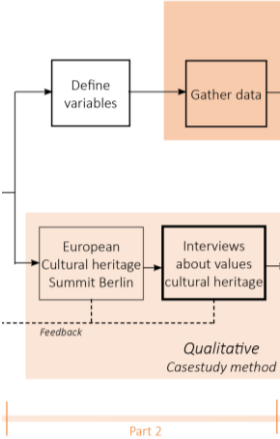
Figure 8 Method part 2
(Own illustration)

Part 3 – Data analysis

To analyse the interviews, the grounded theory was used in which coding and constant comparison were alternated (Bryman, 2016). In this research the comparison was used to equate the focus of different actors within the field of cultural heritage. Also, a thematic analysis was used by providing a framework, which is a matrix-based method, for ordering and synthesising data (Bryman, 2016). In this framework the repetition of the values described by the interviewees was counted in order to reveal each interviewee's focus. Based on this, the value division made in part 1 was revised and the values of cultural heritage were identified. This completed the first aim of this research. In this section, the quantitative part of this research, the hedonic pricing model will be created.

For the quantitative data analysis, a hedonic pricing model is used to create the basic model. The formula of the hedonic pricing method consists of three components, namely the vector for building characteristics (S), the vector for space characteristics (N) and the vector time (L). For a broader explanation see part three of the literature review.

Figure 9 Method part 3
(Own illustration)

Part 4 – Results

In this part the basic model is extended to a heritage model. For this the four case studies are used. The cases are all monumental buildings within Amsterdam that are transformed into hubs of social and cultural integration. By linking the NVM data base to GIS the exact location of the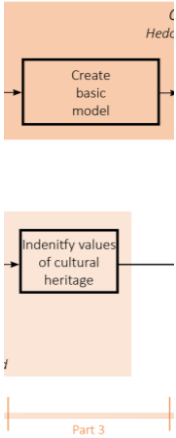 cases studies are determined. By doing this, the distance of the houses to the case studies is added. Besides this, the year of transformation of the monuments is included in the heritage model. The outcome of the model therefore shows the possible price increase around the case studies.

The case studies are described, based on a descriptive process analysis method. The process is described based on process descriptions of foregoing researchers, newspaper articles and websites of the case studies themselves. Each case study is tested on the basis of four models. The first model investigates the distance decay effect by an exponential relationship. The second model does this by the use of concentric circles. The third model is an polynomial function and in the last model the highest price premium found at a certain distance is shown. The results of the models are described per case study and the case study description including neighbourhood developments are used to interpreted and explain the output of the model.
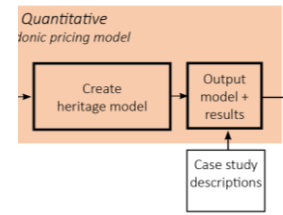
Figure 10 Method part 4
(Own illustration)

Part 5 – Conclusion

In the end the theoretical part and the data collection and analysis (both quantitative and qualitative) came together and conclusions about the economic benefits of transforming cultural heritage were drawn. The conclusion first answer the theoretical and empirical sub questions per part and then answer the two main research questions.

.

Figure 11 Method part 5
(Own illustration)

2.3 Data collection

This data collection consists of two parts:
- Data of the first set of interviews (qualitative),
- Data for the hedonic pricing model (quantitative).

For the first set of interviews two practise/explorative interviews were held with Rosan Pallada and Sunna Schuijt. Rosan Pallada is a developer at MeyerBergman Heritage development and Sunna Schuijt an assistant Architect at VIS restauration architects. Those interviews were not extensively analysed but used to examine the interview protocol made and practise interview technics. For the expert interviews, a semi-structed interview protocol was used, and the following people were interviewed:
- Jan-Willem Andriessen, who is the founder and director of 'Redres de erfgoedexpert', which is a Dutch broker company which focusses on heritage.
- Wessel de Jonge, is an architect who has his own architecture studio who focusses on adaptive re-use. Alongside this, he works as a professor of Heritage&Design at the Faculty of Architecture and the built environment at the TU Delft.
- Jos Bazelmans, head of archaeology at the Cultural Heritage Agency and former section head of the academic section from de CHA, which also focusses on monument-listed buildings.

For the quantitative part of this research, data is gathered which will be used as input for the hedonic pricing model. This data originates from the NVM-database. The NVM is a Dutch branch organisation of real estate agents and appraisers. The database includes detailed buying transactions of 75% of the Dutch houses that are sold. The transactions include different characteristics of properties that are sold and provide information on median transaction prices of properties in each quarter, as well as annualised data stretching back to 1985 (NVM, n.d.).

The data that is required is defined in the variable list in the third part of the literature study and is complemented in the first part of the data collection and analysis. These are the characteristics of the buildings and location that are needed in order to compare them in the hedonic pricing study. The variables that are included are shown on the right.

2.4 Case studies

For this research four case studies will be used. As stated before, all case studies have to be in one city. For this research Amsterdam is chosen. The case studies are selected based on their monument status as national listed monuments. Another important criterium was that the monuments are transformed into so called hubs of cultural and/or social integration, by which it is meant that the new function is accessible to the public and contributes to the cultural and/or social value of the neighbourhood. The cases are located as follow:
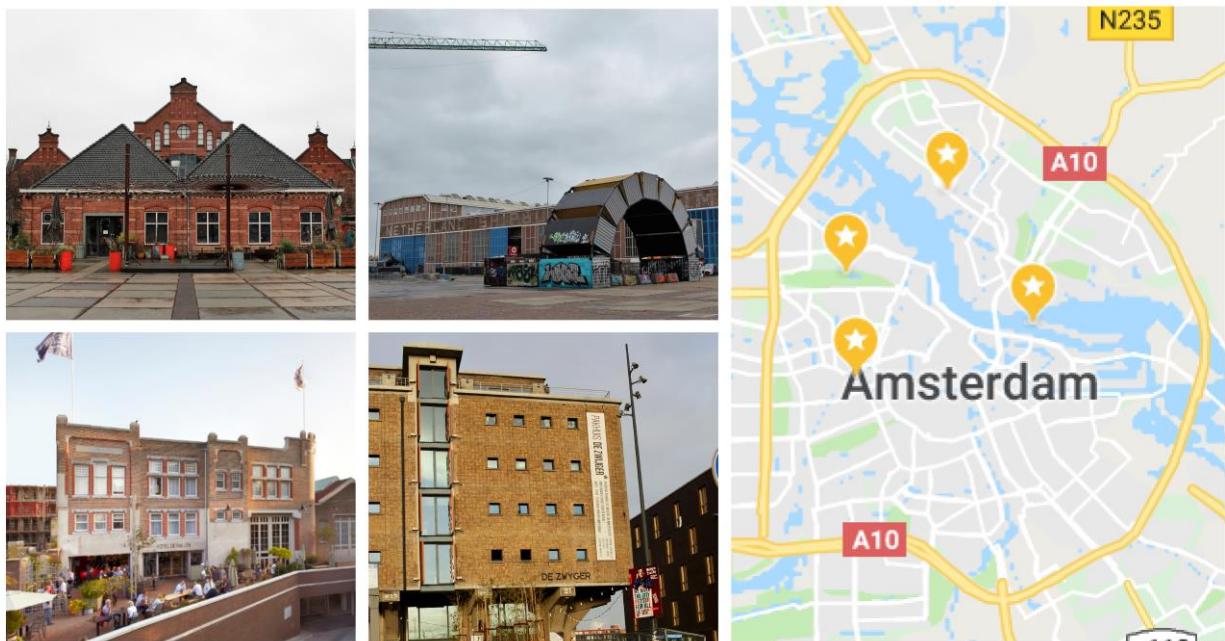

Figure 12 Case studies (Koning, 2018 & Arcam, 2015.) locations (Google maps)

Literature study

3. Literature study

3.1 Value of Cultural Heritage

What exactly is value? Is value always measurable? Is there such thing as "The added value"? Although the value of cultural heritage is widely recognised (Ahlfeldt & Maennig, 2010; Domingo, 2015; Gram, 2018), value is a more complicated concept than one might think. It is exceptionally difficult to define (Bazelmans, 2013), therefore people use multiple definitions of value. Something of value is worth keeping, using and cherishing, while something without value is neglected, abandoned and thrown away (Bazelmans, 2013). But what is value, and can one measure this value? This first part of the literature review therefore aims at defining and analysing the (added) value of cultural heritage. By doing this, the hypothesis that people are willing to pay more for the proximity of cultural heritage can be explained. This added value of cultural heritage can thus explain the increase in market value.

Smit (2014) mentioned that authors describe and divide values of monuments in different ways, however these different values often overlap. The values often express the same quality from a different viewpoint. Several authors therefore aimed at analysing these values and categorising them. According to Moro, Mayor, Lyons, and Tol (2013) the first review of studies about valuing cultural heritage is probably made by Pearce, Mourato, Navrud, and Ready (2002) who identified twenty-seven studies about the value of cultural heritage. In 2006, Throsby evaluated the economic values of cultural heritage. More recently, in 2014, Remøy conducted a study about the different values of cultural heritage as well. She states that the value of cultural heritage, besides its land value and value of buildings as pure physical entities, also contain social, historic and cultural value (Remøy, 2014).

Over time, different values of heritage became important. At this moment, in the neoliberal era, the market value is of the most importance, while in the postmodern era, the experience one gained and the emotional value and recognition of heritage were important (Saris, 2013). In the professional governmental heritage care in the Netherlands the value of heritage is almost exclusively defined in scientific-content or in cultural-historical terms. The value derives therefore from the physical state of the building and the meaning the building has for the histography of professional archaeologists and (architecture) historians. The appreciation of the owners, users and other stakeholders is not or only taken into account in a limited way (Bazelmans, 2013; Saris, 2013).

To analyse all these different values, they first need to be categorised. An interesting distinction made by Bazelmans (2013) is the difference between estimating the value of heritage in price and appreciating the value of heritage in content, which relates to value within the economic domain and outside the economic domain; the distinction between economic and non-economic value. Economic value relates to the utility and price of a building while non-economic values refers to the good or bad characteristics of something.

Non-economic value

Non-economic value is associated with virtue, meaning, principles, traditions, ideals, meaning, conception and decency. These principles play a huge part in how people value the community and the world. This relates to the earlier mention of good and bad characteristics of something or someone, which means value to content, significance and meaning of merit (Bazelmans, 2013). Because of this, everyone looks differently at these values depending on their background. People also refer to this non-economic value as cultural value which is hard to define and therefore hard to measure. People often refer to the "cultural value" of a piece of art or building, this often means that some notion of cultural worth is given to the item which transcends a financial measure (Throsby, 2006).

The non-economic or cultural value of built heritage can be divided into several sub-values. The most obvious one is the architectural value. Aesthetic and artistic values derive from the architectural value. The architectural value expresses in some sense beauty, which is very subjective, but can trigger strong feelings. These values are therefore more and more linked to cultural tourism, for example, by city

branding. The values also relate to the feeling and knowledge created by heritage and the historical progression and artistic characteristics that characterise a specific building period (Greffe, 1999; Remøy, 2014; Throsby, 2006).

However, some buildings are known for their lack of aesthetic value. These buildings were nevertheless considered important. Remøy (2014) states that some buildings prove to be important because of their apparent ugliness and their significance for the surrounding buildings in the urban context. This value is therefore called familiar ugliness.

Furthermore, another value strongly connected to the site and maybe even connected to the familiar ugliness is the authenticity value mentioned by Throsby (2006). A site is valued, just as with the familiar ugliness, because of its uniqueness. An important additional feature herewith is the integrity of a site, which is reviewed differently in different circumstances. The protection of a site's integrity might be important during the project decision making.

Next to this, there is the cultural-historic value. A building is connected to the site on which it is built and is therefore part of the history of a city, which makes it worth to keep. This does not mean that every old building should be preserved, the authenticity also plays a role. This value is probably the non-economic value that is most identifiable in objective terms (Bazelmans, 2013; Remøy, 2014; Throsby, 2006).

The symbolic value can be separated from the cultural historic-value, although they are closely related. It gives certain buildings a symbolic meaning for a city and its citizens, even if the buildings are not functional anymore. The buildings are part of the well-known history of the city (Remøy, 2014). They help citizens to interpret their identity and to maintain its so-called cultural personality. The value of the site as a meaningful object may be important to the education of not only young people but for the understanding of the whole community (Throsby, 2006).

Greffe (1999) states that heritage also generates educational values. Heritage may play an active role in the education and training of young and older people. Museums were, for example, created to educate future artists. Besides museums, this educational function can also be fulfilled by other heritage like monuments and industrial heritage. Although not designated as a separate value, this education function is also recognised by Remøy (2014).

Heritage can also function as a social value by binding people together through the admission of shared beliefs and values. This effect depends on the site use but also on the existence of these sites. This existence might contribute towards social stability and cohesion in the community (Greffe, 1999; Remøy, 2014; Throsby, 2006).

The spiritual value described by Throsby (2006) can be linked to the social value. This value may also contribute to the feeling of identity for the people living in and around the site, for the community as a whole or for the visitors of the site. It may also cause a sense of cultural confidence and connectedness between local and global societies.

The social and spiritual feelings are about the experience of people in and around the site. The same applies to utility effects. The utility effects are about how a building is experienced. If a building is functionally obsolete, because the building does not meet the use requirements anymore, the experience value goes down. The utility is thus depending on the use value (Bazelmans, 2013; Remøy, 2014).

Also, highly depending on the experience of people there can be a traumatic experience value. Which is not so much related to the building itself but to the unpleasant activities that have happened at the location. However, sometimes this value is so high that people want to rethink what has happened and a state memorial or museum is made (Remøy, 2014).

Last is the bequest value, this is a value were people conserve the option for future use. People share knowledge and pass it on to next generations, also called the option value (Bateman et al., 2002; Ruijgrok, 2006; Throsby, 2006).

In conclusion, the non-economic value is hard to define because of its scattered definition in sub-values. The sub-values relate to three main drivers, namely the aesthetics of a building, the experience of people and the (cultural) history. It can also be noted that many of these sub-values are related to one

another or derive from each other. An overall connection to the sub-values is the site and surrounding of the building.

Economic value

The economic value differs from the non-economic value in a way that it can be (more easily) measured and therefore can be priced. The economic value is both related to utility and price, price arises from the exchange value or sales value. As stated by Bazelmans (2013) the price is what you pay, the value is what you get. The value of goods is therefore determined by people's willingness to pay for them. Bateman et al. (2002) defines economic value as something that relates to the willingness of people to sacrifice something else in order to obtain or safeguard a quantity of it.

According to Ruijgrok (2006) "The economic value of cultural heritage can be defined as the amount of welfare that heritage generates for society". Welfare is in this case not only expressed in euros but also in benefits that are external to market economy, such as recreational perception values.

The economic value can, just as the non-economic value, be divided in to several sub values. The most commonly used value is the market value. The market value is determined on the basis of the building's use and the willingness to pay for this use. In general, built heritage has a low market value. The direct market value can be expressed in monetary terms based on its utility and rent or sale value (Remøy, 2014).

The intrinsic value relates to the market value. This is the value of the building itself or parts of the building. The intrinsic value is equal to the highest and best use of a building and is determined by its possibilities for future use. The intrinsic value is derived from the experience people gain and therefore depends on the vision of individuals or groups (Remøy, 2014).

The housing comfort value described by Ruijgrok (2006) is defined as one of the three economic benefits to generate welfare (Remøy, 2014). This value is described as people generating welfare from living in a historical building or living in the surroundings of a historical building. This welfare is then reflected in the house prices (Ruijgrok, 2006).

The second economic benefit determined by Ruijgrok (2006) is the recreation value. This is an indirect economic value because it does not necessarily generate actual expenditure. But it creates welfare when recreationists enjoy the site or building.

The indirect value is based on the spatial quality a monument generates in its surroundings. One of the indirect effects that is named by Remøy (2014) is the indirect value of heritage tourism. Where a monument has a positive influence on the cultural tourism. This creates a twofold multiplier process. First the money spent by tourists on accommodation, food and activities secondary to the monument itself. Second, the income that is generated for people working in the cultural industry.

Another indirect effect is called 'heritage as a source of skills and competencies'. In this value heritage is seen as a source of developing skills, which has a possible impact om the local economy. Promoters in this case organise a school that will exists during the time of public works, usually young people without work or specific qualifications are engaged to work and learn here. Afterwards they are expected to employ their learned skills and competencies in other economic sectors (Greffe, 1999; Remøy, 2014).

To conclude, the economic value is more than just the market value of a building. The economic value refers to values that generate welfare for the society in monetary terms. These values can either directly or indirectly generate money.

Categorisation

Looking back at the first questions asked *What exactly is value? Is value always measurable? Is there such thing as "The added value"?* It can be concluded that there is definitely not one value and value is also not always measurable, which makes it difficult to understand. To add some consistency to this large number of values that are recognised, a categorisation is made, starting with the division between non-economic and economic values.

Remøy (2014) states that cultural and heritage value can be subdivided into aesthetic value, emotional value, experience, architectonic and cultural historical value. However, as described above the aesthetic value can be seen as a part of the architectural value. An overarching value is the emotional value of heritage, which also includes the experience value of heritage. Based on this the division between, architectural values, emotional values and historic values is made.

For the economic values a distinction between use value and non-use value is often seen in economic valuation. The distinction made by Bateman et al. (2002)is the start of many studies. They described that use value can be direct, by actual visits to the site, indirect, by benefitting from the site or an option value. The option value is the willingness of people to pay to conserve the option for future use. Non-use value is described as existence value, where people are willing to pay for the good although they make no (direct) use of it. They might not even benefit from the good. See the first scheme made by Bateman below.
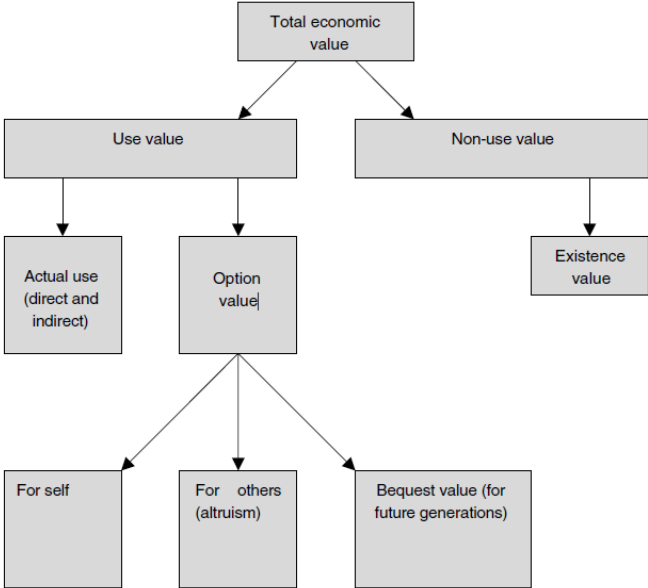
Figure 13 Economic valuation (Bateman, et al., 2002)

In contrast to Bateman some authors refer to non-use values as indirect. They describe the distinction between use and non-use value in the following way. The use value is the direct value to a consumer of the heritage services as a private good. The non-use values are values that are indirectly created by the heritage activities, the experience of heritage as a public good (Choi et al., 2010; Greffe, 1999; Throsby, 2006).

Because this division is not uniform, a division based on the social costs and benefits analysis (SCBA) and Input-Output analysis is made. This economic approach makes a division between direct, indirect and induced effects. In the direct effect the local economy benefits from direct spending or from direct employments and sales of goods and services from direct business investment as for example the construction of a project. The indirect effect is the additional economic benefit of increased sales, income and employment as a result of the business investments of the direct impact. The induced effect is the increased economic activity from household spending due to the increased employment and income earned because of the increased direct and indirect effect (Musil, 2011). The multiplier effect for the scope of this research is not relevant and is therefore left out.
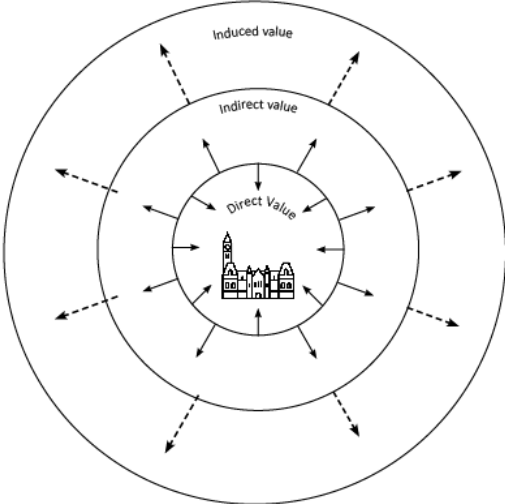
Figure 14 Direct, indirect and induced values (Own illustration)

To support the review of economic and non-economic values, a scheme is made that categorises the different sub-values based on the literature described above, and according to personal interpretation.

Figure 15 Cultural heritage value division (own illustration)

3.2 Economic valuation methods

Heritage is a source of economic activity because it creates utilities, individual or collective and direct or indirect (Greffe, 1999). When economic assessment is used, it clarifies the decision problem. It defines the interest of different stakeholders and how they are affected by the decision made. It also defines objectives and constraints and it identifies the data needed to quantify the relationship between variables. Meanwhile, objective economic assessme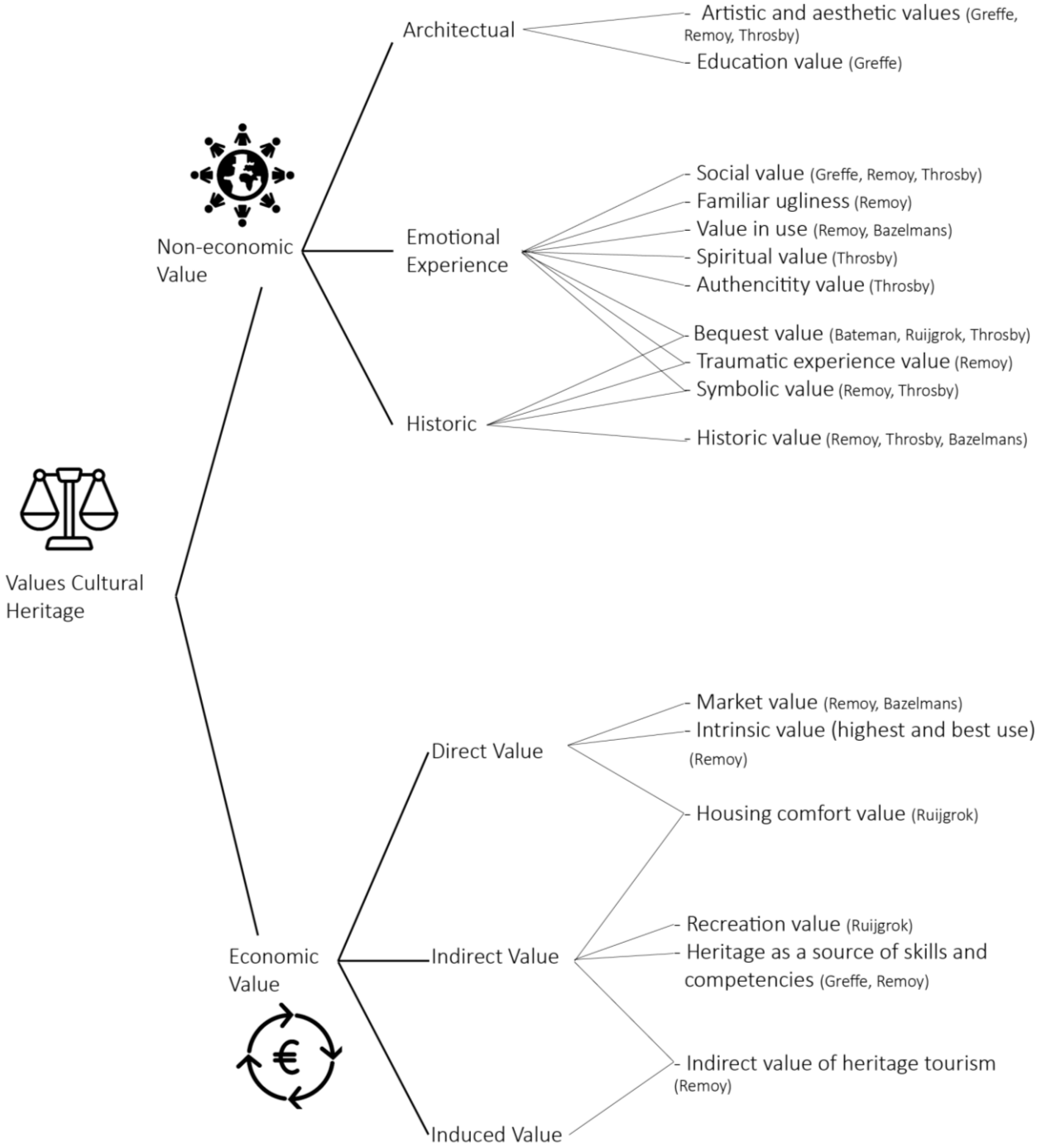nt analysis also shows the taste and preferences of people. These are discussed above as the non-economic values, which are hardly measurable. These are need to be taken into account, because when people value things highly they are also willing to pay (more) for them (Ruijgrok, 2006; Throsby, 2006). Therefore, this research focusses on the economic value of (transforming) cultural heritage.

As described before the impact of the transformation of cultural heritage on its surroundings is of great importance. Therefore, this study focusses on the indirect economic effect of cultural heritage. Expressing the indirect value as a financial value is challenging but not impossible. Based on the scheme of Bateman et al. (2002) which is described above in the section on economic values, Choi et al. (2010) made the following scheme:
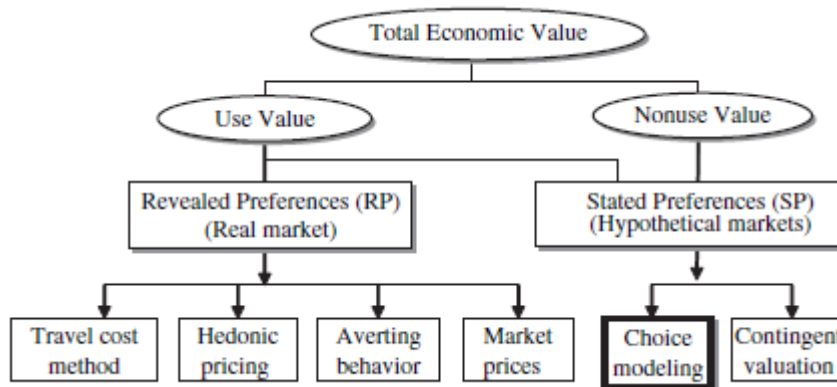
Figure 16 Economic valuation techniques (Choi,etal., 2010)

This scheme starts with the same division between use and non-use values but instead of going further into the division of values it focusses on valuation methods. Only a few studies have been done to place an economic valuation on cultural heritage, despite the growing acknowledgement of their value to society. The application of economic valuation methods can add to the understanding of the broader economic value of heritage to society (Choi et al., 2010). The economic valuation methods that are used will be described below in order make a reasonable choice of the evaluation method used in this study:

- Travel cost method
This method measures the amount people are willing to pay for their travel to visit a certain site or building. Moreover the time people are willing to spend to travel is a variable of this method. The travel cost method is used as an indicator of the experience value of an area. This method however is is quite complex because it is hard to indicate the exact travel time and expenditure, a lot of assumptions have to be made. Besides the underlying hypothesis is arguable (Choi et al., 2010; Dammers, Hornis, & Heemskerk, 2005; Greffe, 1999; Remøy, 2014).

- Hedonic pricing method
The hedonic pricing method is used to measure the welfare users and local residents' experience in an area. It defines the spatial quality by the willingness to pay, measured by the real estate transactions made in the area. It compares different transactions based on different values that are expressed in variables. The difference between the variables, for example one building being near a monument and another is not in connection with monument, indicates the effect of the variable. The method seems

very relevant to identify the value of heritage in urban planning, however lots of data is needed (Choi et al., 2010; Dammers et al., 2005; Greffe, 1999; Remøy, 2014).

- Averting behaviour method
The averting behaviour method is used to calculate the costs that are made to prevent households from a decline in quality in their living environment. These are the cost you pay to avoid an inconvenience or hazard. An advantage of this method is that the method names concrete measurements, which are mostly easy and cheap to implement. However, these measurements take time and are only a global estimation of the value for individuals (Choi et al., 2010; Dammers et al., 2005; Remøy, 2014).

- Choice modelling
Choice modelling is based on the characteristic's theory of value. When using this method, a series of choice sets are presented to survey respondents, for each question a set of respondents have to choose their preferred option. Prices are derivatised by the addition of one monetary variable. This method is might be biased due to the often low response rate which possibly has some influence on the overall result (Choi et al., 2010).

- Contingent valuation method
The contingent valuation method is based on directly asking the users what utility the visit to heritage sites would create for them and how much they are willing to pay for it. This is done by a survey, which offers the possibility to inquire about the use and non-use values. However, the answers to the survey can be systematically biased which can make the method misleading. People might overestimate the value because of the will to preserve the building or underestimate it to drive the price downwards (Choi et al., 2010; Dammers et al., 2005; Greffe, 1999; Remøy, 2014).

Other methods that are not included in the model of Choi et al. (2010), but which are described by other authors are the recovery cost method and the prevention cost method.

- Recovery cost method
Recovery cost method is used to calculate the costs of interventions of unwanted changes in the living environment of residents. This is, for example, a decline in quality by developments in the surroundings of the residents which are of low-quality (Remøy, 2014).

- Prevention-cost method
In this method the costs are calculated for the measurements taken to prevent loss or lower quality of existing public space. When these costs are compensated this is also called a shadow project (Dammers et al., 2005; Remøy, 2014).

For this research the hedonic pricing method is chosen. This method focusses on different characteristics of the building to determine the market value of the building based on a statistical model. The characteristics function as variables for the model (Barentsen, 2015). This method is used because it assumes that the difference in market value is caused by the difference in characteristics. By separating the characteristics, it can be determined if and how much one characteristic, in this case the proximity of transformed cultural heritage, has impact on the market value. This method can thus in contradiction to the other models separate different characteristics. Furthermore, the risk of a low response rate is excluded.

Method	Advantage	Disadvantage
Travel cost method	Costs and time people are willing to pay is measured	Method is quite complex and includes a lot of assumptions
Hedonic pricing method	Precise measurement, the results are only open to one explanation	Lots of data is needed
Averting behaviour method	Method names concrete measurements	Measurements take time and are only a global estimation of the value for individuals
Choice modelling	Can be easily measured by a survey	High risk of bias, due to the often low response rate
Contingent valuation method	Can be easily measured by a survey	High risk of bias, if people have a personal interest they might under or overestimate prices
Recovery cost method	Concrete measurements and relatively cheap	Measurements take time and are only a global estimation of the value for individuals
Prevention cost method	Concrete measurements and relatively cheap	Measurements take time and are only a global estimation of the value for individuals

Table 1 Advantages and disadvantages economic valuation methods (Own illustration)

3.3 Hedonic pricing model

To measure the indirect value of transformed cultural heritage, the hedonic pricing model will be used. If and how much influence the transformed cultural heritage has on the market value of the surrounding houses will be determined by this model. Rosen (1974) is seen as the founder of the hedonic pricing model theory. Rosen (1974) states that the hedonic model is "a model of product differentiation based on the hedonic hypothesis that goods are valued for their utility-bearing attributes or characteristics.". These characteristics are for example size, energy efficiency and location. The hedonic pricing model is in theory a mathematical formula, which is described, in the most simple way, as follow:

$$P = \sum \beta_k \chi_k + \beta_0 + \varepsilon$$

The characteristics (X) determines the market value (P), which implies a linear relationship. X_k is thus a certain characteristic, for example size, β_k is the extent to which the characteristic contributes to the market value. The starting point is β_0, this a part of the market value that is not determined by specific characteristics that are included in the model. E is the error marge that is determined based on the market value that is expected by the model and the actual market value. In theory β_0 and E should be minimized when more specific characteristics are added to the model (Barentsen, 2015).

However, this formula is oversimplified for the use of the market value of houses. A more complex formula is needed, which is rarely linear, but mostly a logarithm. There are three dimensions that are necessary for determining the market value of houses. Apart from the characteristics of the building itself, the dimensions time and location must also be included in the formula (Goodman, 1978). Oligschläger (2015) used the following formula:

$$Yi = \alpha_i + \sum_k \beta_{ki} S_{ki} + \sum_p \gamma_{pi} N_{pi} + \sum_j \lambda_{ji} L_{ji} + \varepsilon_i$$

Which is built up in the same way as the formula described before but consists of three components, namely the vector for building characteristics (S), the vector for space characteristics (N) and the vector time (L).

Background and previous findings

Before determining which characteristics are necessary to determine, the variables of the formula, literature about hedonic price models and their application to cultural heritage is reviewed. Following up on the research of Barentsen (2015), who focused on the market value of living in monuments, this research focusses on the externalities of cultural heritage and not the monument itself. She calls for attention about the positive and negative externalities of transformed cultural heritage. She states that in order to gain subsidies it is important to define what effect the transformed heritage has on the economic competitive position of a city or village. Therefore, literature about the economic external effects on the market value of cultural heritage will be reviewed more in depth.

Starting with the research of Ruijgrok (2006) who investigated the economic benefits of preserving cultural heritage. By using the hedonic pricing model, she calculated the housing comfort value for the resident in the neighbourhood of cultural heritage. She also used the Contingent Valuation method to determine the recreation value and the bequest value of cultural heritage. She performed a case study in Tiel, Culemborgerwaard in the Netherlands, which consisted of a sample of 591 houses. The outcome of this study was that investing in heritage protection pays off to society, because the benefits greatly exceed the costs.

One year later Noonan (2007) preformed a study on the impact of landmark designation on prices of properties and the prices of properties in the neighbourhood. The research focused on sales prices in Chicago between 1990-1999. More specifically, the externalities measured in this research are the effect of the number of landmarks in the block groups at the moment of sale, distance to the nearest landmark and the influence of the characteristics of the landmark. Three methods are used in this research, namely the hedonic price method, the repeat sales method and spatial dependence method. The hedonic price method is used to define the price effect of landmark designation. The model shows

that landmark prices are indeed higher, however this price premium is smaller if the landmark is a district instead of a property. The hedonic model shows limited evidence about the benefits of the proximity of landmarks. However, the repeat sales method shows stronger evidence that the proximity of landmarks within a block group has a positive effect on prices of properties. The distance hereby is more important than the number of landmarks in the block groups. Overall the research shows that the landmark designation has substantial external benefits to other properties and the age of the landmark also has an influence. The older the landmark, the more increase in prices can be seen.

Based upon the work of Noonan (2007), Ahlfeldt and Meannig preformed a study in 2010 on the impact of designated landmarks on condominium apartment transaction prices in Berlin. The study investigates the price differentials between listed and non-listed condominium apartments in monuments and their impact on the surrounding property prices. At first, baseline models were used. The property prices are explained by using the hedonic pricing model, which included a set of structural attributes, neighbourhood characteristics and location of amenities. Similar to Noonan's approach a spatial autoregressive model was used for spatial structure of the error term. During the next step heritage models were used to extend the baseline models in order to measure the price differences of condominium apartments within heritage property areas. At the same time a nonlinear least square estimator was used to calculate the distance decay effect. The results show no significant price difference for designated properties, weak evidence was found that shows a 3-5% depreciation effect of heritage property areas. However, a positive effect in the surrounding neighbourhood was found, not only the proximity to the landmark mattered which can add up to a price increase of 2.8%, but also the density and totality of nearby landmarks. The study suggests that the influence on property prices reached up to 600m from the landmark, whereby the price impact halves every 90m. The authors suggest that the aesthetic appeal of the buildings also have an influence.

Zahirovic-Herbert and Chatterjee (2012) did research about the effects of historic designation on residential property values in Barton Rouge, Louisiana, USA. This study investigated the direct and external effect, as well as the distribution of price premiums of historic designation. The focus of this paper is on the possible improvement of property values and the creation of ripple effects on the value of the surrounding properties. The hedonic pricing model is used to estimate the marginal implicit prices of characteristics of detached single-family homes. The hypothesis about the increase in price is tested by using a quantile regression model. The willingness to pay for historic designation is likely to differ across residents with a different range of house prices. The results show indeed that historic preservation had a positive impact on property values within a historic area. Properties near historic areas show also a house price increase, just as houses in the proximity of land marks. Remarkably, this study also significantly shows that lower-end properties gain most value from the historic preservation, which might lead to displacement of less-affluent residents of historic areas after designation takes place.

The question "does the housing market reflect cultural heritage?" is studied in Ireland by Moro et al. (2013). They investigated whether distance to, and density of, cultural heritage is capitalised in house prices within Greater Dublin. In contrast to the aforementioned research this research focusses on multiple types of cultural heritage and makes a specific distinction between historic buildings, churches, archaeological sites, Martello towers, and memorials. Within the hedonic pricing model different types of distance relationships are specified and the impact of diversity and density effects of heritage buildings is investigated. The results show that some categories of the cultural heritage generate positive spill overs effects, while others seem to have a negative effect. Historic buildings, memorials and Martello towers generate a positive impact. However, a decrease in distance of 100m results in a price decrease of 0,4-0,7%. Archaeological sites seem to have a negative impact. The authors suggests that these impacts are the result of capturing of the aesthetic beauty.

More close to home, Lazrak, Nijkamp, Rietveld, and Rouwendal (2014) investigated the market value of listed heritage buildings and historic-cultural sites within the Dutch urban area of Zaanstad. The effect of cultural heritage is measured in three ways. Firstly, the effect of a listed building on the market value of the building is measured. Secondly, the effect on nearby properties is measured and thirdly, the effect of historic-cultural heritage sites on real-estate prices is estimated. Besides the hedonic pricing model,

a spatial Durbin model which uses a nearest neighbour row-standardized weight matrix is used. The outcome of the research shows that listed build heritage has a 29.6% premium in price over non-listed buildings. The price premium over the surroundings houses is an extra 0,28% for each additional listed building within a 50m radius. Houses sold within a conservation area show a price premium of 27.9%. This indicates that historic ensemble effect is extra valuable and the clustering of listed heritage also increases its value. An interesting note of the authors is that people value listed heritage in their neighbourhood more over time.

Most recently Koster and Rouwendal (2015) investigated the economic effects of large scale subsidised investments in historic amenities in the Netherlands. The external direct and indirect effect are distinguished based upon house prices. The direct effect measured the positive effect of investments on the house prices in neighbourhood, because the overall amenity level of the neighbourhood rises due to an increase in quality of historic amenities. The indirect effect is measured by investigating the private investments by homeowners to increase the quality of maintenance and appearance of their house. This will lead to an indirect effect when the quality also effects the houses in the neighbourhood. To do this a dataset of house investments and transactions in the Netherlands since 1985 is used in a repeated sales regression model. The outcome of the research confirms the positive external effect of investments on house prices. An investment increase of one million euro per square kilometre in cultural heritage results in a price increase of 1.5-3.0% per non-listed building. No evidence is found that the maintenance level is improved, this leads to the conclusion that the effect of investment in cultural heritage is a, as described by the authors, a direct effect.

These eight researchers all stress the importance of identifying the impact of cultural heritage directly and indirectly. Although, the definition of direct and indirect effect sometimes differs, one can say that the direct effect impacts the cultural heritage itself and the indirect effect is on the neighbourhood around the cultural heritage site, also called a spill over effect or externalities. Both effects show in most research a positive outcome, which confirms the well-established notion in literature that historic preservation has a positive influence on house prices in the neighbourhood. It must be noted that a lot of hedonic pricing studies about cultural heritage focus on the influence of heritage designation. This research however, uses the hedonic pricing model to measure the indirect effect, the external effect, of transforming cultural heritage. Therefore, the vector time is crucial, namely before and after the transformation of heritage.

Research	Direct effect	Indirect effect
Noonan (2007)	Price increase of 6.5%	Price increase of 1.7-2%
Ahlfeldt and Meannig (2010)	No significant price differentials	Price increase of 2.8%, based on proximity and density of landmarks
Zahirovic-Herbert and Chatterjee (2012)	Price premium of 6-9% for properties within a historic district	Price premium of 3.8% within historic districts and 7.5% near landmarks
Moro et al. (2013)	-	Positive externalities which decline every 100m with 0.4-0.7%
Lazrak, Nijkamp, Rietveld, and Rouwendal (2014)	A price premium of 29.5% for listed monuments	0.28% increase in value for each listed building within a 50m radius
Koster and Rouwendal (2015)		Investment increase of one million euro per square kilometre results in a price increase of 1.5-3.0% per non-listed building

Table 2 Direct and Indirect effect (Own table, derived from Koppels, 2018)

Variables

Based on the previously described literature an analysis of the characteristics used in the hedonic pricing model is made. The characteristics are used in the formula of the model as variables. A difference in extension of the number of variables is seen between the research. Ahlfeldt and Maennig (2010) for

example use the most extensive variable list, which is four pages long. This list is too extensive for the scope of this research and will therefore not be included in this research. The seven other research papers are compared in the table below. Also the research of Oligschläger (2015) is added, his research is very comparable in methodology and it therefore incorporated in the table. However, his research does not focus on cultural heritage and is therefore not described above. The research focusses on the external effect of icons on the houses and offices in the neighbourhood, and especially on the distance decay effect.

Despite having sometimes different names the variables are comparable. The table functions as a benchmark and indicates how many of the eight researchers make use of the same variable. To make the table more logic and easier to read, the characteristics are divided into four categories, namely transaction, house, neighbourhood and cultural heritage characteristics.

Conclusion

For this research the hedonic pricing model will be used in order to determine if and how much effect cultural heritage has on the neighbourhood, the so-called indirect effect. The table on the next page shows in total 78 characteristics. All characteristics that are used three times or more, are seen as a solid basis and will therefore be used in this research as well. This leads to the following fifteen variables (also indicated in orange in the table below):

Transaction variables
- Transaction price (dependent variable)
- Year of sale

House variables
- House type
- Construction year
- Floor space
- Number of rooms
- Number of bedrooms
- Parcel space
- Heating and insulation
- Parking place
- Garden
- Maintenance inside
- Maintenance outside

Cultural heritage variable
- Number of monuments in the neighbourhood
- Monument type
- Distance to monument

It is worth noting that none of the neighbourhood characteristics are used. This is because the model will include individual houses from the NVM data base, data about the quality of the neighbourhood will be hard to define and of less importance. Additionally, the most important neighbourhood characteristics for this research are included in the variables of cultural heritage, namely number of monuments in the neighbourhood and distance to those monuments.

.	Barentsen	Ruijrok	Noonan	Zahirovic-herbert & Chatterjee	Moro et al.	Lazrak et al.	Koster & Rouwendal	Oligschalger	Total
Transaction characteristics			Log-price	Selling price		Transaction price	House price	Transaction price	5
				Renter-occupied house		leasehold			2
						newly built house			1
						Sell condition			1
				Days on the market (DOM)					1
				Repeat sale					1
							Investments		1
							Subsidies		1
							Trageted buildings		1
							Predicted investments		1
	Year of sale		*Year of sale				Year of observation	Transaction year	4
				Competing listings weighted by days					1
				Season dummy variable					1
House characteristics	Typologie	House type			House type	House type	House type	House type	6
		Volume m3				Capacity, volume of the house			
	Floorspace			sqf Living area	Floor space m2	Floor space	Size in m2	House size	6
			Number of units in the building						1
	Builidng period	Year of construction	Year built	Age of house	Year of construction	Year of construction	Construction year	Construction year	8
				Vacant house					1
			Northside						1
		Position (compass)	Latitude						2
	Parcel size	Lot size m2	Log-area	Sqf of other area					4
			Number of rooms			Number of rooms	Rooms		3
			Number of bedrooms	Number of bedrooms	Number of bedrooms				3
			Number of Baths	Number of bathrooms					2
			Master bathroom dummy						1
	Roomheight								1
	Heating		Number of fireplaces		Gasfired heating system	Gas heater	Central heating	Heating	7
	Insulation					insulation		insulation	3
					Presence of utility room (%)				1
	Parking		Parking spot		Presence of parking	Parking	Garage	Parking	6
			Waterfront						1
	Garden				Presence of garden	Garden	Garden	Garden	5
	Outside space								1
			Roof type						1
			Facade type						1
			Dominant building material						1
			Roof material						1
			Architectual style						1
			Authenticity						1
			Number of historical facade						1
	Maintenance insides	maintenance			Condition	Maintenance inside	Maintenance level inside	Maintenance interior	6
	Maenance outside					Maintenance outside	Maintenance level outsids	Maintenance exterieur	4
					Free acces (%)				1
					State care (%)				1
Neighbourhood characteristics		Ensemble							1
		Distance to town	Distance tp CBD						2
			Distance to lake						1
		Distance to water							1
			Distance to CTA		Distance to public transport				2
			Distance to park		Distance to park				2
					Distance to coast				1
					Distance to beach				1
		Neighbourhood quality		Negative deviations from local mean living area					2
				Positivedeviations from local mean living area					1
						Name Village		Location	2
						Busy street			1
						Proportion of water area			1
			BG-income						1
			BG-value						1
			BG- density			Population density			2
			BG- non-White						1
			BG- year built						1
Cultural Heritage characteristics			BG-landmarks						1
	Number of monuments in the		Districts	Historic district	Number of historical buildings within 250m		Number of listed buildings		5
					Number of churches within 250m				1
					Number of martello towers within 250m				1
					Number of archeological sites within 250m				1
					Number of memorials within 250m				1
				Near historic district					1
	Monument type	Monumnetal status	Landmark	Historic landmark					4
			CL-year built						1
			CL- date designated						1
			CL- distance	Historic landmark distance	Distance to historic building				3
					Distance to church				1
					Distance to martello tower				1
					Distance to archeological site				1
					Distance to memorial				1
			*CL= closest landmark						

Table 3 Variables selection (Own Table)

Qualitative & quantitative exploration
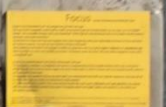
4. Qualitative & Quantitative exploration

The data collection and analysis consist of two parts. The first part involves semi-structured interviews which serve as a foundation to the second part of the practical framework, which is the quantitative analysis. In this second part a hedonic pricing model was made based on four case studies.

Presentation – summit The Future is heritage

In the Young professionals summit "The Future is heritage" as part of the European Cultural Heritage summit in Berlin, I made a presentation together with Leon Koenders from Hylkema Architecten en Rosan Pallada from MeyerBergman Erfgoed ontwikkeling on the Westergasfabriek and Paleis Soestdijk, which are both adaptive re-use projects that are (being) redeveloped by MeyerBergman Erfgoedgroep. My part of the presentation referred to the values of the projects, by linking them to my literature study, which was also discussed with the participants.

During the preparation my awareness about the difficulties and long timespan that come along with those projects grew.

Figure 17 Presentation Berlin (Own picture, 2018)

Both projects started with temporary functions in order to open up the locations and promote them to the public. At the end, a successful re-use of the Westergasfabriek was made by keeping its original creative industries and by adding a successful mix of functions. At Paleis Soestdijk they are still working on opening up the Palace to make people feel more connected to it. In both projects you could see the values that were described in the literature review. The values could be divided in the values of cultural heritage buildings itself and the additional values that are created during the redevelopment.

Alongside our presentation, other presentations addressed the struggle of municipalities concerning vacant heritage. An example was the upcoming vacant monastery within the municipality of Oirschot. The size of the monastery is enormous which makes it hard for the municipality to find a suitable re-use for it. Furthermore, the municipality has trouble financing these large and extensive projects. They were questioning whether they should buy the monastery or influence the project in some other way by for example making restrictions. Another interesting presentation was about the adaptive re-use of churches, which is a very sensitive issue. Here the five values of monuments described by the Rijksdienst van Cultureel Erfgoed were addressed (cultural-historical, architectural and art history, situational and ensemble value, integrity and recognisably and rarity). The research in this case pointed out the missing social value in this list. They stated that this value might be the most important. They also argued that young people should be more involved in those adaptive re-use projects.

Overall the presentations shined a light on the relevant issues in line with the described problem analysis.

4.1 Semi-structured interviews

The first part of the data collection and analysis serves as a foundation for the quantitative research. Together with the literature review, the semi-structured interviews captured the value of cultural heritage. For a better understanding what value is and how value of cultural heritage is used in practice, three interviews with different experts in the field of cultural heritage were performed. Prior to this, two explorative interviews were conducted in order to examine the questions of the interview protocol and practise interview techniques. The perspective of three experts with a design, marketing and governmental background were compared. The interviews showed the different views on the value of cultural heritage within different working fields.

Work field	Company	Function	Interviewee
Marketing	Redres de erfgoedexpert	Owner Redres erfgoed and broker	Jan-Willem Andriessen
Government	Rijksdienst voor Cultureel Erfgoed	Head of the archaeology department	Jos Bazelmans
Design	Wessel de Jonge Architecten BNA bv	Director Wessel de Jonge architecten and professor at the Delft University of Technology	Wessel de Jonge
Development	MeyerBergman Erfgoed ontwikkeling	Developer	Rosan Pallada*
Design	Vis Architecten	Architect	Sunna Schuijt*

Explorative interviews
Table 4 Interviewees (Own table)

The grounded theory was applied to analyse the interviews in which coding and constant comparison were used. By constantly comparing phenomena that were coded under a certain category, a theoretical elaboration emerged (Bryman, 2016). In this research the comparison is used to equate the focus of different actors within the field of cultural heritage. Also, a thematic analysis was used by providing a framework, which is a matrix-based method, for ordering and synthesising data (Bryman, 2016). This framework is based on the value division made in part one of the theoretical framework. In this framework the repetition of the values, described by the interviewees, was counted in order to reveal each interviewee's focus (see appendix 2 for the outline of the semi-structured interviews and the interview analysis). The most important findings of the interviews are discussed below on the basis of the coded themes of the analysis.

Adaptive re-use of cultural heritage

The problem analysis described in chapter one of this research is clearly recognised by all interviewees. All experts explained that monument-listed buildings are often built at the beginning or at the highest peak of a technological and/or societal era, this makes those buildings special. However, lots of these buildings tend to lose their original function because of societal and technological developments. The vacancy among these buildings can lead to negative consequences for the building itself but also for the surrounding area (Andriessen, 2018, Bazelmans, 2018 & De Jonge, 2018). The level of vacancy depends on the function of the buildings (Bazelmans, 2018). Industrial heritage is a type of heritage that strongly depends on the technological evolution of an era. At a certain moment, when the technology grows, industries or factories lose their function and become vacant (Andriessen, 2018). This vacancy is also seen in, for example, office buildings, when too many are built for unknown customers before the economic crisis and different ways of working led to a reduction in the office space needed (De Jonge, 2018).

In the conceptual model made in chapter one of this research, there are two options given for vacant heritage buildings, which are either to demolish the building or re-use them for a new function. In addition to those two options the interviewees also stated that reusing the building without changing the function, with a minimal restauration is sometimes an option (Andriessen, 2018, Bazelmans, 2018 & De Jonge, 2018). Secondly, making the buildings wind and waterproof. When doing this, you only prevent the building from decay, but you do not add anything else. Bazelmans (2018) states that sometimes you need to give buildings "time", in order to find a suitable re-use. Following up on this, temporary functions were named as a solution to vacancy. This however, is often part of the adaptive re-use process (Andriessen, 2018, Bazelmans, 2018 & De Jonge, 2018). The last option is to give the building a ruin status, although this is not a common option in The Netherlands and is more often seen in the south of Europe (Bazelmans, 2018).

-- *Het beste behoud is altijd nog gebruik. - Jan Willem Andriessen, 2018* --

The need for adaptive re-use is recognised by all interviewees. Nevertheless, the interviewees argue that the adaptive re-use is not a new thing. Bazelmans (2018) states that each era knows their vacant buildings, so the adaptive re-use of cultural heritage has always existed. De Jonge (2018) recognises a shift from adaptive re-use out of social and economic needs, thus a need for square meters and money, to adaptive re-use as a cultural and architectural challenge.

Values of cultural heritage

When asking the interviewees about the value of cultural heritage, none of them started talking about financial values. All interviewees seemed to focus on emotional value, social value, cultural historic value and so on. Andriessen (2018) stated that cultural heritage is about the experience of people. He sells his buildings by telling "the narrative" of the building. This narrative is the history of the building and explains the identity of a building, it determines people's perception and understanding of a building. This same narrative comes back in the explanation of De Jonge (2018), "by re-using a building you deliver a message, the narrative". Another important value that was mentioned several times, is the strong association people feel with things they recognise from the past, a need for origin. People want to connect to an object or place; those values are explained by the authenticity of a building. Cultural heritage is part of people's identity, this is why cultural heritage has a strong emotional value (De Jonge, 2018). An interesting perspective was given by Bazelmans (2018), he declared that the ideas and habits of people determine what they value as important. Cultural heritage has therefore values in terms of "norms and values" (normen en waarden), which are shaped by education and our environment. Therefore, he states that emotional value derives from our perception to the world, our perception of what we think is right and wrong. It is important to note that this focus on emotional values and the narrative of a building is very recent. A shift from an expert view, where architectural and historical research is leading, to a societal view, where the opinion of the public is the most important, is noticeable.

The translation from emotional values to market values seems to be a difficult topic. Bazelmans explains that for example a church is built with all kinds of small contributions from the church community. At that time, it never crossed their mind that this church would once be sold. Andriessen, a heritage expert and broker, states that he bases his prices on the local market values and reference projects but also on feeling and experience. He states that the intrinsic value of a heritage building is a sort of heritage premium above the normal market price of a building. This heritage premium depends on the experience of people and cannot be determined by a €/m^2 value. However, people interesting in buying cultural heritage are people who love heritage and are therefore willing to pay more for it. One thing about market value that can be made explicit, is that the market value of cultural heritage, just like other buildings, depends on the function determined in the land use plan of the municipality. A housing function is worth twice as much as an office function. Societal functions are worth a lot to the public but have a low market value, etc (Andriessen, 2018).

--   *Ik vergelijk het altijd met een Rembrandt. Hoe bepaal je hoeveel zo een schilderij waard is, dat doe je ook niet per cm2. En dat is iets wat wij bij vastgoed wel altijd doen, per GBO. – Andriessen, 2018*   --

A distinction can be made between values of cultural heritage that already exist and values that are generated by the adaptive re-use of cultural heritage. Additional values that are created by adaptive re-use simply start by reviving vacant buildings. Experts acknowledge the value that monument-listed buildings have for their neighbourhood. The adaptive re-use of cultural heritage therefore has a positive impact on the market prices of the surrounding buildings. Controversially, vacant heritage buildings have a negative impact on their surroundings (Andriessen, 2018, Bazelmans, 2018 & De Jonge, 2018). There are two ways in which adaptive re-use can influence the neighbourhood. First missing functions in de area can be incorporated in the adaptive re-use, this creates an additional value for the neighbourhood. But the adaptive re-use can also generate demand by for example a new university building also demand functions like a lunchroom in the neighbourhood (De Jonge, 2018). Besides adding new values, adaptive re-use can also increase existing values by, for example, extending the historic

value of a building or by adding new qualitative layers to a building by design (Bazelmans, 2018 & De Jonge, 2018). This can, for example, be done by exposing the history of the building or increasing the sustainability.

The adaptive re-use process takes at least seven years. Andriessen (2018) states that placemaking is the most important feature by adaptive re-use. This has to be done by making sure that people like the place, which starts by opening it up and marketing. To achieve this, often temporary functions are added first. The temporarily functions can be used as an experiment to see which functions fit the best a certain place and what does not fit. Multiple functions are often needed for successful placemaking (Andriessen, 2018, Bazelmans, 2018 & De Jonge, 2018).

Focus per work field

Form a marketing perspective, Andriessen (2018) stated that the market for cultural heritage is very specific. Most heritage buildings are big, which leads to high prices because of the number of square meters. Hence the buyers of cultural heritage must have enough financial resources and see the potential of these buildings. The marketing of a place is very important. The acquisition of cultural heritage is the art of temptation. Until two years ago, Andriessen photographed all the buildings of Redres himself. When he is selling buildings, he captures people's imagination in a sort of time capsule by telling the narrative of the building. He states that he cannot change the location of a building, which is the most important feature of real estate, but he can change the perception and understanding of people.

Concerning the adaptive re-use of cultural heritage Andriessen (2018) and Pallada (2018) look from a demand perspective, which functions are missing in the neighbourhood. They both point out that the new use of a building has to have an economic carrier in order to make the project financially feasible.

In the design perspective, value is determined by research. Either by a building history research and value statement or by a design research. The building's history research is mostly focussed on the architecture and aesthetics elements of a building. The design research is about daylight, construction, height etc. of a building. By analysing these features, the architect determines which functions would suit the building best. This will result in, for example, ten possible options in rough sketches where they expose the potential of the building. The architect will then discuss with his client what the best suitable function is. The architect is also capable of increasing value by adapting the design of a building or by underlining the building's (or companies) history (De Jonge, 2018).

The governmental perspective is different. Here the focus is on what makes cultural heritage worth to be preserved and protected. The Rijksdienst voor Cultureel Erfgoed has several tasks, which are listing monuments, keep the monumental register up to date, give advice about restoration and land-use plans and award grants for restauration (Rijksdienstvoorcultureelerfgoed, n.d.). Bazelmans (2018) stated that in the protection of monuments, all monuments are equal, the palace at Dam square is not better protected than a farm with a monument-listed status. The price of heritage does not matter. A recent issue occurred in the appointment of monument-listed status, due to the change in view about what needs to be protected. Bazelmans (2018) declares that at first, the government only focussed on architectural and historical values, thus an expert view only. Over the last two years the government is doing research on the emotional and social values. A shift is seen where monuments are valued from a strictly academic perspective to a more social perspective, where the public's view of a building becomes more important. Due to this shift and the lack of knowledge on how to deal with this, the government did not appoint a monument-listed status for the last two years (Bazelmans, 2018).

-- *Eén van onze grootste issues is hoe ga je om met die emotionele waarde, die expertgemeenschap is daar niet de drager van, dat is het publiek. – Balzemans, 2018* --

In the figures below, the thematic analysis is shown. For each value the number of times the expert mentioned that value is counted. It highlights the values that are addressed the most by each expert.

The values originate from the value division made in part one of the theoretical framework. It shows that Andriessen is the only one who actively focussed on the economic value of cultural heritage. Furthermore, he focussed mostly on the experience of people. The historic value is mentioned multiple times by all experts. Wessel De Jonge naturally focusses mostly on the architectural values, also the authenticity value is mentioned several times. Jos Bazelmans focusses on three values extensively. These are the architectural value, the historic value and the social value. This can be explained by the changing view in values by the government, where it first focused on architectural and historical values, and is now trying to focus on the social value more.

Jan- Willem Andriessen

Non-economic value											Economic value					
Architectural value		Emotional / Experience value X						Historic value			Direct		Indirect			Induced
Artistic and aesthetic values	Education value	Social value	Familiar ugliness	Value in use	Spiritual value	Authenticity value	Bequest value	Traumatic experience	Symbolic value	Historic value	Market value	Intrinsic value	Housing comfort	Recreation value	Skills and competenci	value of heritage tourism
I		I		I		I		I	I	V	VI	III	I			

Table 5 Value focus marketing (Own table)

Wessel De Jonge

Non-economic value											Economic value					
Architectural value III		Emotional / Experience value I						Historic value			Direct II		Indirect I			Induced I
Artistic and aesthetic values	Education value	Social value	Familiar ugliness	Value in use	Spiritual value	Authenticity value	Bequest value	Traumatic experience	Symbolic value	Historic value	Market value	Intrinsic value	Housing comfort	Recreation value	skills and competenci	value of heritage tourism
II	II	II		I		III				VI				II		

Table 6 Value focus Design (Own table)

Jos Bazelmans

Non-economic value											Economic value					
Architectural value III		Emotional / Experience value II						Historic value			Direct		Indirect			Induced
Artistic and aesthetic values	Education value	Social value	Familiar ugliness	Value in use	Spiritual value	Authenticity value	Bequest value	Traumatic experience	Symbolic value	Historic value	Market value	Intrinsic value	Housing comfort	Recreation value	Heritage as a source of	Indirect value of heritage tourism
		VI			I	I				V	II			I		

Table 7 Value focus Government (Own table)

Feedback value division literature

All experts agreed with the distinction between economic and non-economic values. However, De Jonge (2018) claimed that non-economic value is not a valid name for the emotional values. Bazelmans (2018) questioned the name of emotional values and stated that they were rather values in terms of norms and values, as explained before. Therefore, the non-economic value is also called the narrative, this captures the feeling better.

The experts addressed a few values that were missing. Andriessen (2018) stated that location is also a direct economic value. Furthermore, he stated that societal and technological developments could be seen as a separate value besides the historic value. Sustainability is also seen as a value of cultural

heritage. He stated that nothing is more sustainable than a building that is a hundred years old. De Jonge (2018) suggested to separate authenticity value into design authenticity (the idea behind the building) and material authenticity, because authenticity differs in different cultures. Bazelmans (2018) suggests switching the architectural and emotional value because of hierarchical reasons. The emotional value is the most important and should therefore be on top. Bazelmans (2018) also states that the value in use is part of the economic value.

None of the interviewees knew the familiar ugliness value. When the value was explained they did recognise the meaning of it, however the familiar ugliness is seen as part of the uniqueness of a building and is therefore part of the authenticity value. The traumatic experience value will be eliminated, as the story of a building is already captured in the overall narrative and the historic value of the building.

-- Je hebt project ontwikkelaars die zich alleen focussen op historische gebouwen, dus dat betekend dat daar wel een meerwaarde in zit die zij herkennen en andere niet. – De Jonge, 2018   --

Conclusion

The problem analysis and value of cultural heritage described in chapter one of this research is clearly agreed upon by all experts. The experts also acknowledge the value that monument-listed buildings have for their neighbourhood. The adaptive re-use of cultural heritage therefore has a positive impact on the market prices of the surrounding buildings. On the contrary, vacant heritage buildings have a negative impact on their surroundings. Buildings lose their function and become vacant, due to social and technological evolutions. The level of vacancy depends on the function of the building. The adaptive re-use is seen as a good possibility to preserve cultural heritage. Other options that are possible with vacant heritage are: demolishing, re-use, do nothing (temporary), declare the building a ruin.

Four main aspects can be concluded. First of the focus is on the emotional and social value of cultural heritage. "The narrative" of a building is introduced, which focusses on the story behind a building. It is concluded that the narrative is an overarching concept that incorporates all the non-economic values. The architectural value and historic value, although seen as different values, both contribute to the emotional value of cultural heritage. This narrative value is seen as a heritage premium above the normal market price of a building.

Figure 18 Narrative (Own illustration)

Secondly, the values of cultural heritage can be distinguished into values of the heritage itself and the added value of the adaptive re-use, which can be adding new values but also extend existing values. Besides this, it is also the important to consider the shift in how people value cultural heritage. This has changed from an academic perspective to a more social perspective.

Lastly, it can be concluded that different experts work from different perspectives, but those perspectives are complementary to each other. Marketing experts (broker, Jan-Willem Andriessen and developer, Rosan Pallada) work from a demand perspective. They look at which functions are missing in the neighbourhood, and also focus on the economic feasibility of the project. Design experts (architects Wessel de Jonge and Sunna Schuijt) look from a supply perspective. The architects explore the potentials of the building, and look for a fitting re-use. The architect thus reveals the potential for the cultural heritage, while the developer points out what is required. The government has a more overall perspective. From a distant point of view, the government protects and preserves the

Figure 19 Work perspective (Own illustration)

cultural heritage buildings, by appointing them as listed monuments, giving advice about restauration and land-use plans and awarding grants.

Based on the feedback on the theoretical value division, the value division is revised (see feedback value division literature). Although, the main structure of the values division stays the same because of the positive feedback from all interviewed experts.
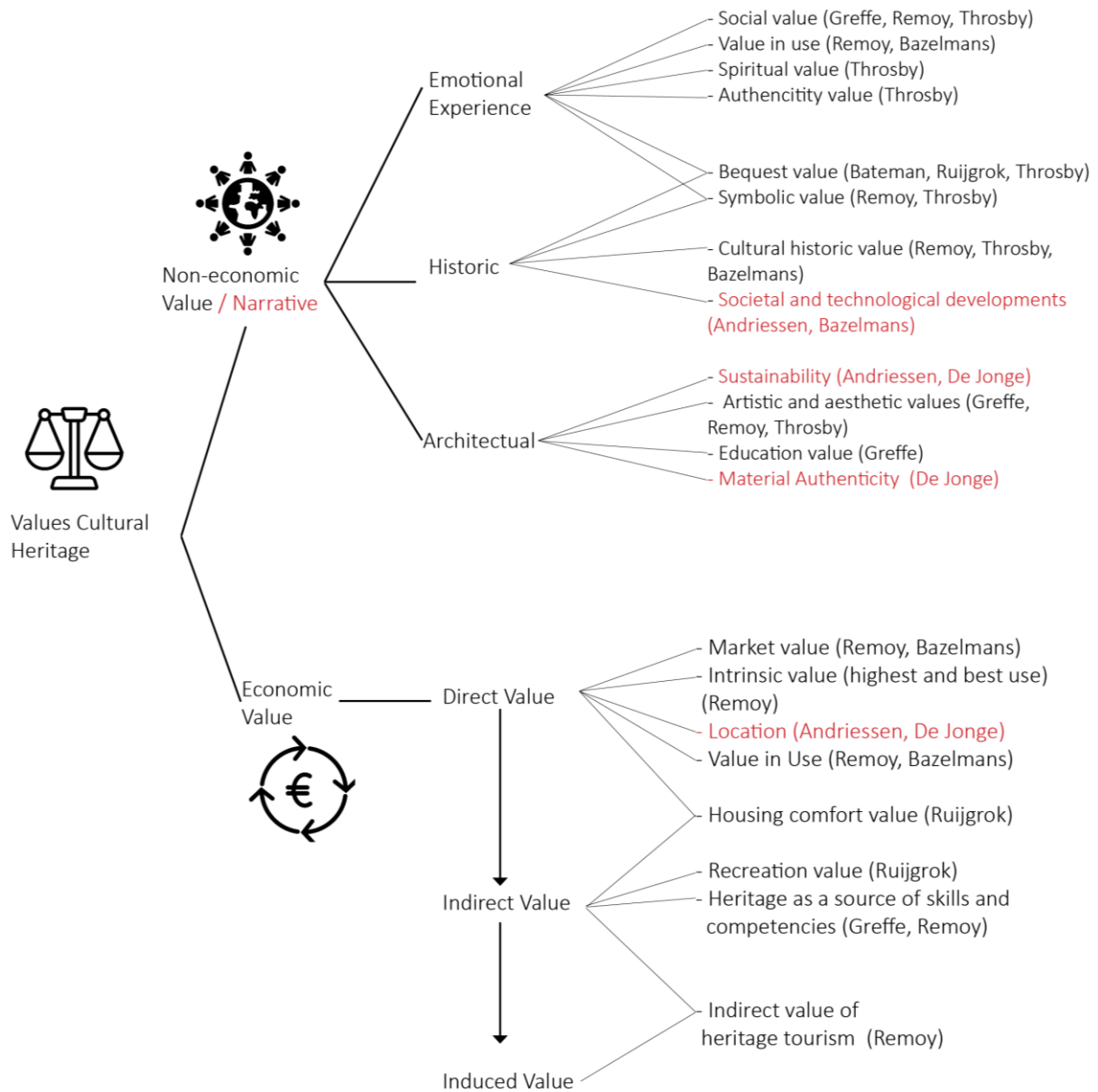
Figure 20 Revised value division (Own illustration)

4.2 Hedonic pricing model

To measure the indirect value of the transformation of cultural heritage, a hedonic pricing model will be used. The model will determine if and how much the transformed cultural heritage site influences the market value of the surrounding houses. The program IBM SPSS statistics is used to execute the hedonic pricing model. A multiple linear regression analysis is conducted. With this analysis, multiple house characteristics are used as independent variables to determine the dependent variable, the house transaction price per square meter.

The structure of this subsection is divided into several parts. First, the data collection and descriptive analysis are explained. Second, the basic model is described. This model is made based on the transaction and house characteristics from the whole of Amsterdam derived from the NVM database. Following this, the heritage models are discussed. In these models the data was linked to the Geographic Information System (GIS). The house transactions within a radius of 1500 meters were used to measure the effect of the transformed cultural heritage on these houses. To do so, the year of transformation of the case studies were also included in these models.

The Data

This data is provided by the NVM. The NVM is a Dutch branch organization of real estate agents and appraisers. The database includes detailed buying transactions of 75% of the Dutch houses that are sold. The transactions include different characteristics of properties that are sold and provide information on median transaction prices of properties in each quarter, as well as annualised data stretching back to 1985 (NVM, n.d.). The dataset obtained by the NVM contains 135.563 transactions in Amsterdam, dated from 2000 to 2017.

The data will be linked to the Geographic Information System, GIS, in order to link the data to an exact location. By linking the NVM data to GIS, the transactions can be grouped into smaller scale neighbourhoods. The neighbourhood division is made by the CBS, the Dutch statistic agency. The link with the GIS application makes it possible to determine the distance to the monument-listed building.

Filter data

Before constructing the model, the data first had to be cleaned. This means that all outliers, duplicates, unknown and unrealistic data had to be filtered. An example is shown in the picture below where the transaction price per square meter against the surface of the building is plotted in a scatterplot diagram. The left diagram shows all the data and the diagram on the right shows the filtered data. Outliers with extreme high transaction prices (more than €12.500 per m²) are excluded as well as extreme low transaction prices (less than €1000 per m²). The right diagram shows a lot of transactions which included a transaction price of 0 or -1 euro per m², these are probably unknown and are therefore also excluded. The diagram on the right also shows that houses bigger than 402m² are excluded from the dataset. This is done because after investigating some of these houses it turned out that they included the entire (care) apartment buildings and not the single houses.
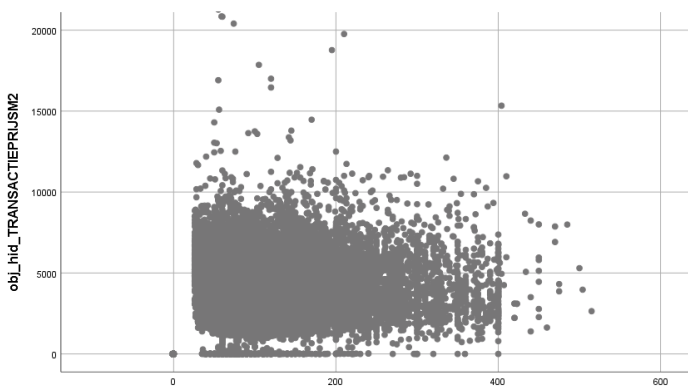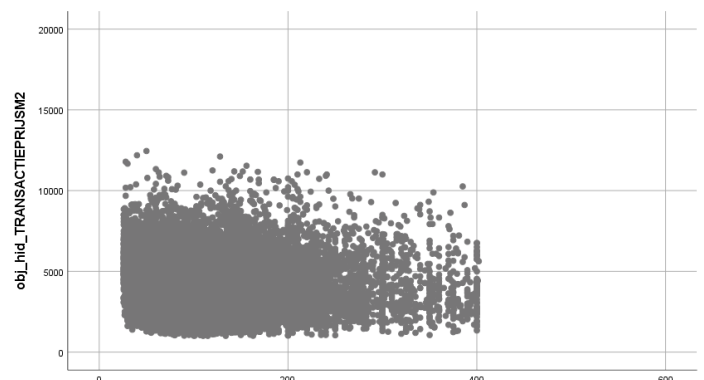

Figure 21 Outliers (Own illustration)

Figure 22 Exclusion outliers (Own illustration)

For each variable described in the list of figure 39 the frequencies are checked, to exclude extreme outliers or unknown or unrealistic numbers like 99999 or -1. To Filter the NVM database the following steps were taken:

- All duplicate transactions are filtered based on their street name, house number, house number addition and date and time of sign-up for the NVM database. This included 187 cases.
- Transaction prices m^2 below €1000,- and above €12.500,- are excluded, as shown in the example.
- The minimal house size in the Netherlands is 24m², therefore transactions below this are excluded from the database. These transactions are most likely garage boxes. Houses bigger than 402 m² are excluded for the reasons stated above.
- Transactions that are listed as garage boxes and construction land are excluded.
- Special house types like mobile homes or boathouses are excluded. They are not representative of the average house prices in a certain area.
- Houses with an unknown building period or that are built before 1500 are excluded. This transaction group was too small (37 transactions).
- Houses with more than 35 rooms are excluded, for the same reason that houses above 402m^2 are excluded, these houses are entire apartment blocks.
- House with special sale conditions as an auction are excluded. Only transactions "vrij op naam" and "kosten koper" are included.

Based on this, the dataset is reduced by 7% from 135.563 to 126.280 transactions.

Descriptive statistics

For a better overview of the content of the dataset, descriptive statistics are executed. A few of them will be explained here, to give a better insight on the key figures and variables.

In the descriptive table you can see that the average house price is almost €300.000,-. However, the standard deviation is very high, which indicates a wide range of transactions prices. The houses prices are range from €48.000 to €3.5 million. A wide range is also seen in the surface of the buildings, from 26m² to 402m². The average house surface is almost 90m².

Descriptive statistics

		Transaction Price	Transaction Price m²	Surface
N	Valid	126225	126225	126225
	Missing	0	0	0
Mean		€296.735,52	€3397,83	87,30m²
Std. Deviation		€203976,87	€1226,77	41,15m²
Minimum		€48.500	€1006	26m²
Maximum		€3.525.000	€9968	402m²

Table 8 Descriptive statistics (Own illustration)

The diagram below shows that most building are built between 1906-1930. The line chart below displays the transaction prices in relation to the construction years. The oldest houses show the highest transaction prices, which is quite logic, because these houses are probably all listed as monuments. A decrease in house prices is seen in buildings built between 1945-1980. An explanation for this could be the crisis after the second world war (Barentsen, 2015), where a lot of houses had to be built very fast and very cheaply which led to low quality housing. Newer buildings are again sold for a higher price, due to their high quality.
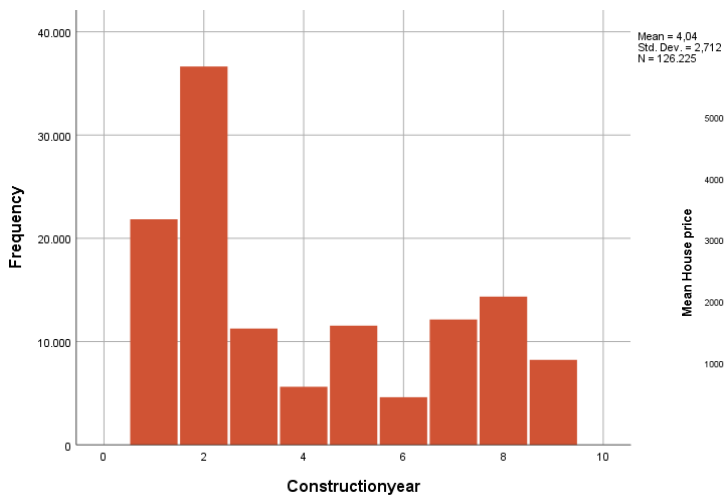
Table 9 Construction years (Own illustration)

Table 10 Construction year versus house price (Own illustration)

It maybe obvious, but it is still interesting to see the lowering amount of houses sold during the economic crisis of 2008. It is clearly seen that the number of houses sold is significantly lower between 2008-2013.

This breaking point in 2008 is also seen in the decrease in house prices in Amsterdam. However, this decrease is not as extreme as one might have expected, according to this dataset of Amsterdam. On the contrary, the rise in house price since 2015 is quite extreme. This is also the year when the most houses are sold. After 2015, again, a decrease in sold houses is seen. This is probably due to the extreme high house prices and a lack of available and affordable houses.

These figures are presented to show that time and therefore social and economic circumstances have a huge influence on the transaction price of houses.

Table 11 Year of sale (Own illustration)

Table 12 Year of sale versus house price (Own illustration)

4.3 Basic model

For the hedonic pricing model, a multiple regression model in SPSS is used. In this model multiple independent variables determine the outcome of the dependent variable. The in dependent variables functions as a cause for the effect that is displayed in the dependent variable (Field, 2009). The dependent variable in this case is the transaction price per m². The independent variables are determined before and entered after recoding and regrouping in the model. The formula used is:

$$Y_i = (b_0 + b_1 X_{i1} + b_2 X_{i2} + \ldots + b_n X_n) + \varepsilon_i$$

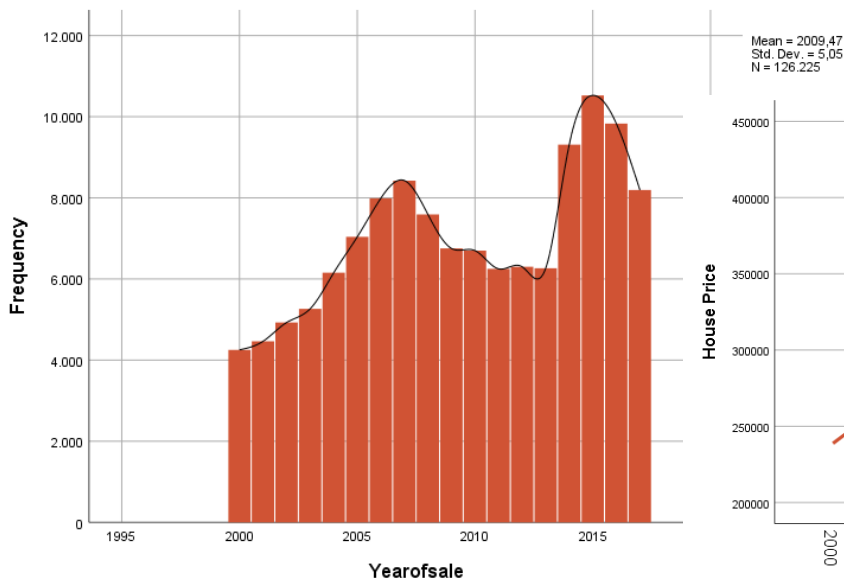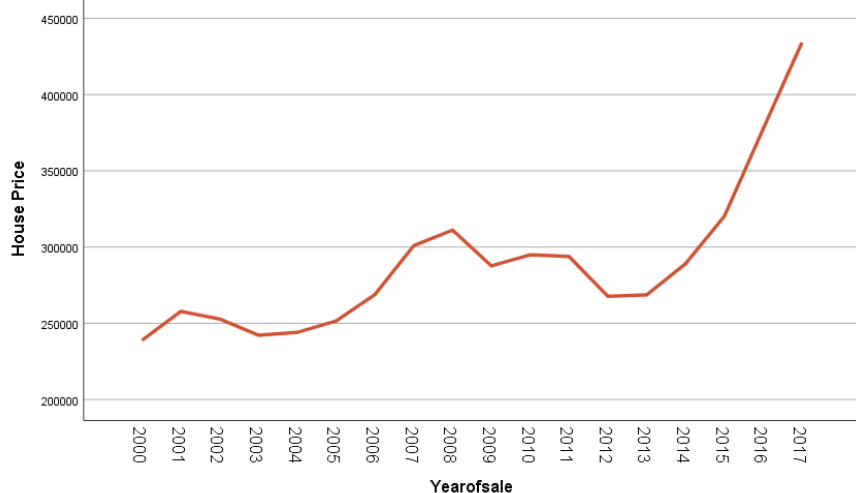Y is the dependent variable
b0 is the intercept
bn is the independent variable / the regression coefficient
Xin I is the amount of the independent variable
εi the standard error

The coefficient bn indicates how much Y increases as X_{i1} increases with one unit, taking into account (adjusted for) the influence of the other X_i variables by keeping them constant. In this way, the impact of X_{i1} on Y can be analysed independently from the other variables.

For the dependent variable a choice had to be made between the transaction price and the transaction price per m². Based on the research of Oligschläger (2015), the transaction price per square meter as dependent variable was chosen. The model with the transaction price as dependent variable might have a higher determination coefficient, but most of this will be explained by the size of the house. When using the transaction price per square meter as dependent variable, the size of the house has a relatively lower impact on the dependent variable. Subsequently, the other independent variables play a bigger role, including the distance to the case study projects. The goal of this model is not just to have a high explanatory power, but above all, the goal is to design a valid model where the effect of the transformation of cultural heritage is measured, the transaction price per square meter is therefore preferred.

For the independent variables, the variables list in figure 39 is used. However, one additional value is added which is the ground lease. Because the municipality of Amsterdam regularly makes use of ground lease, this variable was investigated. It turned out that 56% of the transaction included ground lease, which is clearly significant.

The variables provided by the NVM database are often subdivided into several categories. The frequencies analyses showed that the subdivisions sometimes are a bit too extensive, this makes the categories too small to be reliable. In order to increase the significance of each category, some of the categories are combined and recoded to make the nominal or ordinal variables of each category large enough to be sufficient. This means that they should include at least 5% of the total transactions. For each variable below, an explanation can be found stating if and how they are recoded:

Transaction price per square meter: For the independent variable, the transaction price per m², a logarithmic transformation is used, the LN. This variable is not divided into categories because it is a continuous variable.

Time of sale: The time of the transactions are categorised in quarters of each year. Due to the large dataset quarters could be used, which are more specific than the more commonly used year of sale.

House type: The house types are reduced from 22 categories to 9 categories. As explained before special types like boathouses and bungalows are excluded. The categories included are family homes, canal house, mansion, ground floor apartment, upstairs apartment, maisonette, portico apartment, gallery flats and down-and upstairs apartments.

Construction year: The construction year categories are used as prescribed by the NVM: 1500-1905, 1906-1930, 1931-1944, 1945-1959,1960-1970, 1971-1980, 1981-1990, 1991-2000, >2001. Only transactions before 1500 or unknow are removed.

Floorspace: Just as the transaction price, the floorspace logarithmically transformed with the LN. This variable is not divided into categories because it is a continuous variable and is therefore inserted as covariate in the model.

Number of rooms: Just as the transaction price and floorspace, the number of rooms is logarithmically transformed with the LN. However, due to multi-correlation this variable is inserted as a fixed factor.

Number of bedrooms: Data for the variable "number of bedrooms" is not included in the NVM dataset and therefore excluded from the variables list.

Parcel space: The frequencies of the parcel space gave a very interesting outcome. 74,8% of the transaction had zero parcel space. This can be explained due to the high number of apartments in Amsterdam. Furthermore, a lot of transactions had a parcel space bigger than $1000m^2$ which seemed quite big in Amsterdam. After some more research it turned out that this included the parcel space for an entire apartment block. At last, 535 transactions had a parcel space of 99999 or 111111 and so on. These were seen as not reliable numbers. Based on these three reasons and the fact that the possession of a garden is already incorporated in the variable garden orientation, the variable parcel space is excluded from the variables list.
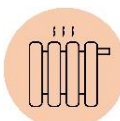
Heating: The categorising of the heating is reduced to four categories. The last category by the NVM "Air-conditioning and solar panels" are merged with the other types of heating because this category only pertained to 31 transactions. This leads to the following three categories: No heating, gas or coal heating, other types of heating.
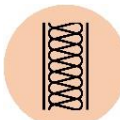
Insulation: Similarly to the heating, the insulation is divided into three categories: no insulation, one or two layers of insulation or three or more layers of insulation. Originally the layers were divided into five categories.

Parking space: The parking is grouped into three categories: no parking space (almost 90%), parking place and garage/carport.

Garden: Instead of eight categories, the garden is grouped into a garden or no garden and the orientation of the garden, where a distinction between good orientation (south, south-west and west) and bad (North, north-east, east, south-east, north-west) is made,.

Maintenance inside: The maintenance inside is reduced from ten categories to five, rating from excellent to bad.

Maintenance outside: Similarly to the maintenance inside, it is reduced from ten categories to five, rating from excellent to bad.

Monument type: In the NVM database the type of monument is not included, however it is indicated whether a house is a listed monument or not. This variable is therefore included in the model.

Ground lease: The categorisation of ground lease is used as set by the NVM: Unknown, no ground lease, ground lease.

Zip code: The transaction database of the NVM divides the transactions in 71 zip codes, which are used in the basic model to correct for neighbourhood characteristics. This variable will be replaced in the heritage model by GIS neighbourhoods.

For the precise overview of the recoding of categories and the frequency tables, see appendix 2: Recoding and frequencies data. In appendix 3, the mode (the most common category) and range of each variable is displayed. Here you can, for example, see that most houses in the database are upper floor apartments without a garden and parking space, but the houses do have a good maintenance condition, a boiler and insulation. Most households also pay for ground lease and are not listed as monuments.

It is important to note that none of the location characteristics are incorporated in the variables list. This is because the houses in the same neighbourhood (with the same zip code) will be compared. It is assumed that the houses in the same neighbourhood are influenced by the same location characteristics and this is thus equal for each house, therefore the neighbourhood characteristics are not included in the model.

Besides this neighbourhood dummy, a time dummy is also incorporated in the model. As seen in the descriptive analysis, time and therefore the social and economic developments of that time have a huge influence on the market price of the houses. The basic model is thus corrected for the location characteristics and time of sale by including the neighbourhood and time dummy.

Outcome basic model

The R square is the determination coefficient which shows how much variance the model explains, so the proportion of the variance in the dependent variable that is predictable from the independent variables. This is also referred to as the measure of model fit. When preforming a multiple linear regression the adjusted R square is more important than the "normal" R square. The adjusted R square takes into account the number of independed variables in the model. The basic model has an adjusted R square of 0,812, this shows that 81% of the variance is explained by the model. All variables included in the model show a significance of 0,000 which means they are 99% significant. At first, the significance of each variable deviated a lot from this, but by excluding outliers and regrouping the categories of each variable the significance improved clearly. Some insignificant variables are also excluded from the model.

The F column in the model shows the significance of the linear relation between the independent variable and the dependent variable. The model shows that still the strongest relation is with the surface of the houses, followed by the zip code and the time of sale. Which is quite logic and therefore already expected. The inclusion of the neighbourhood and time dummy are thus very important. Also, the maintenance inside the building, the number of rooms and the possession of a parking space show a high F rate.

Tests of Between-Subjects Effects

Dependent Variable: LN price m²

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	12674,871ᵃ	179	70,809	2990,746	,000
Intercept	24013,352	1	24013,352	1014242,406	,000
LN m²	302,218	1	302,218	12764,677	,000
Sale per quarter	3070,555	71	43,247	1826,617	,000
Zip code	3254,244	71	45,834	1935,890	,000
Maintenance inside	111,557	4	27,889	1177,945	,000
LN Number of rooms	31,538	1	31,538	1332,054	,000
Parking	43,845	2	21,923	925,933	,000
Heating	33,559	2	16,779	708,701	,000
Garden orientation	31,634	2	15,817	668,057	,000
Ground lease	29,395	2	14,697	620,769	,000
Construction year	138,736	8	17,342	732,466	,000
Monument	12,857	1	12,857	543,055	,000
Housing type	59,951	8	7,494	316,518	,000
Insulation	9,411	2	4,706	198,747	,000
Maintenance outside	8,991	4	2,248	94,941	,000
Error	2931,154	123802	,024		
Total	8081114,719	123982			
Corrected Total	15606,026	123981			

a. R Squared = ,812 (Adjusted R Squared = ,812)

Table 13 Basic model (Own illustration)

In appendix 4 the parameter estimates are shown. The parameter estimates show the B, standard error, significance and confidence interval of the categories of each variable. The B shows the values for predicting the dependent variable from the independent variable. The first one is the intercept, which is the starting point of the linear regression. The standard error indicates there is much deviation on average. The confidence interval shows the lower and upper bound of the standard error for 95%. So, the deviation from the linear regression lies for 95% between those two lines.

4.4 Heritage models

For the heritage model a connection with GIS is made. The X-and Y coordinate of each house is determined. In this way, the distance between the case studies and surrounding houses was identified up to 1500 meter. This is very relevant, because it is expected that the effect on the house prices decreases when the distance to the listed-monument increases. The GIS connection also made it possible to regroup the houses into small-scale neighbourhoods, which are determined by the CBS, Dutch Statistics Agency. The houses without an X and Y coordinate were filtered from the data set. Because the neighbourhood determination includes 380 neighbourhoods (379 degrees of freedom), the neighbourhood division is much more specific than the 72 zip codes. The zip codes in the basic model are therefore replaced by the neighbourhoods, the so called "Buurtnamen". The neighbourhood dummy corrects the location characteristics even better than in the basic model. As a result, the adjusted R-square of the model increased from 0,812 to 0,838, which means that the model now explains 84% of the variance.

Tests of Between-Subjects Effects

Dependent Variable: LN price m²

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13084,759[a]	487	26,868	1316,024	,000
Intercept	23198,646	1	23198,646	1136291,522	,000
LN m²	378,545	1	378,545	18541,476	,000
Sale per quarter	3071,876	71	43,266	2119,202	,000
LN Number of rooms	39,424	1	39,424	1931,010	,000
Maintenance inside	111,171	4	27,793	1361,319	,000
Parking	40,890	2	20,445	1001,424	,000
Heating	30,540	2	15,270	747,927	,000
Garden orientation	29,310	2	14,655	717,810	,000
Buurtnaam	3664,131	379	9,668	473,543	,000
Construction year	57,011	8	7,126	349,058	,000
Monument	6,000	1	6,000	293,868	,000
Housing type	48,708	8	6,089	298,223	,000
Insulation	10,501	2	5,250	257,163	,000
Ground lease	9,445	2	4,723	231,316	,000
Maintenance outside	7,287	4	1,822	89,233	,000
Error	2521,266	123494	,020		
Total	8081114,719	123982			
Corrected Total	15606,026	123981			

a. R Squared = ,838 (Adjusted R Squared = ,838)

Table 14 Heritage model (Own illustration)

The distance effect from the case studies to the houses is very important. Several theories about this distance effect exist. One of the most famous ones is assigned to Alonso in 1964, the bid-rent theory. This theory assumes a relation between the distance to a city centre and house prices. When the distance to a city centre increases, people have to spend more money and time on commuting, therefore they are willing to pay less for houses with a greater distance to the city centre. In this way people can maintain their level of utility. This theory assumes that the city centre holds the most employment opportunities. This theory could be applied to this research by seeing the transformation of the case study projects as city centres. A steeper relationship between the price of the houses and the distance to the case study projects is then expected, see the picture below (McDonald & McMillen, 2011; Oligschläger, 2015).
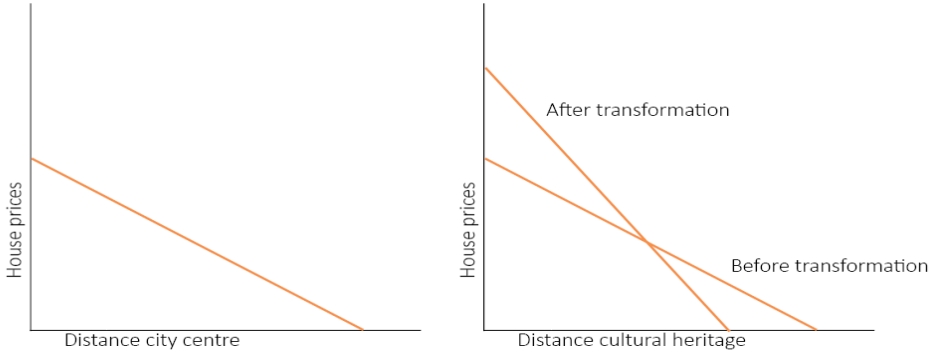
Figure 23 Distance relations CCD (Own illustration, derived from Oligschläger, 2015)

In 1980, (Li & Brown, 1980) presented a theory about the distance effect of services. They stated that the extra value services create decrease when the distance increases. However, they also stated that some negative effects, such as blockage and contamination could be accompanied by those services. They assumed that the negative effects would decrease faster that the positive effects. By subtracting the negative effects from the positive effects an optimal distance to the services can be calculated. So the closest houses to the neighbourhood do not necessary gain the most value from the services, see the figure below (Oligschläger, 2015). For this research the case study projects could be seen as services. According to this theory, the houses closest to the projects would not gain the highest value from the case study projects but a peak in value in should be seen after a certain distance.
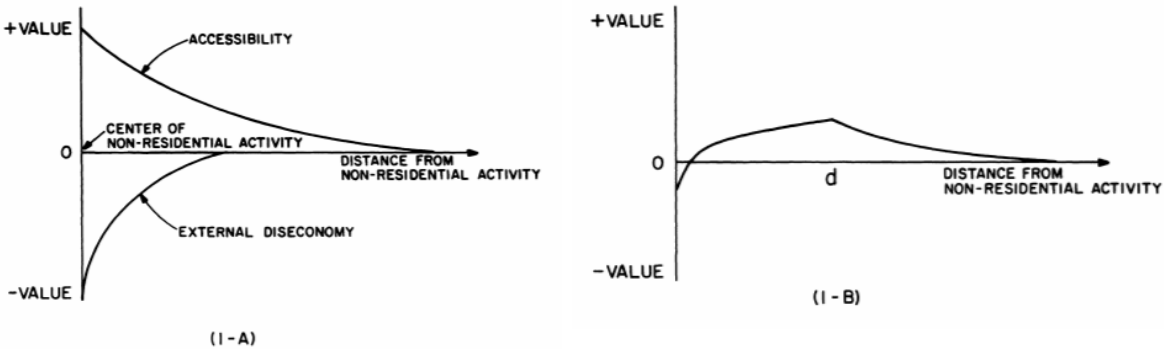
Figure 24 Distance relation services (Li & Brown, 1980)

The distance relationship between the case studies and nearby houses can be measured in several ways. There are three main methods for this. As the crow flies, this measures the distance from the case study directly to the houses. Secondly, the actual distance that people need to travel from the case study to their houses can be measured by using the road network. Lastly, sightlines can be used to measure the

distance (Oligschläger, 2015). For this research the as the crow flies method was used. This method is less complex than the other two methods and therefore easier to use. Moreover, this research focusses on measuring the indirect economic effect of the proximity of cultural heritage and not on how the distance can be best specified. However, further research could focus on the roadmaps to measure the distance. The distance decay effect assumes that there is an interaction between the distance to an object and the possible price-increase. It assumes that an increase in distance leads to a decrease in property premiums, the rising house prices. To test this distance decay effect of the case studies on the nearby properties, four models for each case study are made. For each case study two time dummies, before and after transformation, are included.

The first model is a exponential function and makes use of the natural logarithm (LN). The ln is a logarithm that uses the number e its bases. In the model the distance to each case study is transformed to a LN distance and the interaction between the LN distance and transformation year is researched. This leads to an outcome before and after transformation which can be compared. It is expected that the exponential line will decrease when the distance to the case study project increases, see the light orange line. When the prices increases when the distance increases, the slope of the line will be positive, see the dark orange line.
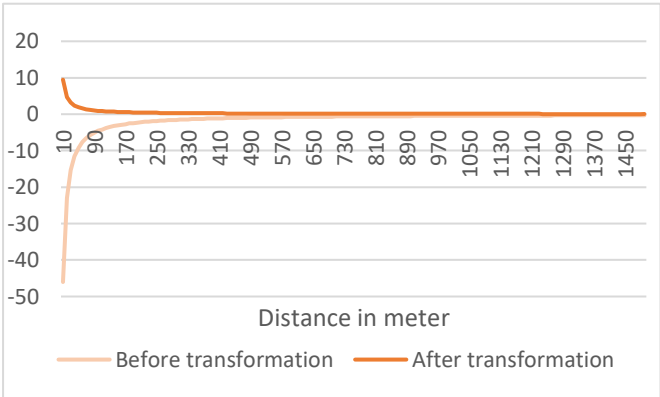
Figure 25 Exponential function (Own illustration)

The second model makes use of concentric circles. It includes a dummy variable for the distance to each case study, step by step the distance is increased by 250 meters, hence 1-250, 1-500, 1-750 etc. The interaction between the distance and the year of transformation shows in which radius the anticipated price increase is significant. The distance decay function assumes that at certain limit heritage premiums are no longer present. This model assumes a decrease in price premium when the distance increases, it assumes a hard line till where the premium reaches. It presumes that the difference between neighbourhoods are a hard boundary, which is sensible by people. The model explores at what distance the highest price premium is found.
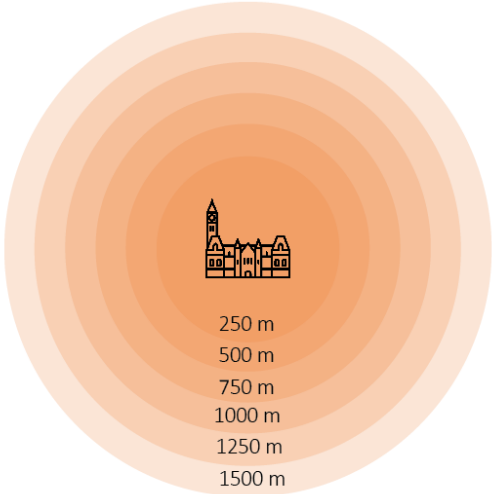
Figure 26 Concentric cirkels (Own illustration)

he third model is a polynomial regression. This is a form of regression analysis where the relationship between the independed variable, so the price per m^2, and the depended variable, in this case the distance to the case study projects, is modelled as a 3th degree polynomial in x. This is tested by the following formula $B_1A_1+B_2A_2^2+B_3A_3^3$, where B_nA_n is the distance to the case study projects. The formula is used for transactions before and after transformation, which leads to two outcomes per case study that can be compared.
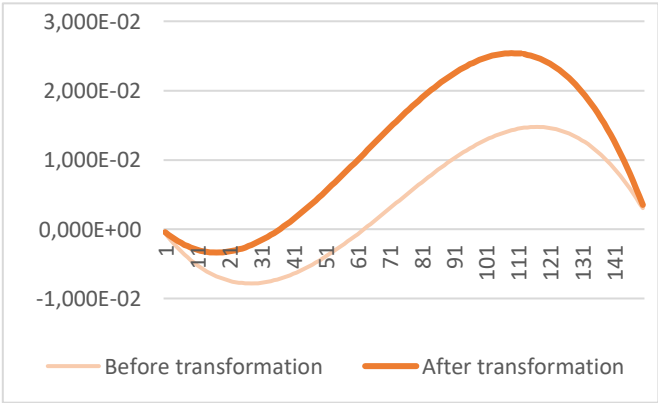
Figure 27 Polynomial function (Own illustration)

The fourth model builds up on the first three models. The model shows the total price difference before and after transformation for houses within a certain radius and for houses outside this radius. The radius is determined in the first and third models by defining the perfect distance to each of the case studies, the distance with the highest price premium. Hence, a dummy variable for the transformation year and a dummy variable for in or outside this radius are made. Then, if the transactions show the expected price increase, the price increase outside the radius is subtracted from the price increase within the radius. This corrects the model for the price increase related to the popularity of Amsterdam itself and price increase can thus be assigned to the transformation of the case studies.
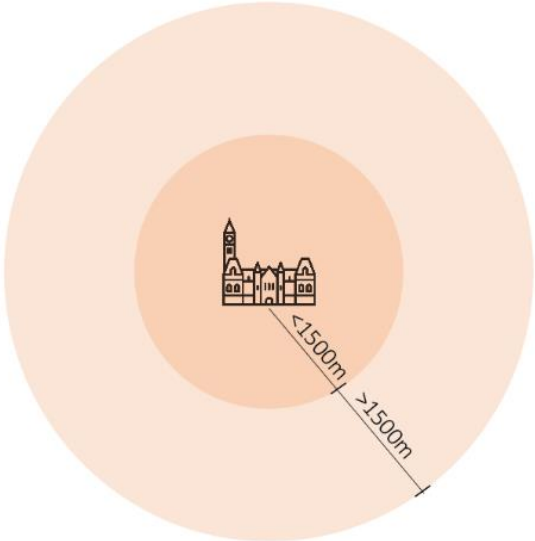
Figure 28 Heritage premium (Own illustration)

Case study

Descriptions

5. Case study descriptions

The cases are a selection of adaptive re-use projects based on the website *herbestemming.nu*. *Herbestemming.nu* is a website about the adaptive re-use of monument-listed buildings and is initiated by the Dutch Restauration fund (Restauratiefonds). The website links theory and practice according to seven knowledge files and elaborates on 245 redevelopment projects.

The cases are selected based on several criteria. The first criterium limits all cases to one city, due to the data available of the NVM. The the city of Amsterdam is chosen due to personal preferences and a personal connection with the cases in the city. This limited the cases available on the website to 47. The second criterium is that all cases are listed as national monuments, so all provincial and municipal monuments were excluded, this leads to 24 cases. To narrow down the scope of this research it is decided to focus specifically on industrial cultural heritage, hence this is the third criteria which limits the amount of cases to 11. The last criterium is again defined in the scope and focusses therefore on monument-listed buildings that are transformed into so called hubs of cultural and/or social integration. Thus, this means that the new function is accessible to the public and contributes to the cultural and/or social value of the neighbourhood. This led to the following four cases:

- De Hallen, Oud West/ De Baarsjes
- NDSM Werf, Oud Noord
- Pakhuis De Zwijger, Indische buurt/Oostelijk havengebied
- Westergasfabriek, Westerpark.
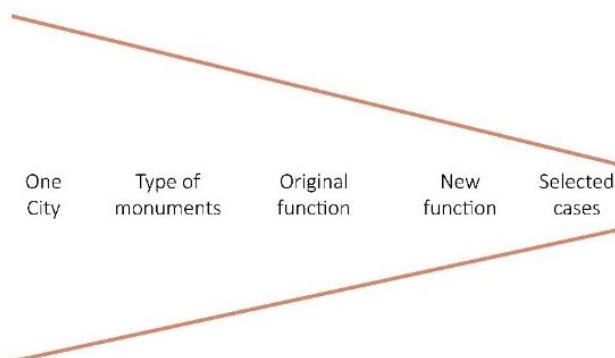
Figure 29 Case selection (Own illustration, based on Oligschlaeger, 2015)
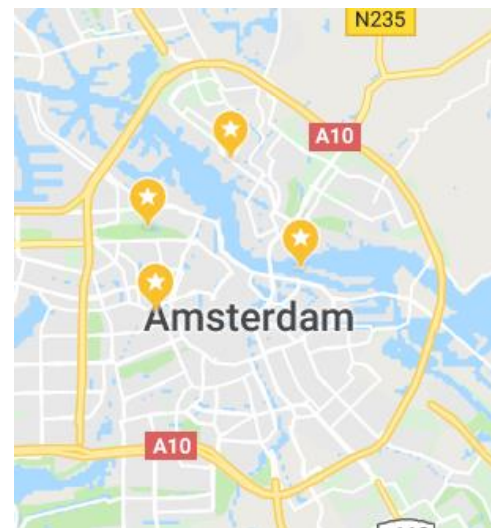
Figure 30 Case study location (Google maps, 2018)

For all cases general information is provided, a brief overview about the redevelopment process is given and the new function of the buildings is explained. In the results section the cases will be used to measure the effect of the redevelopment on the house prices in the surrounding areas.

5.1 De Hallen, Amsterdam

Figure 32 De Hallen (Herbestemming.nu, A, n.d.)

Figure 31 De Hallen (Herbestemming.nu, A, n.d.)

General information:

De Hallen was originally a tram remise located in Amsterdam west. The building consists of different halls where buses and trams were maintained and refurbished. The maintenance of the first electric trams took place here (BNA, n.d.). The building was built in three different stages, the first five halls were built between 1901 and 1903, three of these halls were extended in 1909 and the last part of the building was built in 1914. The different stages led to different architectural styles. For example the colour of elements (Kalk, 2015 ; Kloek, 2015). The building has a characteristic façade and staggered halls. The building is of general interest because of its cultural, historical and typological values and was therefore listed as national monument in 2001. The total building contains six big halls and one traversing hall with street lights (BNA, n.d.; Kalk, 2015).

Address	Tollensstraat 60 Amsterdam Netherlands
Monument type	National monument
Year of transformation	2014
Old function	Tram Remise
New function	Centre for Media, Fashion, Crafts and Culture
Year of construction	1902 -1914
Architect (original)	Dienst der Publieke Werken, gemeente Amsterdam
Architect (transformation)	André van Stigt
Owner	TROM CV
Involved parties	Standsdeel West Stichting TROM Vereniging Rond de Hallen, Stichting Standsherstel De Nijs/Structon
Organisation	Nationaal Restauratiefonds
Square meters	15.504 m²

Table 15 Case information (herbestemming.nu, A, n.d.)

Redevelopment process:

The redevelopment process of the Hallen took 20 years, therefore it is not possible to describe the entire overview in detail. Based on the Book of Kalk, 2015 the development is briefly described in four stages.

1994-2002 From nota of starting points to urban development plan

Although the Hallen were owned by the government, the building had a poor maintenance condition with a backlog of 16 million euro (Kloek, 2016). The redevelopment of the Hallen was first initiated by the municipality in 1994. Public participation was used to draw-up the first nota of starting points in 1995, where the focus was on keeping the buildings instead of demolishing them. Despite the public participation the residents did not agree with the first nota, they appealed against the building heights, the intention of building a large parking garage and partly demolishing De Hallen. In 1996 the building became officially vacant, temporary functions would obtain the building for two years until the redevelopment of the building would officially start. From that moment, several plans were made but they all failed. Mostly due to lack of support from the neighbourhood, governmental challenges and the lack of financial feasibility. The building obtained a monument status in 2001 to prevent the Hallen from

being (partly) demolished. In 2002 the city district launched an Urban programme of requirements. This programme of requirements was used by the government as a starting point for the redevelopment.

Based on the Nota of starting point and the Urban programme of requirements, the city district selected several market parties to elaborate on the redevelopment plans. In 2001 SFB Vastgoed (later on BPF Bouwinvest) was chosen to draw-up an urban plan and a land-use plan. During this time, disagreements rose between Bouwinvest, the city district and the neighbourhood. To make the plan financially feasible, a new idea emerged to combine De Hallen, the new build at the Bilderdijkkade and a new city district office into one project. However, the disagreements rose even further and the financial feasibility of the plan was still not clear. This lead to Bouwinvest to withdraw from the project in 2005.

A Dutch TV-producer and investor, Harry de Winter, came with a new initiative. He wanted to create a pop-stage and an entertainment district in De Hallen. This plan matched the programme of requirements and was positively received by the municipality. They saw the entertainment district as a cultural impulse for the neighbourhood. But again, the neighbourhood did not agree with this plan, they were afraid of nuisance during the night and they found the number of houses accompanied with this plan too big and the size too high. Despite the protest from the residents, the city district agreed with the urban plan. However, due to a new entertainment district in the south-east of Amsterdam, some investors withdrew from this project which put its realisation in danger. Eventually Harry de Winter also withdrew and the initiative came to an end.

In 2006 Burgfonds was commissioned as the new developer in collaboration with architect André van Stigt to finish the urban plan, including the new built houses and the new city district office. Burgfonds and van Stigt thought that the project was too big. In 2007 thinktanks were set-up to include public participation in the project. The residents did not feel like they had any input, so they created their own alternative plan with their neighbourhood group called "Rond De Hallen". Nevertheless, Burgfonds and the municipality proceeded with the project. In 2007 and 2008 the costs of the construction of the new city district office rose too high and the alderman responsible resigned.

The new alderman stopped the construction of the new city district office and developed houses instead, this led to a better ground yield. The land-use plan was altered for this in 2010. Due to financial troubles at Burgfonds and a lack of further investments by the city district, an extra investor was needed. Housing corporation The Key agreed to invest in the project. In return The Key was allowed to build new rental homes in the adjected area. Due to the crisis around housing corporations and the withdrawal of the central City, the Key had to withdraw from the project. This left Burgfonds again with financial troubles.

A juridical conflict arose when negotiations started with Lingotto (a real estate-developer) while officially the agreement with Burgfonds had not yet ended. Burgfonds appealed against this, but did not participate in the project anymore. With the drawback of Burgfonds, the neighbourhood was tempered and squatters took over the building in 2010. The squatters wanted to raise awareness about the failed plans of the last ten years and wanted to use De Hallen for small cultural events. Lingotto submitted a plan of action in 2010. The city district was very positive, but the residents of the neighbourhood still did not feel heard, despite the resident meetings with Lingotto. Under guidance of André van Stigt and his wife, the neighbourhood developed their own new plan. They called themselves TROM (Tram remise Development company). This plan shocked the city district and Lingotto.

A new city council was appointed in 2010 and immediately had to deal with two plans, the plan of Lingotto and the plan of TROM. An intention agreement was already signed with Lingotto and after several talks the city district also indicated their preference to the plan due to the solid financial bases. A lot of criticism followed on from this plan by several heritage organisations, triggered by the partly demolishing and replacing of the building. The city district therefore decided to investigate both plans on financial, economic and sustainability aspects.

Co Stor, Project director of the Houthavens in Amsterdam, was asked by the alderman to make an analysis on both plans and give advice. Stor became project leader in 2011 and first separated the housing project from De Hallen and tendered these. He also created a competition between Lingotto and TROM, both companies could score points based on five main criteria. TROM won the competition and was chosen to redevelop De Hallen. The commitment from renting parties and construction parties to TROM was decisive. Lingotto disagreed with this and appealed.

2011-2014 Redevelopment by TROM

In 2011 TROM got permission to extend their plans for the Hallen. The land-use plan, the land issue and the lease agreements caused some discussions. In March 2012 these subjects with a co-operation agreement between TROM and the city district were finally agreed upon. However, the next obstacle was to make the plan financially feasible, this turned out to be a lot harder than expected. Finally, they managed to have enough investors despite the withdrawal from the catering investor for hall three. In January 2013, the construction for the redevelopment of De Hallen could finally start.

New function:

De Hallen opened in April 2014, in October all companies had moved in. Each hall has its own function, and they are all connected to the "passage-hall". The hall parallel to the passage hall (hall 7) is split into multiple functions. In the end the residents got what they wanted, a contribution to the neighbourhood. De Hallen houses a cinema, hotel, food halls, restaurants, library, day-care, a craft centre with workshops, and more (see the picture on the right). Above all, De Hallen were saved from demolishing and respect was paid to the industrial heritage values of the building (Kalk, 2015 ; Kloek, 2015; Pallada, 2017).

Figure 33 New functions in De Hallen (Kalk, 2015)

Neighbourhood developments:

The figure below shows De Hallen and the developments around De Hallen within a radius of one kilometre. The developments at the time of delivery are displayed. As seen in the pictures no big developments took place, only a few projects started after 2005. A few apartments buildings are built around the same time of the transformation of De Hallen. The Kwintijn apartment block was part of the development around the Hallen, the other apartment buildings were delivered a year before.

City district Old-West is rising extremely in polarity. It is stated that De Hallen increased the neighbourhood attractiveness and boosted its economic development. The offer of houses decreased by 40% since 2014 and the term of sale was only 26 days in 2015. The target groups in this area vary from starters to the elderly. Apartments up to 60 square meters are very popular with young buyers between 25-35 years old. The maisonette houses are wanted by (starting) families up to the age of 45 and the new built apartments with elevator are mostly preferred by 55+ (Martens, 2015).

1. De Hallen,
transformation 2014
2. New built apartments
Kwintijn, 2014
3. New built apartments
and mosque (Wester-
moskee), 2013
4. Metrum Healthcare,
2011
5. New built apartments,
2013

	< 1800
	1800 - 1850
	1850 - 1900
	1900 - 1930
	1930 - 1945
	1945 - 1960
	1960 - 1975
	1975 - 1985
	1985 - 1995
	1995 - 2005
	> 2005

Figure 34 Neighbourhood De Hallen (Own illustration, derived from Waag Society, 2015)

5.2 NDSM terrein, Amsterdam

Figure 35 NDSM terrain (Koning, 2018)

Figure 36 NDSM terrain (Koning, 2018)

Figure 37 NDSM terrain (Koning, 2018)

General information:

The NSM (Nederlandsche Scheepsbouw Maatschappij) a Dutch shipbuilding company was located in Amsterdam east and was looking for a new location to expand their business. In 1915, the NSM was loacted across the IJ in Amsterdam North. In 1920, the Dutch DOK company, a shipyard, was located next to NSM. After the second world war the two companies merged and the NDSM (Nederlandse Dok en Scheepsbouw Maatschappij) was born in 1946. At that moment there was a lot of demand for the replacement of old ships and for transportation to and from the Dutch East Indies. Furthermore, the economy was growing which resulted in an increase of transportation in goods and passengers (NDSM-werf, 2017). Currently, the terrain of the NDSM is divided into four parts: east, west, harbour and north, see picture (Herbestemming, n.d.).

Address	Tt. Neveritaweg 15 Amsterdam Netherlands
Monument type	National monument
Year of transformation	2006
Old function	Shipyard
New function	City district
Year of construction	1927
Architect (original)	G.J. Langhout (oorspronkelijke bebouwing) A.G. Postma en J.D. Postma (uitbreiding
Architect (transformation)	o.a. Trude Hooykaas (Kraanspoor) Max van Aerschot (timmerwerkplaats) Basta Urbanism (Pllek)
Owner	Stadsdeel Amsterdam-Noord
Involved parties	o.a. Stichting Kinetisch Noord Mediawharf Amsterdam Waterfront Stichting Beheer NDSM-werf Oost
Organisation	NPH
Square meters	680.000 m²

Table 16 Case information (herbestemming.nu, D, n.d.)

Redevelopment process:

The NDSM was very successful and known worldwide. However, due to political games, the oil crisis and rivalry in the seventies, the NDSM got into trouble. As a result, the NDSM had to close its doors in 1984. The city district of North Amsterdam bought the 90 hectares of land. A period of vacancy and decay followed. A few attempts were made to relocate activity in the area, a few small-scale businesses settled at the NDSM-harbour, but most of it stayed empty. Artist, architects, skaters and theatre makers were tempted by the empty industrial buildings and squatted them. Slowly, a creative residence emerged. The city district North put out a tender for the re-use of the district in 1999. Some big investors submitted a plan, but the plan of the temporary users, the ex-squatters of the site, won. The municipality was positive about their plan, which included the redevelopment of the creative industry, where affordable ateliers and workspaces were combined with public and cultural activities. A feasibility study

was performed and a plan of approach was submitted to the municipality in 2002 called the Kinetisch North (Steenhuis & Meurs, 2011)& herbestemming, n.d.).

An important aspect of the redevelopment was the adaptive re-use of the shipyard to an indoor art hall. In the hall a system of steel frames created the route to multiple art ateliers. The system ensures that the original construction was unaffected. Also, the outdoor area contains a self-built restaurant and more art ateliers underneath the former ramps were transferred to the foundation of Kinetisch North. The restoration of the shipyard and ramps, but also the construction of the steel system and infrastructure cost a lot of money, mostly invested by the central city and city district North. The requirements of the refurbishment of the yard were often only determined during the construction. The safety requirements turned out to be stricter than expected and also the appointment of the monument status increased the requirements of the construction and therefore the expenses. The shipyard indoor hall was delivered in 2006. The popularity of the shipyard increased and the special ateliers were rented and due to its special construction under high demand. The NDSM-terrain broke records for biggest creative residence in Europe in terms of square meters but also in number of tenants (Steenhuis & Meurs, 2011).

In the first quarter of 2008 a development vison was prepared by the municipality to further expand the area. The starting points of this vision were to protect the shipyard elements and to make a mix of housing, working and leisure buildings. The city district North subsequently drafted an environmental effect report (MER). In 2012, an investment decision about the NDSM-terrain was made. Due to planning restrictions and the impact of market developments, the area is being developed in phases. The municipality expects to develop the NDSM-yard for at least the upcoming ten years (GemeenteAmsterdam, n.d. ; NDSM-werf, 2017 ; Steenhuis & Meurs, 2011).

New function:

The NDSM-terrain is transformed to one of the largest creative residence in Europe. The pronounced, open and spatial character makes the yard attractive for creative experiments, innovative ambitions and entrepreneurship. In 2018, the largest Street Art museum in the world was located in the Lasloods on the wharf. Companies such as Hema and Red Bull have also found a unique home base in NDSM. The industrial heritage in combination with new creative activities creates an interesting dynamic.

Where there are many (restored) monuments on the east and lots events happening, there is more room for urban development on the west, which focusses more on housing (NDSM,n.d.).

Figure 38 Plans NDSM-werf (Amsterdam, n.d.)
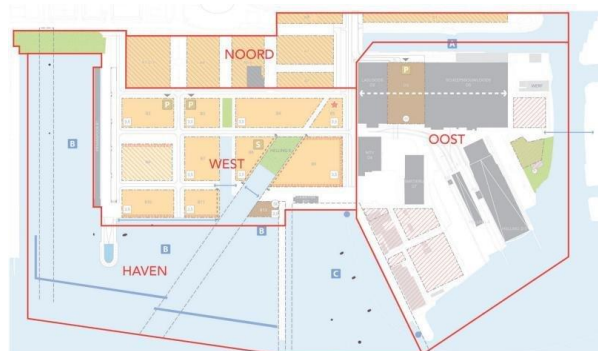
Figure 39 NDSM-werf (herbestemming.nu, D, n.d.)

Neighbourhood developments:

The figure below shows NDSM terrain and the developments around NDSM terrain within a radius of one kilometre. The developments at the time of delivery are displayed, as seen in the figure a lot of developments took place around the IJ in the last twenty years. For this research the transformation of the shipyard indoor hall into the "Art city" is chosen as the main year of transformation, which was in

2006. The NDSM terrain is still under development, just as some areas close by, for example the Houthavens and Buiksloot. This is shown in the newly built houses in 2005 and 2006, but also more recently in 2014 (see picture below).

At the moment, the North of Amsterdam is increasing in popularity, which is seen in the number of newly built projects and the rising house prices. The increasing accessibility of the North also contributes to this. The goal of the municipality is to develop the NDSM-terrain as a full-fledge city district. The investment decision contains two land use plans, one for NDSM west and one for NDSM east. In the NDSM West the focus is on housing, working and services. The development is in phases, at this moment five parts of the nine indicated parts are realised, see figure 40. The east side focuses on the pioneers, which is characterised by events, catering industry and creative companies (GemeenteAmsterdam, n.d. ; NDSM-werf, 2017 ; Steenhuis & Meurs, 2011)
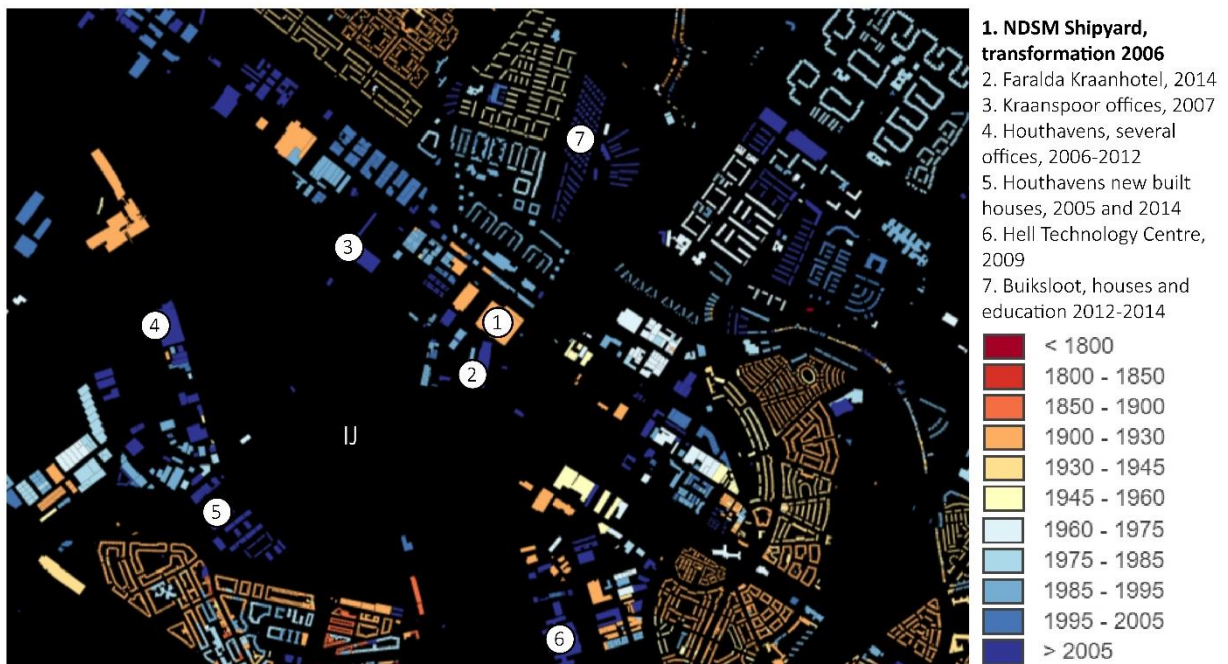
Figure 40 Neighbourhood NDSM terrain (Own illustration, derived from Waag Society, 2015)

5.3 Pakhuis de Zwijger, Amsterdam

Figure 41 Pakhuis de Zwijger (Koning, 2018)

Figure 43 Pakhuis de Zwijger (Koning, 2018)

Figure 42 Pakhuis de Zwijger (Koning, 2018)

General information:

The construction of Pakhuis de Zwijger was in 1934 commissioned by the harbour company Blauwhoed en veem for the cooling of perishable products. The warehouse was designed by Jan de Bie Leubeling Tjeenk and was one of the most modern warehouses of that time. The building is 28 by 33 square meter and has six floors that are freely dividable through the so called, mushroom colums and reinforced concrete. The south and east side of the building have a canting of four meters. The façade of the building is covered with bricks to prevent the reinforceerd concrete from rust and are not bearing. The north side of the building, situated towards the IJ, contains a serie of loadingdoors. The south side contains two series of loading doors and small square windows. The east façade is totally closed and is coverd with panels with names of the places where the company had other offices (Groenendijk, 2007) .

Address	Oostelijke Handelskade 21 Amsterdam Netherlands
Monument type	National monument
Year of transformation	2006
Old function	Ware house
New function	Multi-company building Cultural function Event location catering industry
Year of construction	1934
Architect (original)	Jan de Bie Leuveling Tjeenk (vormgeving) ir. K. Bakker (constructie)
Architect (transformation)	Architectenbureau Van Stigt, André van Stigt
Owner	Stadsherstel Amsterdam
Involved parties	Stadsherstel, Amsterdam Cultuurfabriek Salto TV Waag Society Amsterdams Fonds voor de Kunst M.J. de Nijs en Zn Van Rossum, Amsterdam
Organisation	BNA Onderzoek
Square meters	15504m²

Table 17 Case information (herbestemming.nu, C, n.d.)

Redevelopment process:

1960-2001 Demolishing of Pakhuis De Zwijger

In 1960 the east harbour area was no longer used subsequently squatters and artist became the new residents. This was also the case for Pakhuis de Zwijger. For example, rock artist Herman Brood used the warehouse as a rehearsal studio. When the warehouse "Amerika" was demolished in the same area the users of this building started foundation the Zwijger and continued their activities in the Pakhuis de Zwijger. At the beginning of the nineties, the municipality made a new urban plan for the harbour with a lot of houses. Some of the old warehouses, including Pakhuis de Zwijger, were saved in this plan and were assigned with a cultural function in 1997. The re-use of the building was not easy. Developer Amvest tried to redevelop the building but failed to do it due to financial issues. A disturbing factor was the new route to Javaeiland right across the building. By making the route through the building, the

ground level was partly removed. This put the construction to a test. Cracks emerged in the building and the municipality decided to demolish the building in 2000. This was prevented by Cuypersgenootschap and the activities of Stichting De Zwijger and Stadsherstel Amsterdam. They made sure that the building got a monument status to protect it from demolishing, but the building was not saved yet (Steenhuis & Meurs, 2011; Steinmetz, 2005; Van Stigt, n.d.).

In the beginning of 2002, the municipality gave Stichting the Zwijger the assignment to perform a feasibility study. Foundation De Zwijger in co-operation with social housing corporation Het Oosten tried to find a feasible function mix for the building. However this did not succeed, the rent prices would be too high. Ultimately the foundation came in contact with consultant Dieric Elders, architect André van Stigt and Stadsherstel Amsterdam NV (city restauration). After an intensive development period, the municipality of Amsterdam provided 6 million euros for the redevelopment of Pakhuis de Zwijger to a place for creative industry. The innovative view of architect van Stigt and the austere approach of Stadsherstel made the redevelopment possible. In 2004, a feasibility plan was delivered and approved by the municipality of Amsterdam (Architecten bureau van Stigt, n.d.).

The role of the users was crucial, they were involved in an early stage of the process and influenced the use and design of the spaces. The creative sector was satisfied with the outcome of the design. The design was focussed on places for meetings and interchange, places where people could work and have leisure at the same time. Good functioning spaces and design that did justice to the monument created a cost-effective outcome. The construction remained visible through the entire building. The biggest challenge was to restore the concrete frame and recreate the structural balance disturbed by the construction of the main road underneath the building. This had to be done without damaging the outdoor appearance of the monument. The biggest feature was to centre the main theatre over three floors high above the road. In this way, the hall putted less pressure on the existing structure and several heavy floor plates good be removed (Steenhuis & Meurs, 2011; Steinmetz, 2005; Van Stigt, n.d.).

New function:

Pakhuis De Zwijger is a new unique cultural organisation and is nowadays an independent platform for and by the city of Amsterdam and its inhabitants. The building contains one big hall with a capacity of 350 people, two smaller halls for 150 and 100 persons with dressing rooms. Furthermore, the building contains a restaurant, café, foyers and 5000 square meters of workspaces and studios. 25% of the offices space is rented with a discount to creative development companies. The building has two entrees and routes, one for public and one for the offices users. At the restaurant-café, on the first floor and on the second floor the facades are replaced with glass walls.

The building became very successful, due to its unique location, special spaces and big hall with great acoustics. It is a meeting point of modern culture (Steenhuis & Meurs, 2011; Steinmetz, 2005; Van Stigt, n.d.).

Figure 44 Section Pakhuis de Zwijger (Van Stigt, n.d.)

Neighbourhood developments:

The figure below shows Pakhuis De Zwijger in the middle and the developments around Pakhuis De Zwijger within a radius of one kilometre. The developments at the time of delivery are displayed, as seen in the figure, a lot of developments took place at the Pietheinkade where Pakhuis De Zwijger is located. Pakhuis De Zwijger was reopened in 2006, around the same time when the Music building, at the start of the Pietheinkade, and several apartments blocks were delivered.

The city district, eastern port area, is a mixed area of houses that are rented or sold. The area is close to the central station of Amsterdam and the Passenger terminal, next to the Music building, attracts 300.00 passengers to the area yearly (GemeenteAmsterdam, 2017). The whole area is growing, which is shown in the increasing number of houses but also in the construction of a primary school in the area in 2007. It is also important to note the opening of the Public library in 2007, which attracts a lot of (high school) students to the area. The library also functions as a meeting place.

Figure 45 Neighbourhood Pakhuis De Zwijger (Own illustration, derived from Waag Society, 2015)

5.4 Westergasfabriek, Amsterdam

Figure 47 Westergasfabriek (Koning, 2018)

Figure 46 Westergasfabriek (Koning, 2018)

General information:

The Imperial Continental Gas Association constructed two coal-gas factories. The Oostergasfabriek and the Westergasfabriek. The Westergasfabriek was built in 1885 and was strategically located between water, rails and access roads. The gas produced in the factory was originally used to light the city. The Westergasfabriek was the largest coal-gas factory in the Netherlands and covered four hectares of land, which included multiple gas-tanks, coal-depots, treatment-plants, a water-tower and office buildings.

The director, Julius Pazzai (1841-1888), took care of the technical planning of the manufacturing process and the terrain by himself. The Amsterdam architect Isaac Gosschalk (1838-1907) was appointed for the design of the buildings. Gosschalk worked in a picturesque style that he himself had initiated: the "Hollandsche Neorenaissance" (Westergasfabriek, n.d.).

Address	Polonceaukade 27 Amsterdam Netherlands
Monument type	National monument
Year of transformation	2003
Old function	Factory Gashouder
New function	Cultural function
Year of construction	1885
Architect (original)	Isaac Gosschalk
Architect (transformation)	o.a. Architectenbureau Braaksma & Roos, Kathryn Gustafson (parkontwerp)
Owner	Duncan Stutterheim since 2018, before MAB and Meyer-Bergman Investments BV
Involved parties	o.a. Bouwfonds MAB Development CVG BV Bureau Monumentenzorg Amsterdam Commissie Welstand en Monumenten RE-USE (Evert Verhagen) Renovatiespecialist Jurriëns Hylkema Erfgoed
Organisation	NPH
Square meters	130.000 m²

Table 18 Case information (herbestemming.nu, B, n.d.)

Redevelopment process:

The redevelopment process of the Westergasfabriek took 20 years, therefore it is not possible to describe the entire overview in detail. Based on the Book of (Koekebakker, 2003) the development is briefly described in three stages.

1967-1992

The production of coal gas was taken over by the Hoogovens in IJmuiden in the sixties. . From this moment, the Westergasfabriek only produced water-gas. In 1967 the factory officially stopped producing gas. After the factory became vacant, the municipal energy company used the buildings for storage of equipment and workspaces. The special architectural value of the buildings was only later acknowledged after part of the buildings had already been demolished. Subsequently, the buildings got a protected monument status. The municipality gave the Westergasfabriek a recreational function in the new land-use plan of 1981. A design for the Westerpark was made in 1985, but the polluted ground caused a big obstacle. After research, the only feasible solution was to isolate the ground with quay walls and cover the ground with asphalt. It was too expensive to clean the entire soil. In this way, the

buildings could remain. This led to protest from the neighbourhood, they came with an alternative plan where the qual walls were also used, but instead of the asphalt a new layer of ground would be added. This was called the insulation-plus alternative, which made it possible to proceed with the Westerpark design.

Another delaying factor was the transfer of the Westergasfabriek from the central municipality to the city district in 1990. With this transfer, the sector head of the city districts, Evert Verhagen, came in contact with the Westergasfabriek, and soon became the fulltime project manager of the Westergasfabriek. Landscape architect Hans Warnau was chosen in 1991 to make a design for the Westerpark with the insulation-plus alternative. In 1991 the city district called for ideas to redevelop the Westergasfabriek. They received 334 submissions from individuals and organisations, they all had to be judged by a commission under supervision of architect Herman Zeinstra. Based on these ideas in 1992 the city district performed four feasibility studies. Two of these ideas were preferred, a music centre for modern music and Rhizome-scenario, where the buildings would be devoted to the neighbourhood residents and organisations. The last idea had the preference of the neighbourhood, but the city chose for the first idea based on its financial feasibility.

1993-2000 Temporary solutions

In 1993, the energy company left the buildings and they became vacant. Project leader Liesbeth Jansen was commissioned to fill the Westergasfabriek for one year with temporary solutions, while the buildings would be refurbished. Instead of the predicted half a year of preparation time, Jansen only had two weeks. There was no time to create a full policy plan, nevertheless Jansen made sure that a selection of tenants was made and that not anyone could just enter. All tenants had to contribute to a surprising cultural life. A lot of tenants signed up themselves, but Jansen found it important to create a restaurant/café where people could meet. Koen Vollears, who was specialised in temporary catering, was approached to fulfil this role. Vollears set up Kantine West, which is one of the few tenants who ended up staying in at the Westergasfabriek permanently. Six months later, the place was open to the public and a performance of the opera Antigone showed the unknown value and endless possibilities of the old Gashouder. The temporary solutions were extended by one year, not knowing that this would become several more. The permanent tenants ensured continuity, while the short stay tenants created variety and surprises. The list of events that took place in the Westergasfabriek since 1993 is endless, fashion shows, operas, circus, exhibition, company parties, festivals and many more. In 1995, the agreement with the Modern music festival stopped unexpectedly, because the municipality offered them another space near central station. The city district was very displeased by this decision, however, the temporary concept was working so well that they decided to proceed with this. Some people were even relieved. A new alderman, Edgar Peer, was appointed to project leader. Under his supervision 3500 square meters of newbuilt houses were constructed. He also stated that the refurbishment and exploitation of the buildings of the Westergasfabriek had to be done by a private party and not by the city district itself.

A development plan was set-up in 1996 when the concept of the temporary functions was transferred to permanent functions, the park would be renewed and the extra ground for the soil cleaning was not necessary anymore, therefore the buildings could stay in use. The temporary solutions lasted for seven years.

1996- 2003 MAB

Based on the recommendations of Peer, the city district initiated discussions with private parties for the development and restoration of the Westergasfabriek. Based on the development plan of 1996 the Westergasfabriek had to have a cultural function. Twelve market parties started the negotiations, but soon only three were left. Most of the parties retreated because they thought that the possibility for new-built constructions was insufficient. After the negotiations, the collaboration with MAB, a private developer, was preferred. MAB wanted to emphasise their image as visionary developer with an eye for special urban context. They saw the Westergasfabriek as an opportunity to gain experience with new

types of leisure. Also, the personal interest of owner Ton Meijer for architecture and art played a role in the decision of MAB to take the risk of developing this project. In 1997, MAB signed an intention agreement, nevertheless it still took two and a half years for the transfer to be official. This showed the complexity of the project.

In 1999, MAB and the city agreed upon the terms of collaboration, this was secured by three documents: A collaboration agreement, a ground lease contract and a revised zoning plan. The city district was responsible for the construction of the park and MAB was responsible for the reconstruction of the buildings and the construction of 3500m² new built. MAB set up a management and operating company called Westergasfabriek B.V. and appointed Liesbeth Jansen as director. Due to a lot of subsidies it seemed that MAB could get the buildings almost for free, however they were determined to invest millions in the restauration of the buildings. In 2000, a new land-use plan was designed so the municipality could keep a grip on the functions of the buildings, even if eventually MAB would have sold them. After this the "deed of establishment of leasehold" could be signed and the transmission of the buildings was official in 2000.

The positive vibes were spread and everyone thought that most of the buildings could stay in use during the soil cleaning and the temporary functions would get a permanent status. However, the first setbacks occurred. At the start of the soil cleaning, the ground turned out to be much more polluted than former research indicated, especially underneath some buildings. The cleaning and restoration of the buildings became much more expense and the use of the buildings impossible. Another setback was the appeal of the association of friends of the Westergasfabriek, they claimed that an environmental permit was needed. This delayed the project as well, because a new land-use plan had to be set up again.

Due to the setback MAB came into some financial problems because they could not find an investor. Luckily a loan from the Restauration fonds helped them in 2003. In 2003, the mix of cultural functions and the creation of a community could finally restart. However, due to the high costs and the exploitation by a market party the rent prices had increased and not many start-ups could afford to move into the Westergasfabriek. Nevertheless, the project became extremely successful and the mix of functions still exists.

New function:

The Westergasfabriek is nowadays described as "A place in the city where people meet, work and relax. You will find green, a place to work, space for large and small events and various catering, cinema, theatre and exhibition venues in the beautiful city park and historic factory buildings." (Westerpark, n.d.). The cultural vision of the city district and MAB stayed, the place offers space to creative, cultural and innovative entrepreneurs. Still lots of events take place and the popularity of the Westergasfabriek increased enormously. The Westergasfabriek is now often mentioned as one of the most famous examples of adaptive re-use.

Figure 48 Map Westerpark (Koekebakker, 2003)

Neighbourhood developments:

The figure below shows the Westergasfabriek, located in the Westerpark and the developments around the Westerpark within a radius of one kilometre. The developments at the time of delivery are displayed. Around the Westergasfabriek lots of houses were already present before the reopening of the Westergasfabriek. However, it can be seen that the Westerpark and Westergasfabriek are growing in popularity for its residents but also for tourists {GemeenteAmsterdam, 2018 #2975}. The Westerpark is famous as a meeting place but also because of the many events that take place at the park, from fashion weeks to wine festivals and techno parties.

Near the Westerpark some offices and industry settled in at the same time as the transformation of the Westergasfabriek. Next to the Westerpark a park with garden sheds is can be found, and on the westside of this park the station Sloterdijk is located. Sloterdijk is an important transportation point but also has a growing office/work district. As mentioned before new built houses are still underdevelopment at, for example, the Houthavens. In the upcoming years more developments around the Westerpark will take place, for example the former INGbuildings at the Haarlemmerweg will be transformed into housing.
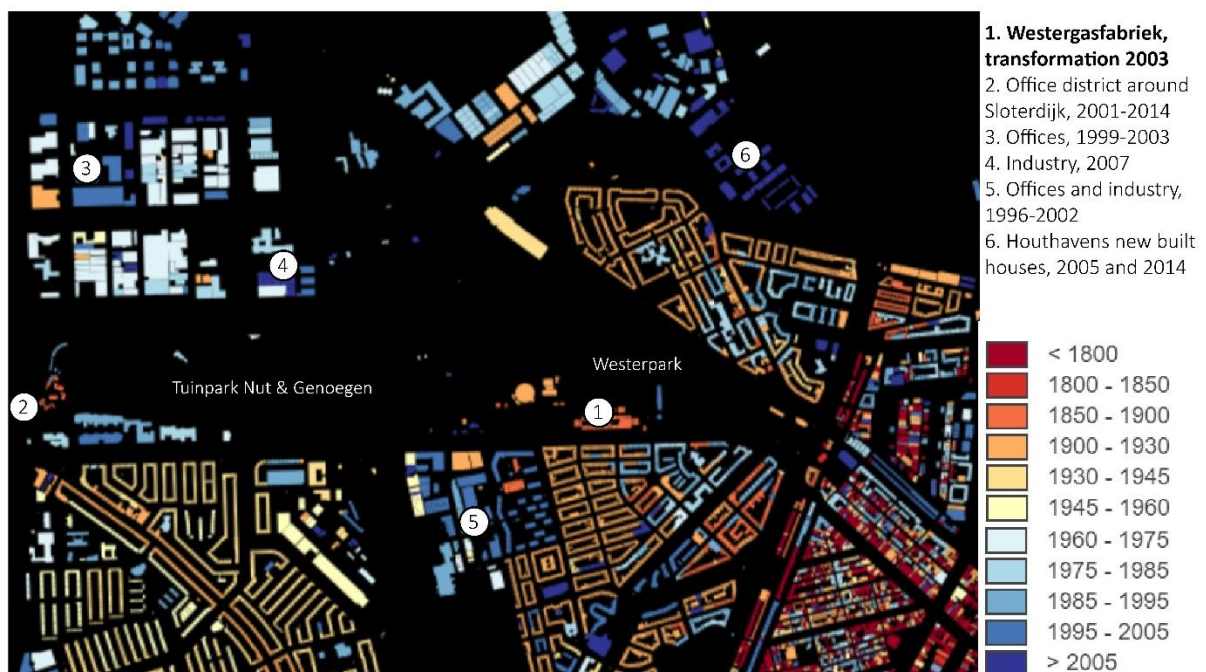
Figure 49 Neighbourhood Westergasfabriek (Own illustration, derived from Waag Society, 2015)

Results

6. Results

6.1 Results De Hallen

The transformation of the Hallen took over 15 years. The project was in delivered in April 2014, this date is therefore used as the time dummy before and after transformation.

Model 1:

The first model shows an exponential relationship between the distance to De Hallen and the increase or decrease in price per square meter (LN) of the nearby properties. The outcome of this model is significant, both before and after transformation, a significance of 99% was found. The graphic on the right shows that before the transformation, the house prices close to the De Hallen were substantial lower than house prices further away. After transformation, the model shows that an increase in distance leads to a decrease in price premium, which matches the hypothesis defined before.

Model 2:

The second model explores the price premium around De Hallen with the use of concentric circles. What is noticeable, is that for the houses closest to De Hallen, the smallest increase (but still 15,4%) is seen. Between 1 and 500 meters distance the price increase is at its highest point of 15.9%. Further distances show a slight decrease in price premium of -0.1% per 500 meters, which matches the expected outcome. None of the circles show a significance of 99%, however all show a significance of at least 94%, which is still a valid amount. The lower significance can be explained by the smaller amount of transactions within the radius of 1500 meters, compared to the rest of Amsterdam.

Model 3:

The third model, the polynomial function, shows the decrease or increase of the (LN) price per square meter when the distance increases. Before and after transformation the same pattern is observed as seen in the graph on the right. The graph shows an increase in price after transformation at any distance. Similarly to the second model, the peak of the heritage premium is not found directly next to cases study but after a certain distance. According to this model the largest increase in price between before and after transformation is at 880 meters. However, it must be noted that this model has a low significance, especially before the first turning point, so the decrease in the beginning of the graph can

Figure 50 Exponential function De Hallen (Own illustration)

Significance before	99%
Significance after	99%
Adjusted Rsquared	0,840

Figure 51 Concentric circles De Hallen (Own illustration)
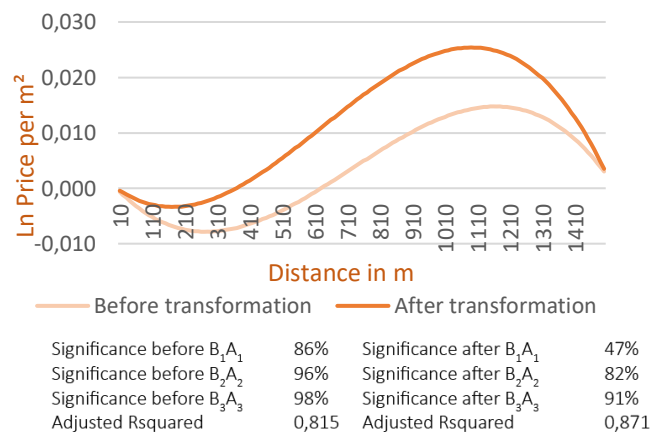
Figure 52 Polynomial function De Hallen (Own illustration)

Significance before B_1A_1	86%	Significance after B_1A_1	47%
Significance before B_2A_2	96%	Significance after B_2A_2	82%
Significance before B_3A_3	98%	Significance after B_3A_3	91%
Adjusted Rsquared	0,815	Adjusted Rsquared	0,871

not be seen as a hard fact. On the other side, the determination coefficient increases considerably after transformation, which means that the variety the model explains is increasing. This suggest that the proximity of the De Hallen does have an effect on the house prices, as the model demonstrates a higher variety then before.

Model 4:

The last model shows the overall highest heritage premium that is found based on the third model. In this model the highest increase compared to before and after transformation is found at 880 meters, which is assumed to be the highest peak of the heritage premium. Prices in this area increased by 15.8% after the transformation of De Hallen. Prices outside this radius, so all other houses in Amsterdam, increased during that time period by 7.8%. This means that the transformation of De Hallen added an extra 8.0% price increase to the surrounding houses in the neighbourhood. The significance of this model is 95% which is quite high but not entirely guaranteed. This can again be explained by the limited number of houses within a radius of 880 m.
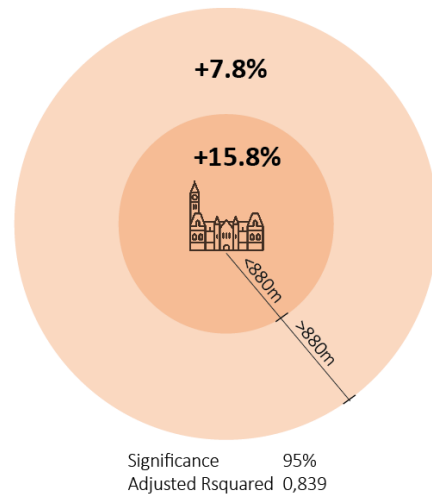
Figure 53 Heritage premium De Hallen (Own illustration)

Interpretation:

Thus, by looking at those four models, it can be concluded that De Hallen did indeed have a positive effect on the prices of the surrounding houses. The first model shows that especially in the first 200 meters the price-difference before and after transformation is huge. Before transformation the model shows that the houses have a lower price with a radius of 200 meters than the average at this moment, while after transformation the model shows that the houses have a higher price than average. This can be explained by the years of decay of the building before De Hallen got a new function, see figure 38. An empty and neglected building can have negative impact on the neighbourhood. After transformation, De Hallen turned into a place of attraction instead of a place of poverty.

A pattern is observed where the heritage premium is not at its highest peak directly next to De Hallen, but between 500 and 880 meters. An explanation for this is the potential nuisance that is caused by the activities in De Hallen. The process description mentioned that the neighbourhood residents strictly appealed against a late closing time. Although, De Hallen closes at one o'clock, the popularity of De Hallen might causes some nuisance during the day and especially at closing time.

The concentric circles in the second model assume a hard-line per neighbourhood. So that after a certain amount of distance the heritage premium is not sensible anymore. However, this drop in heritage premium is not found. This can be explained by other developments in the area that might also have contributed to this. However, as can be seen in the described developments in the case study description, no big developments took place around the same time as the transformation of De Hallen. It therefore seems more likely that this decrease is not due to the site of De Hallen. As seen in figure 35 the Vondelpark and canal belt in Amsterdam are both within a radius of one kilometre of De Hallen. When subtracting the price increase form the whole of Amsterdam from the heritage premium an 8.0% price increase is found which can most likely be allocated to the adaptive-reuse of De Hallen.

6.2 Results NDSM site

For the NDSM site it was harder to pinpoint one exact moment in time due to the large surface of the project (not just one building) and due to the fact that the redevelopment took place in different phases. The year 2006, when the former shipyard reopened as an "Art city" is chosen. The difficulty in this case study was the lack of houses close to the case study. It was found that there were no houses within a radius of 500 meter in the transaction database.

Model 1:

The first model shows an exponential relationship between the distance to the NDSM site and the increase or decrease in price per square meter (LN) of the nearby properties. The graphs before and after transformation display a decrease in price by an increase in distance. The price decrease was bigger before transformation than after, it is unclear what the cause is. The decrease is shown nearby the NDSM site, mostly within the first 300 meters. It is worth noting that in the next model, no houses where found within a radius of 500 meters. While in this model both graphs show a high significance of 95% and 99%. This is contradicting.

Before transformation	
After transformation	
Significance before	95%
Significance after	99%
Adjusted Rsquared	0,838
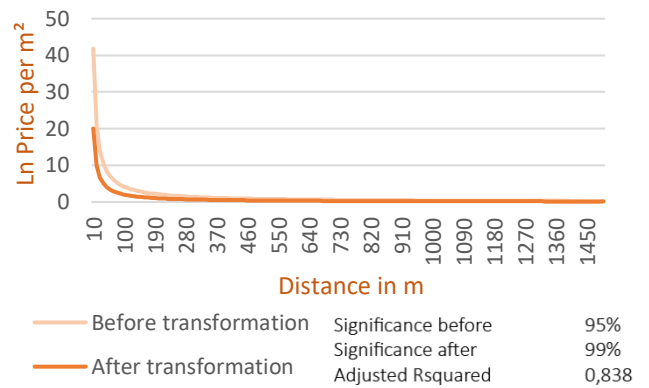
Figure 54 Exponential function NDSM terrain (Own illustration)

Model 2:

The concentric circles show a huge price increase. However, this is inherent to the price increase in Amsterdam from 2006, the year of transformation, onwards. The lack of transactions within a radius of 500 meter is shown. After that, the prices do increase slightly until 1250 meters. The last concentric circle, the 1500-meter radius, shows a slight decrease in price premium. This matched the hypothesis defined before that the heritage premium only goes until a certain distance. However, the decrease is minimal and does not show a hard line between neighbourhoods. All concentric circles show a high significance of 99% and the adjusted Rsquared remains constant.
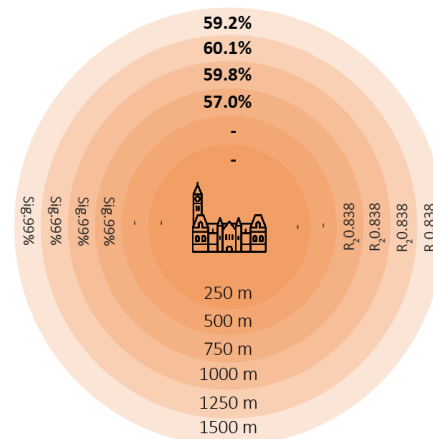
Figure 55 Concentric circles NDSM terrain (Own illustration)

Model 3:

The polynomial function shows two very different outcomes before and after transformation. The line before transformation differs enormously from what is expected. When looking at the significance of this graphs, it is seen that the graph before transformation is only 20% significant. Therefore, the graph before transformation is ignored. The graph after transformation shows the same pattern as De Hallen, first a decrease and after a certain point an increase in price premium. However, it cannot be seen if this is an increase or decrease compared to before transformation. Therefore, the biggest price increase

Significance before B_1A_1	20%	Significance after B_1A_1	88%
Significance before B_2A_2	20%	Significance after B_2A_2	92%
Significance before B_3A_3	20%	Significance after B_3A_3	93%
Adjusted Rsquared	0,775	Adjusted Rsquared	0,845

Figure 56 Polynomial function NDSM terrain (Own illustration)

after transformation also cannot be found. The peak of the model is therefore used. The peak is at 1290 meters which is close to the first model.

The last model, shows the overall highest heritage premium. The second and third model, both found the highest peak in the heritage premium around the same distance of 1250 meters. The distance of the third model, 1290 meters, is used, because the polynomial function displays the distance more specifically than the concentric circles. A house price increase of 60.7% is found, which seems huge. But by subtracting the average house price increase in Amsterdam, a heritage premium of 3.4% is found. The model shows a significance of 99%. The determination coefficient did not increase in this model, but stayed at the same level.
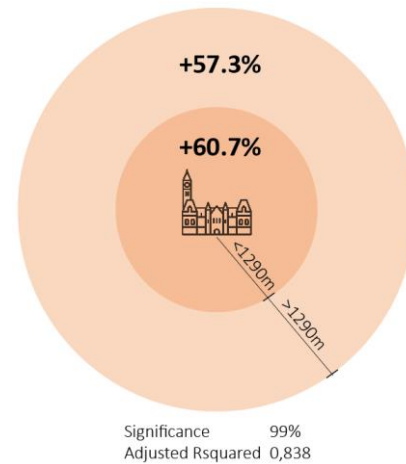
Figure 57 Heritage premium NDSM terrain (Own illustration)

Interpretation:

The most striking thing about the four models is probably the absence of housing transactions within a radius of 500 meters. This can be clarified by a few possible explanations. A limitation of the models is that the distance is measured from a point in latitude and longitude. This means that the distance is measured from a specific point at the NDSM site and not from the whole area. This might have affected the number of houses within the 500 meters radius. Secondly, because the target group of the NDSM site(especially the east side) are creative people who rent workshops, it is possible that most of them also rent their homes nearby. The same with the student housing that is rising in the area, these are probably all rented apartments and are thus not included in the data base. Lastly, the dataset can be incomplete. The dataset includes 75% of the transactions in Amsterdam, it is thus possible that the transactions due to the ongoing developments at the NDSM site are not included.

Because of this, the steep decrease in price premium found in the first 300 meters of the first model is not likely, due to the missing transactions within these 300 meters. The same applies to the third model where a decrease up to 350 meters is found. Therefore, although significant, the first 500 meters of the graphs from model 1 and 3 will be ignored.

The second and third models show a similar pattern, where a house price premium from 500 up to approximately 1300 meters is found. After that a decrease in the price premium is seen. This suggests that the heritage premium goes up to 129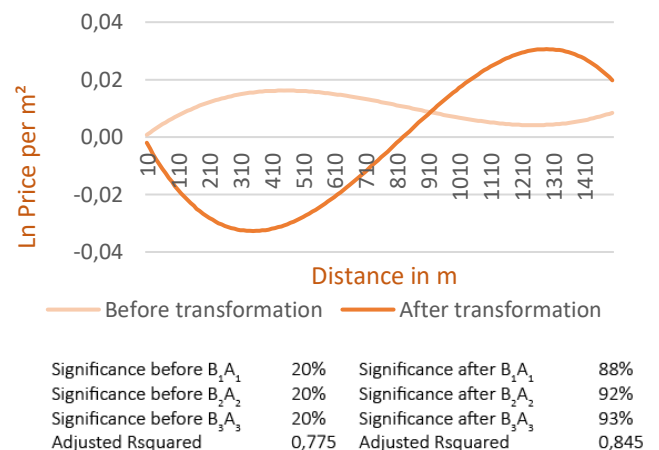0 meters and drops after that. However, the decrease is minimal and does not show a hard line between neighbourhoods. At this point a price premium of 3.4% is found when subtracting the average price increase of Amsterdam during the same timespan. This thus confirms the hypothesis that the adaptive re-use of cultural heritage has a positive effect on the surrounding houses.

However, due to the increasing popularity of the north and the ongoing developments in the area (see figure 41), the heritage premium can probably not only be assigned to the NDSM site. Other developments as for example the Houthavens might also have contributed. Nevertheless, it can be stated that the transformation of the NDSM site not only contributed to the determined heritage premium, but also to the planned new built houses for the upcoming ten years. This is because the popularity of the shipyard increased and the special workshops were rented for high prices due to the high demand and its special construction. The NDSM site broke records for biggest creative residence In Europe in terms of square meters but also in terms of number of tenants (Steenhuis & Meurs, 2011).

6.3 Results Pakhuis De Zwijger

The reopening of Pakhuis De Zwijger took place in 2006, all transactions before this date are included as 0 in the dummy variable and all transaction after this date are included as 1.

Model 1:

The first model shows a similar exponential relationship before and after transformation. Both lines overlap each other, therefore the line before transformation is not visible in the graph. The graphs are inline with the before defined hypothesis that the increase in distance from Pakhuis De Zwijger will lead to a decrease in the heritage premium of the surrounding housing transactions. However, almost the same outcome is shown before transformation, this indicates that the transformation of Pakhuis De Zwijger did not have an effect on the house prices of the nearby properties and thus no heritage premium is found in this model. Both graphs show a significance around 95%, which is a valid amount.
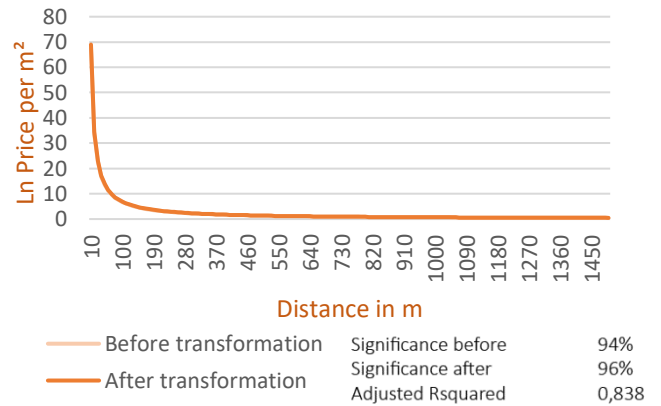
Figure 58 Exponential function Pakhuis De Zwijger (Own illustration)

Model 2:

Non of the concentric circles of the second model show a significant outcome. The significance per step varies from 13% to 79%. The highest significance of 79% is found in the of 1000 meters circle, where a price decrease of 1.4% is found. It is visible that all circles show a negative outcome. This indicates that the houses nearby Pakhuis De Zwijger decrease in price after the transformation of the case study. However, the significance of this model is so low, that no conclusions about the outcome of this model can be drawn. This outcome also seems odd, because the house prices in the whole of Amsterdam have certainly increased since 2006, the year of the transformation of Pakhuis De Zwijger.
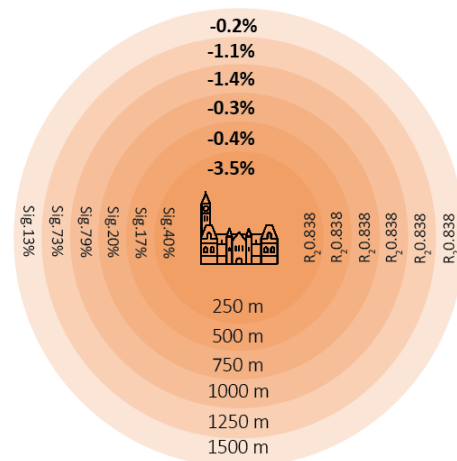
Figure 59 Concentric circles Pakhuis De Zwijger (Own illustration)

Model 3:

The third model, the polynomial function, shows a higher significance. Nevertheless, the same results as in the second model are seen, which is a decrease in price premium after transformation. The houses up to 430 meters from Pakhuis De Zwijger have a positive price premium. After 430 meters the price premium drops. This suggests that the heritage premium increases up to this point. However, this premium is lower than the price premium before transformation. It can therefore be concluded that the transformation of Pakhuis De Zwijger has no effect or a negative effect on the surrounding houses. This will be discussed in the interpretation part. However, it is noticeable that the
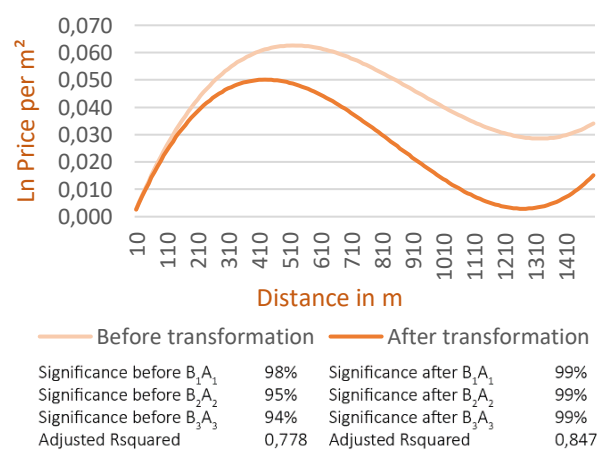
Figure 60 Polynomial function Pakhuis De Zwijger (Own illustration)

adjusted R2squared is higher after transformation then before, which indicates that the model explains more variety.

Model 4:

The last model shows the highest heritage premium found. For this model the distance found in the third model is chosen, due to the high significance compared to the second model. When using the 403 meters distance, a price increase of 0.6% is found. When subtracting the 0.1% price increase of Amsterdam, a heritage premium of 0.5% is found. This model is only 20% significant and therefore not reliable. This unreliability is also seen in the low price increase in Amsterdam since 2006, according to this model.

+0.1%

+0.6%

<430m
>430m

Significance   20%
Adjusted Rsquared 0,838
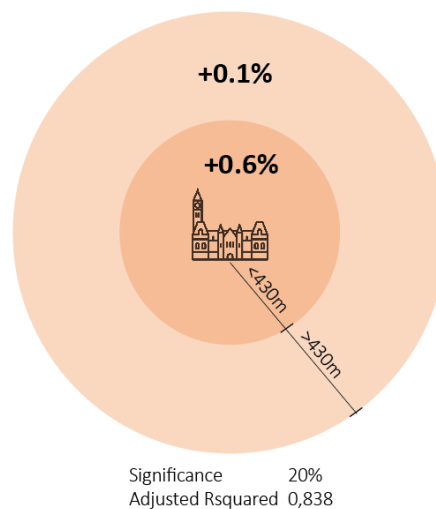
Figure 61 Heritage premium Pakhuis De Zwijger (Own illustration)

Interpretation:

Thus, the first model shows that there is probably no heritage premium to be found in this case study. Although, the prices premium decreases when the distance from the cases study increases, there is almost no difference between before and after the transformation. Both models 2 (although unreliable) and 3, show that after the transformation the price premium within the radius of 1500 meter is negative. This is very odd because the average house prices in Amsterdam have definitely increased since 2006. This is seen in the case

Figure 62 Year of sale versus house price (Own illustration)

study of the NDSM site, which has the same transformation year. Here a price premium of almost 60% was found since 2006. This was also displayed in the descriptive statics part of this research, see the graph on the right. Therefore the fourth model is also unreliable, where only a 0.1% increase on average in Amsterdam was found since 2006. This is also indicated by the 20% significance. However, due to the high significance of the third model it is assumed, that the pattern: firstly an increase in price premium up till 430 meters and then a decrease, is correct.

The low significance of this case study can be explained by the location of the warehouse. The warehouse is located at the Piet Heinkade, in the east harbour of Amsterdam. A seen in figure 46 many developments took place at the Piet Heinkade around the same time as the transformation of Pakhuis De Zwijger, for example the music building. Furthermore, many offices and apartments were built here in the last 10 years, but hardly any residential houses were located at the Piet Heinkade before 2006, so the direct house premium is therefore hard to measure. Furthermore, the warehouse borders the water of the IJ directly. This water could be a barrier to the price premium of the houses across the IJ. Also, the other side of the Pietheinkade is separated from the surrounding houses by the tram and Dijksgracht. This can explain why the third model does not show the same pattern as in the other case studies, where the graph first decreases before it increases. This means that the closest houses have a lower price premium, probably due to nuisance caused by the popularity of the case studies, than the houses a little further away. Because of the barriers around Pietheinkade this is not the case by Pakhuis De Zwijger.

6.4 Results Westergasfabriek

For the Westergasfabriek 2003 is chosen as the transformation year of the case study, when the Westergasfabriek was reopened.

Model 1:

The exponential model shows similar results as in the first model of De Hallen. Before transformation the house prices close to the Westergasfabriek were lower than house prices further away. After transformation, the house prices were substantially higher than before. The model shows that an increase in distance leads to a decrease in price premium, which matches the hypothesis described before. The difference with De Hallen is that the decrease before is to a lesser extent while the increase after seems higher. Both models show a high significance of 99% and the adjusted R2sqaured increased with 0,01 percent
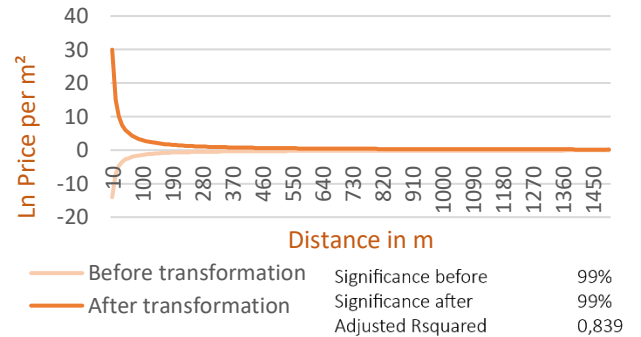
Figure 63 Exponential function Westergasfabriek (Own illustration)

Model 2:

The concentric model shows again an increase in house price premium untill, in this case, 750 meters and afterwards a slight decrease. In the first 500 meters an increase of 5% is found, which is quite a lot in such a short distance. The highest increase, of 47,2%, is shown in the 750 meter radius. Outside the 750 meter radius, a decrease in price premium is seen when the distance increases. This matches the expected results described before. However, this decrease is not so big that a hard border between neighbourhoods can be determined. All steps are 99% significant and from step 3 (1-750meters) the adjusted R-squared increased again slightly.
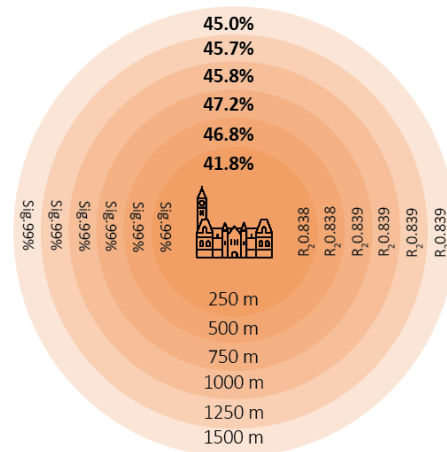
Figure 64 Concentric circles Westergasfabriek (Own illustration)

Model 3:

The third model, the polynomial function shows the decrease or increase of the (LN) price per square meter when the distance increases. Before and after transformation the same pattern is observed as seen in the graph on the right, first a decrease and after the first tipping point an increase and after that a decrease again. Differently to De Hallen and the NDSM site this model shows a more negative Ln price before transformation and quite flat graph after transformation. However, by comparing before and after the transformation a big increase in prices (LN) is found. The biggest difference between before and after the transformation was found at 620 meters. The model is significant and increases the variety explained after transformation.
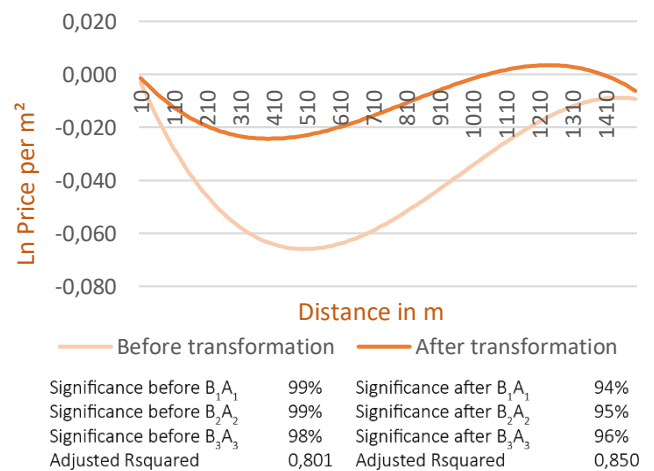
Figure 65 Polynomial function Westergasfabriek (Own illustration)

In this model and as well as in the second model, high percentages of price increase were found. This high percentages can again be explained by the time of the transformation in 2003 and the price increase ever since. In the third model the biggest difference between before and after transformation was found at 620 meters. This is also in line with the second model were the highest increase was found in concentric circle with a 750 meters radius. At 620 meters a price increase of 48.2% was found, which is indeed higher than the total concentric circle of 750 meters. By subtracting the price increase of Amsterdam, a heritage premium of 9.9% was found by the transformation of the Westergasfabriek. This is the highest premium of all case studies.

+38.3%

+48.2%

<620m

>620m

Significance 99%
Adjusted Rsquared 0,838
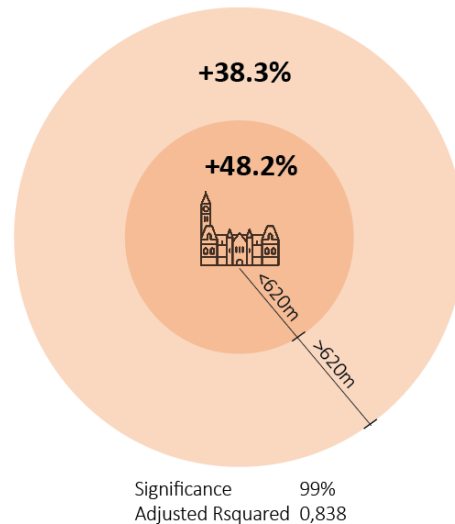
Figure 66 Heritage premium Westergasfabriek (Own illustration)

Interpretation:

The first model shows a decrease in price close to the Westergasfabriek before transformation. This can be explained due to the construction works of the Westergasfabriek around that time. As explained in the case study description the Westergasfabriek had a temporary function similar to the present function, after the municipal energy company left the buildings. From 1993 to 2000 the Westergasfabriek was filled with the temporary functions. However in 2000, the redevelopment started and due to some setbacks the transformation took three years. The data in this research before transformation are from 2000 till 2003, so the years of redevelopment and closure.

Similar to De Hallen, the highest prices increase was not found directly next to the Westergasfabriek but in the third concentric circle (750 meters) of the second model. A possible explanation for this is the nuisance caused by the Westergasfabriek for the most nearby houses, due to the events held here. The Westergasfabriek is a very popular event space where for example also techno parties take place until late at night. Additionally many festivals take place during the weekend days, which can create some nuisance.

The concentric circles in the second model assume a hard-line per neighbourhood. So that after a certain amount of distance the heritage premium is not sensible anymore. However, this drop in heritage premium is not found. This can be explained by other developments in the area that might also have contributed to this. Areas growing in popularity such as the Houthavens and Sloterdijk are located within one kilometre. They can also be responsible for the price increase in the fourth and fifth concentric circles (1000-1500 meters).

The low curves that are found in the third model can be explained by the low quality houses around the Westergasfabriek. The Staatsliedenbuurt was a neighbourhood with poor housing and a lot of squatters in the seventies and eighties. This improved later on by transformation. After the Pijp, the Westerpark district was one of the upcoming areas in Amsterdam. This why the founded heritage premium probably cannot only be addressed to the Westergasfabriek, but is also part of the increasing popularity of the city district. This also explains why the highest heritage premium is found at the Westergasfabriek. The neighbourhood was seen as relatively poor and cheap and could therefore improve a lot.

Conclusions

7. Conclusion

This conclusion is divided into two parts based on the two aims stated at the beginning of this research. The first aim was to identify the values of cultural heritage in general, to capture its unique and impossible to recreate identity. Secondly, this research aimed to prove the indirect added economic value of transforming industrial cultural heritage into hubs of social and/or cultural integration within inner cities. For each part, the conclusion first answers the subquenstions and then the main research question.

7.1 Value definition cultural heritage

Figure 67 Expression aim 1 (Own illustration)

Theoretical sub question:
- Which values of cultural heritage are described in literature?

Firstly, from the literature, it can clearly be concluded that there is not only one definition of the value of cultural heritage. Multiple values are described by different authors, sometimes overlapping, sometimes different. The values described are incorporated in the value division on the next page. This value division separates the values into economic values and non-economic values. This is a distinction between estimating the value of cultural heritage in price (economic) and appreciating the value of cultural heritage in content (non-economic). The economic value can be subdivided further into: direct value, indirect value and induced value. The non-economic value into: architectural value, historic value and emotional value.

Empirical sub questions:
- Do experts in the field of cultural heritage recognise the values of cultural heritage described in literature?

The values explained in literature broadly overlap with values that are recognised by people in practise. However, some values had to be explained and thus were not familiar to the experts. They did recognise the meaning of the value but did not see it as a separate, independent value. Some values were therefore seen as less sufficient and were adjusted in the value division. In the same way some values were added and the order of the values was changed, due to hierarchical reasons. The experts argued that the emotional value is the most important and should therefore be on top. For the economic values a new hierarchy shows that the indirect and induced values derive from the direct values. The non-economic value is often called the narrative of the building by the experts. This narrative focusses on the story behind the building and includes emotional, architectural and historic values. During the European Cultural heritage summit in Berlin this focus on the story behind the building was also expressed by experts. The revision of the value division based on the semi-structured interviews is also shown on the next page.
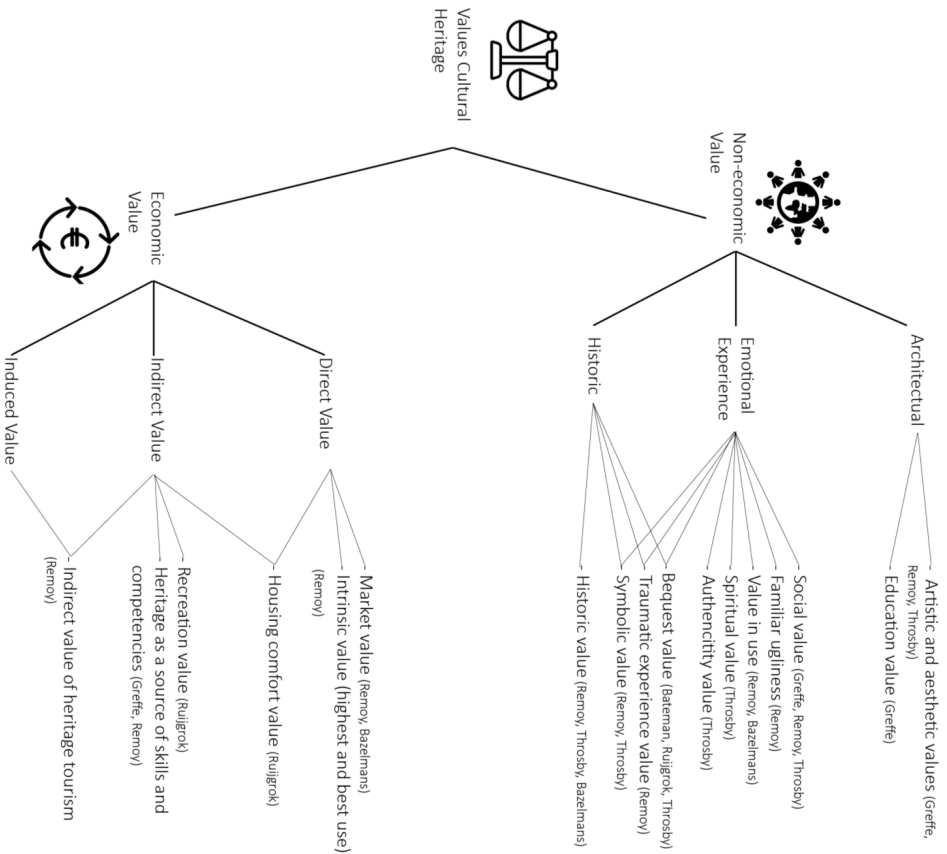
Figure 68 Value division (Own illustration)
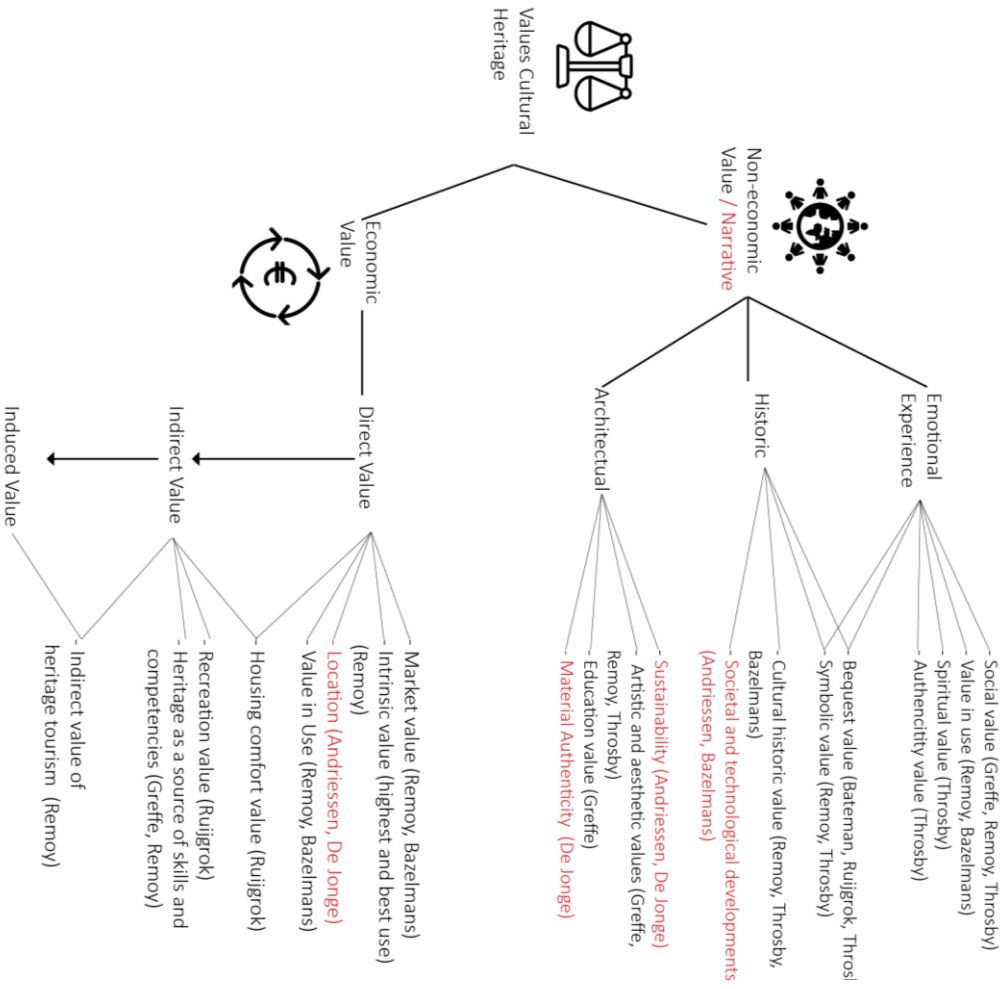
Figure 69 Revised value division (Own illustration)

- Does the view on the value of cultural heritage differ between experts with different work backgrounds within the field of cultural heritage?

It can be concluded that the view on value differs between the experts due to their work perspective. From a marketing background, the experts' approach is from the demand perspective. They look at which functions are missing in the neighbourhood and also focus on the economic feasibility of a project. It was observed that the experts with a marketing background were the only ones who actively focus on the economic value of cultural heritage. Experts with a design work background, focus on a supply perspective. The architects reveal the potentials of the building and look for a fitting re-use of the building. Naturally, the focus is mostly on architectural and authenticity values. The governmental perspective focuses on three main values: architectural, historic and social. They have a more overall perspective. However, a shift is seen in the governmental perspective from a focus on architectural and historic values to a focus on social values as the most important aspect.

Main research question:
- What is the value of cultural heritage?

Cultural heritage is unique and irreplaceable, this creates its value. This value is recognised by people, mostly in an emotional and social context. However, the value of cultural heritage cannot be described in one sentence or in one value. The value of cultural heritage is plural and is partly subjective. A distinction is made between estimating the value of cultural heritage in price (economic value) and appreciating the value of cultural heritage in content (non-economic value).

The non-economic value is hard to define because of its scattered definition in sub-values. The sub-values relate to three main drivers, namely the aesthetics of a building, the experience of people and the (cultural) history. It also seen that many of these sub values are related to one another or derive from each other. An overall connection to the sub-values is the site and surrounding of the building.

The economic value is more than just the market value of a building. The economic value refers to values that generate welfare for society in monetary terms. These values can either be direct, indirect or induced.

It can be concluded that the adaptive re-use of cultural heritage has a positive impact on the market price of the cultural heritage buildings. But above all, the narrative of a building, the story behind the building, is the most important value of cultural heritage and separates it form new built. The narrative is an overarching concept that incorporates all the non-economic values, architectural, emotional and social. It is seen as a heritage premium above the normal market price of a building.

7.2 Prove heritage premium
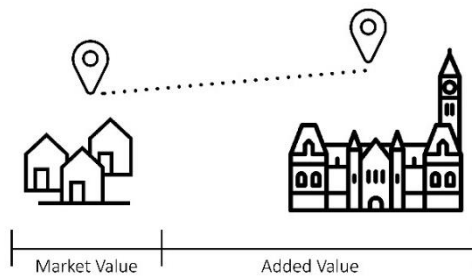
Figure 70 Expression aim 2 (Own illustration)

Theoretical sub questions:
- Which methods are used to measure the economic value of cultural heritage?

Seven methods to measure the economic value of cultural heritage are defined:
1. the travel cost method,
2. the hedonic pricing method,
3. the averting behaviour method,
4. choice modelling,
5. the contingent valuation method,
6. the recovery cost method and
7. the prevention cost method.

Based on the advantages and disadvantages of each method the hedonic pricing method is chosen.

- How does the hedonic pricing model work and in what way is the hedonic pricing model used?

The hedonic pricing method focusses on different characteristics of the building to determine the market value of the building based on a statistical model. The characteristics function as variables for the model. This method is used because it assumes that the difference in market value is caused by the difference in characteristics. By separating the characteristics, it can be determined if and how much impact one characteristic, in this case the proximity of the transformed cultural heritage, has on the market value.

In this model multiple independent variables determine the outcome of the dependent variable. The independent variables functions as a cause for the effect that is displayed in the dependent variable. The dependent variable in this case is the transaction price per m² (Ln). The independent variables are determined before and entered after recoding and regrouping in the hedonic pricing model. The hedonic pricing model is based on the following mathematical formula:

$$Y_i = (b_0 + b_1 X_{i1} + b_2 X_{i2} + \ldots + b_n X_n) + \varepsilon_i$$

Y is the dependent variable
b0 is the intercept
bn is the independent variable / the regression coefficient
Xin I is the amount of the independent variable
εi the standard error

Empirical sub question:
- What is the effect of transformed cultural heritage on house prices in the neighbourhood?

The effect of the transformation of cultural heritage on the nearby house prices differs per case study. The price premiums were determined within a radius of 1500 meters and were corrected for the time

and location by subtracting the price increase of Amsterdam from the determined heritage premium. Three out of the four research cases show a significant heritage price premium.

For De Hallen a price premium of 8.0% was found within a radius of 880 meters. This significant effect is attributed to the transformation of De Hallen and its popularity ever since, however the upcoming popularity of the neighbourhood as a whole could also play a part in this.

The houses around the NDSM site show a smaller, however still significant, effect of 3.4% price increase within a radius of 1290 meters. This effect is probably smaller due to two reasons. Firstly, the NDSM site, is just as the entire city district North, still heavily under development. Therefore, it is hard to determine the exact price premium. Nevertheless, the many developments could also be seen as the success of the NDSM site and the city district. The radius in which the highest heritage premium is found, is the largest of all cases. This can be explained by the lack of surrounding houses within the first 500 meters. Additionally, the NDSM site is the only case study that includes a district instead of one building, this makes it difficult to determine the exact distance to the case study and could affect the price premium.

Pakhuis De Zwijger shows no significant price premium at all. There are three possible explanations for this, all related to the location of the case study. First, the warehouse has some physical barriers which are the IJ on one side and the tram and Dijksgracht on the other side. This could be an obstacle for connecting to the case study and therefore lowers the significance of the project. Secondly, most houses were built at the Pietheinkade after the transformation of the Pakhuis. Lastly, Pakhuis De Zwijger was just a small part of the urban area development of the Pietheinkade, therefore its is hard to measure its individual contribution.

The Westergasfabriek shows the highest outcome of 9.9% within a radius of 620 meters. Similarly to De Hallen, this significant effect is attributed to the transformation and popularity of the Westergasfabriek, but probably also to the upcoming popularity of the neighbourhood as a whole.

Main research question:

- What is the indirect added economic value of transforming industrial cultural heritage into hubs of social and cultural integration within cities?

Three main aspects can be concluded when proving the existence of a heritage premium with the use of a hedonic pricing model. First, in two of the four case studies a negative price premium is found before transformation. This is probably due to the poverty and construction before transformation of some buildings. As the municipality of Amsterdam (n.d.) declares: "Empty buildings form a 'dead' place in a neighbourhood. A place that is quickly impoverished, can become a landfill or worse. In short, an undesirable situation for a neighborhood". The best example here according to the models but also according to the pictures below is De Hallen. Thus, by only bringing the building back in use, added value is created.

Figure 71 Decay De Hallen (Koning, n.d. in Kloek, 2015)

Figure 72 De Hallen after transformation (Acram, 2015)

Secondly, an overall pattern is observed where the highest heritage premium is not found directly next to the case study, but a few hundred meters away. This can be explained by the possibly nuisance that is caused by the activities of the case studies. Due to their popularity many events take place at the case study sites which can lead to noise and crowded areas. Living a bit further from the case studies this is not the case, therefore the heritage premium is higher there. After a certain distance the heritage premium is at its peak and the distance decay effect, the increase in distance leads to a decrease in price premium, comes into being (see the graphs below). The expected hard barriers between neighbourhoods are not found. None of the models show a drop in significance or price premium after a certain distance.
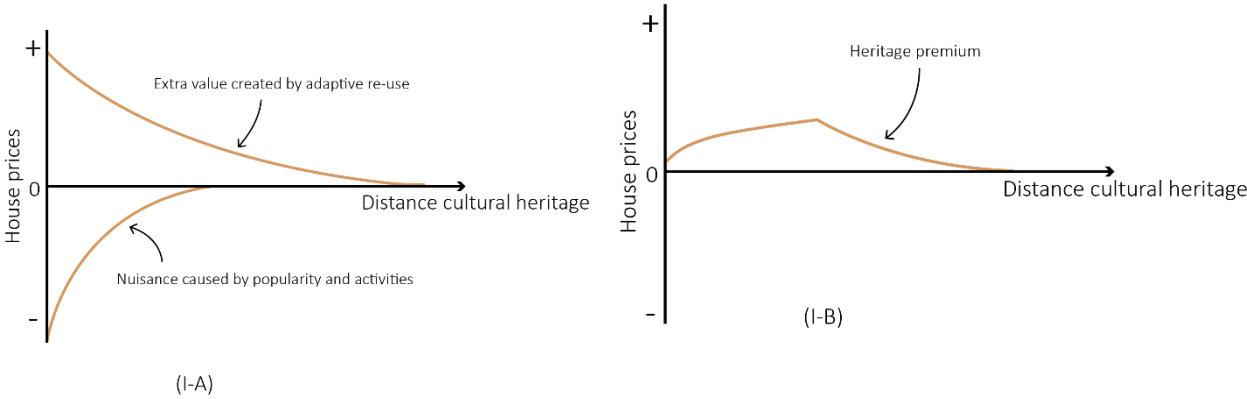
Figure 73 Heritage premium (Own illustration)

An overall average price premium of 7.1% within a radius of 620-1290 meters was found within the three case studies that had a significant outcome. It can thus be concluded that the adaptive reuse of cultural heritage has a positive effect on the surrounding houses by creating an extra house price premium. This thus confirms the hypothesis defined in the beginning of this research "The adaptive re-use of cultural heritage buildings into hubs of social and cultural integration will not only increase the value of the building itself but will also positively influence the property values of the houses in the surrounding area.".

+8.0%	+3.4%	+0.5%	+9.9%
<880m	<1290m	<430m	<620m
De Hallen	NDSM terrain	Pakhuis De Zwijger	Westergasfabriek
Significance 95%	Significance 99%	Significance 20%	Significance 99%
Adjusted Rsquared 0,839	Adjusted Rsquared 0,838	Adjusted Rsquared 0,838	Adjusted Rsquared 0,838
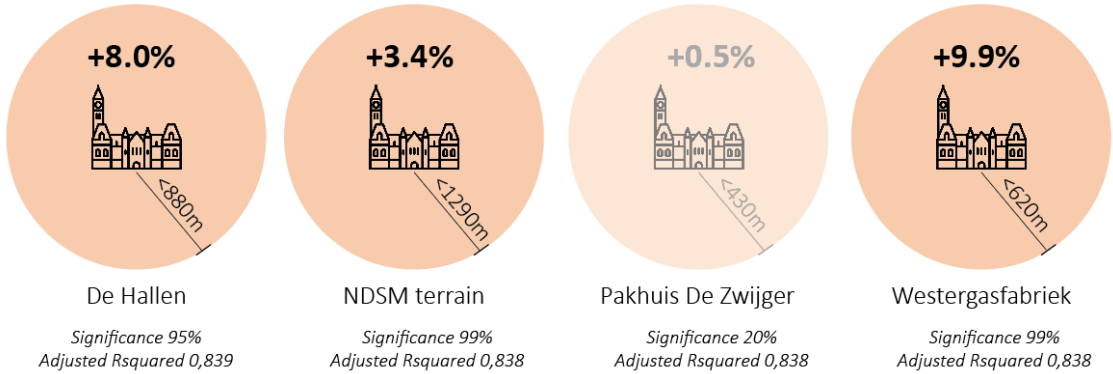
Figure 74 Price premiums case studies (Own illustration)

However, it must be noted that the price premium found probably cannot entirely be attributed to the case studies, other developments in the relevant areas could also have contributed and as well as the probable raise in popularity of the city district concerned. Additionally, this outcome does not mean that every transformation of cultural heritage into hubs of social and cultural integration immediately leads to an increase in house price for the nearby properties. It was observed that the location and the physical barriers within this location could form an obstacle for the house price premiums.

The value of cultural heritage is plural. Its unique and irreplaceable character is recognised by people in the narrative of a building, which touches people mostly in a social and emotional sense. This value and the added value created by the adaptive re-use of cultural heritage is expressed by the average 7.1% price premium observed for houses located within a 1500 meters radius from the cultural heritage site for three out of four case studies.

Epilogue

8. Epilogue

8.1 Discussion

The discussion of this research consists of three parts. First, the research methodology and results for the qualitive part of this research will be discussed. Following up on this, the methodology and results of the quantitative part will be examined and lastly the limitations of this study will be considered.

Qualitative

The qualitative part of this research consists of two explorative interviews and three semi-structured interviews, which is a relatively small sample size, but sufficient for this research. When doing qualitative research there are a few things to be aware of. First of all, bias could occur due the subjective interpretation of qualitative data. Especially when talking about values, the author needs to be aware of the partly subjective interpretation of values of the interviewee, therefore more interviews have to be compared. People with different work backgrounds are addressed in order to give a more complete overview of values and not from one point of view. Doing so, hopefully reduces the bias. However, in order reduce this bias even further the number of interviews could have been higher.

Secondly, when doing interviews, a certain knowledge from literature and own experience is already encountered. It is therefore hard, but important, to exclude one's own opinions and interpretations. Another aspect of the bias is that one learns during each interview; the interviews are therefore not completely comparable. To reduce this bias, two explorative interviews were conducted to test the interview protocol and practise interview technics.

The approach that was used to discuss the value division made in part one of the literature study with the interviewees, could have been made otherwise. In this approach the value division was discussed at the end of each interview, to exclude bias. This was done to get the opinion of the interviewees about the value division made and encountered potential changes. However, because the interviewees did not read the literature behind the values, they were a little overwhelmed by this and could not give in-depth feedback. Therefore, this approach might have been different.

Lastly, another not entirely valid method was the thematic analyses, where how many times each interviewee named a certain value was counted. This indicated which values the interviewee focussed on and thus found most important. However, this is exposed to bias due to the questions that were asked and the literature framework presented. This could have steered the interviewee in a certain direction. Nevertheless, the interviewees told their own story and were asked what they found most important, which was inline with the most addressed values. Therefore, the bias in this method seems minimal.

Quantitative

For the quantitative part of this research a few notes have to be made concerning the method used and the results found. The dataset for this research, although quite extensive with 130.000 transactions, only includes transactions within the city of Amsterdam and between the years of 2000 and 2017, it is thus limited. Especially the heritage models, might have a limited amount of data due to fewer transactions within a radius of 1500 meter. Also, the year of transformation of the case studies differs, therefore the data group before transformation is sometimes a lot smaller than the group after transformation.

The heritage models, besides the sometimes small amount of data, have two other limitations. The time dummies are set at a certain point in time while the transformation of the case study projects took place over several years and can thus not be fixed to one moment in time. Therefore, the delivery/ reopening of the projects is chosen as the transformation moment in time. Secondly, the distance to the case studies is not exact. The point of reference is set at a certain longitude and latitude, while the building is of course bigger than this. Especially in case of the Westergasfabriek and the NDSM site where the

redevelopment is not just about a single building but multiple buildings. This could unfortunately affect the radius in which the heritage premium is measured.

For each case study, four heritage models are used in order to exclude their individual limitations and confirm the outcomes in the different ways. Except for Pakhuis De Zwijger the models show a similar outcome foreach case study, which is positive. However, in the concentric circles model the distance effect is measured by steps of 250 meters. These steps might be too big. Steps of 100 meter might give a more precise outcome, but the calculation time would be tripled. The polynomial function forced the outcome into two tipping points, due to its mathematical formula to the power of three. Therefore this model can in this case not be used on its own, but can be used in collaboration with the concentric circles. In the calculation for the overall heritage premium the price increase of the whole city of Amsterdam is subtracted from the price premium, however the difference in price increase between neighbourhoods is not considered for this. This might have led to another outcome.

Some research state that the price premium can sometimes already be found one year before the delivery of a project. This is because people expect what is coming and anticipate on that. However, this is not researched in this thesis due to a lack of time and necessity.

Results

Concerning the outcome of the model, the notes described above have to be taken into account. Firstly, not every transformation of cultural heritage into hubs of social and cultural integration, immediately leads to an increase in house price for the nearby properties. It is observed that the location and the physical barriers within this location could possibly form an obstacle for the house price premiums. Secondly, the model corrects for time and location. However, it must be noted that the price premium found probably cannot entirely be attributed to the case studies, other developments in the area could also have contributed as well as the price increase of the entire city district.

Hence the following question asked by Robby van Beveren area manager at the municipality of Amsterdam, *is the growing popularity of the neighbourhood part of the success of the redevelopment of the case studies* or *is the success of the case studies part of the growing popularity of the neighbourhood?* In my opinion both are true. All areas that are investigated in this research were probably already upcoming due to the growth of Amsterdam, where more and more people are living around the 19e century ring of Amsterdam, the inner city is growing. But I do believe that the transformation of the case studies has a positive influence on the neighbourhood and due to their popularity makes the city district more well-known and lively and therefore more popular which indeed increases the house prices.

8.2 Limitations

- The study is only applicable to one city, other cities might differ in outcome.
- This research only focusses on inner-city cases, in outdoor areas it is probably harder to transform to social and cultural integration and the positive influence will be less.
- Amsterdam is already booming, which makes it hard to separate this value.
- If the buildings would have had another function after transformation the outcome might differ.
- Only four case studies, thus the conclusions in this research might not apply to other cases.
- The heritage premiums found can probably not entirely be attributed to the case study projects. Other developments, activities and growing popularity of the neighbourhood could also play a role.

8.3 Recommendations

Further research

One of the limitations of this study is the limited amount of case studies. Naturally, further research could extend the number of cases. In order to validate the conclusions in this research further research, including more case studies could be done. Additionally, more types of cultural heritage can be researched. This research only focusses on industrial cultural heritage. A difference in outcome between different types of monuments may possibly be found. The same goes for the function after transformation. The public function of social and cultural integration of this study automatically has an effect on the neighbourhood. Other functions like, housing, might have less of an effect on the surrounding properties. Although, the value of the building itself will probably be increased. Further research could investigate if different effects by different types of cultural heritage occur and if different types of function after transformation have a different influence on the surrounding area.

This research only focusses on case studies within the city of Amsterdam, this might lead to a biased outcome due to the popularity of Amsterdam, as it will be explained in the discussion. Further research could show if the same effects occur in different cities inside and outside the Netherlands. Another comparison can also be made by investigating the effect of the transformation of cultural heritage in outdoor areas. Here different function after transformation might be applicable due to another type of demand by the residents.

Furthermore, for a redevelopment process to be successful, as stated by all interviewed experts and also discussed during the presentations in Berlin, the place first has to be accessible to the public and temporary functions are needed. A mix of functions seems to work better to make the redevelopment of cultural heritage successful. The size of the buildings and an inaccurate fit for the new functions could be part of the explanation for this. This would be an interesting topic to investigate further.

Practise

Although the cases described in this research are very successful at this moment, the redevelopment process was not always as successful. All developments, especially of De Hallen and Westergasfabriek, took a long time to develop due to, among other things, the lack of support from the neighbourhood. It is therefore recommended to involve the residents living close the project. This can for example be done with the ABC-scan of the Rijksvastgoedbedrijf, or by using other methods. It turned out that the residents and sometimes squatters of the projects, had good ideas that fit the neighbourhood and these ideas are still successful today. This does not mean that they should decide everything, but they should have a say in the process.

Furthermore, in the problem analyses of this research the following was stated: *Preserving heritage creates some benefits, like recreational perception values to the general public and being a local economic driver, which thus serves the public interest. Private stakeholders, however, do not necessary derive cashflows from this and have therefore less interest. So this raises the question "Who benefits and who pays?"*. This research shows a significant effect of the adaptive re-use of cultural heritage to the property values of the nearby houses. Therefore, investments in the adaptive re-use of cultural heritage are certainly, but not only, a public interest. The price premium of the surrounded houses is also a private interest, private investments in cultural heritage are therefore recommended.

Building on this, the municipality could use the transformation of cultural heritage more actively as an indicator for their strategic urban plan. It was stated by Robby van Beveren that they do look at cultural heritage and they make plans in collaboration with private developers. But this is not presented as a stimulator for the success of an area. While this research does show a price increase and the projects are without a doubt successful.

8.4 Reflection process

In September 2016 I started the master MBE. In September 2017 I was still happy with this choice, but I did not what to do for my master thesis. Everything seemed interesting and I had no idea about a subject for my thesis. I had some unfinished courses and some extra activities besides my study, so I decided to postpone the start of my graduation by half a year. In the beginning of September, I came in contact with Hilde Remøy and started working for her as a student assistant focussed on research. In that period, I participated in some European research proposals for calls of Horzion2020 about cultural heritage. I became more aware about my affection for existing buildings and their transformation. When I look back, this has always been the case, I just never realised it so consciously. This made my choice for my subject, adaptive re-use, a lot easier at the start of my graduation in February 2018.

Choice of subject

The graduation lab for adaptive re-use was not present at the time a started my research. Luckily Hilde and Philip were willing to provide me with some guidance on this topic anyway. I first had the idea to look at the adaptive re-use of monument-listed buildings within University campuses, which was one of the topics of the graduation labs. However, I struggled with defining a real research question. When it turned out that the two mentors I asked for this topic were not allowed to work together because they were from the same domain within MBE, I decided to put the campus topic aside and look for something new. Based on the Horizon 2020 call "Transforming historic urban areas and/or cultural landscapes into hubs of entrepreneurship and social and cultural integration", which I was familiar with due to my student assistant job for Hilde, I found a new subject. She asked me if I was afraid of finance and models and I said no, so she sent me to Philip Koppels. With him I discussed the possibility to make a hedonic pricing model to capture the possible price increase of living around monument-listed buildings. I liked this idea and decided to focus on the effect of the transformation of cultural heritage for the neighbourhood, by using the hedonic price model. Because I did not want to do only quantitative research, I combined the methods (quantitative and qualitative) and started to write the first draft of my research proposal.

Research proposal

In March, I was called by my former internship supervisor to see if I wanted to help him with a project, on which I had worked before. I said yes to this, but it took a bit more time than I had anticipated. This gave me some extra stress to finish graduation proposal (my P2) on time. However, looking back, I think the writing of my P2 went quite smoothly. Because I decided relatively quickly what my main aim was, I had a head start to most of my fellow students. Also, the work on the research proposals for the Horizon 2020 calls worked in my advantage. Because of this, my structure and some general description were made quickly.

I struggled a bit to get grip on the value of cultural heritage described in literature. There were multiple values described by different authors, sometimes overlapping and sometimes totally different. Feedback from my supervisors made me limit my research to six authors. To get a better overview I wanted to make a division between the values, but this was quite hard. The division made by different authors did not entirely match so I made a new division myself. The difficulty was that some values belonged to multiple categories. In the end, I think I succeeded by using a division commonly used in the social costs and benefits analysis.

Data collection

After my P2, the summer started, and although I had good intensions, being away for most of the summer, I did not achieve as much as I had hoped. The planning of interviews took more time than I had foreseen. This was partly due to the lack of response from the interviewees, but certainly also because a lot of people were on holiday. In the end, I succeeded to plan all my interviews in September. Before conducting the interviews, I was quite nervous, but it turned out that this was not necessary at

all. All the people I talked to were very enthusiastic about my research and were willing to help, this was a big relief and also made me excited about going further.

The same issue occurred when I was trying to receive data from the NVM database, a few weeks went by because people were on holiday, but in the end, they provided me with a really extensive data base. The NVM database only includes one city, so I had to make a choice. I chose to do my study about Amsterdam because this the city where I grew up in and thus I am familiar with the cases, which makes it even more interesting to me.

Data analysis

During the data analysis, I first analysed my interviews based on constant comparison and thematic analysis. I had some trouble with drawing conclusions because most seemed to be to obvious. After some feedback from my mentors and comparing the main findings of each interview in bullet points it was easier to draw conclusions. The interviews gave some interesting insights on how value is used in different work fields within cultural heritage.

The next part was the hedonic pricing model, I had the program, I had the data, but how to start? Luckily it was not expected that I could do this at once. Philip provided a short workshop which helped me and another student start with our models. I spent a lot of time reading statistics books to get familiar with the work methods and concepts. I had some trouble at times, finding the small mistakes a made in the syntax which lead to totally different outcomes. But in the end is was very pleased with my basic model, which approached reality by 84%. The heritage model was quite stressful due to the late connection with GIS and the unreliable distances to my case studies.

Outcome

Overall, my graduation process was quite smooth although I had some ups and downs. I had some time issues and struggle with completing my hedonic pricing model. However, the outcome is in my opinion satisfying. I like that I did some quantitative analysis as well, so I have also some hard outcomes in numbers compared to the partly subjective values. I like the balance between the two. I think the strong points in my process have been the structure of my report and staying with the same topic overall. If I had had more time, I would have included more cases in order to draw more general conclusions. Looking back, I would have chosen my case studies more carefully. I could for example have predicted due to the surroundings that Pakhuis De Zwijger would not give a significant outcome.

References

Ahlfeldt, G. M., & Maennig, W. (2010). Substitutability and Complementarity of Urban Amenities: External Effects of Built Heritage in Berlin. *Real Estate Economics, 38*(2), 285-323. doi:10.1111/j.1540-6229.2010.00268.x

Barentsen, D. (2015). *Waardebepaling van wonen in erfgoed.* (Master thesis), Delft University of Technology Delft.

Barentsen, D., Koppels, P., & Remøy, H. (2015). *Heritage Designation and House Prices*. Retrieved from

Bateman, I. J., Carson, R. T., Day, B., Hanemann, M., Hanley, N., Hett, T., . . . Pearce, D. (2002). Economic valuation with stated preference techniques: A manual. *Economic valuation with stated preference techniques: a manual.*

Bazelmans, J. (2013). Waarde in meervoud. Naar een nieuwe vormgeving van de waardering van erfgoed. In *Cultureel erfgoed op waarde geschat: economische waardering, verevening en erfgoedbeleid* (Vol. 13, pp. 24). Den Haag: Platform 31.

BNA. (n.d.). De Hallen Amsterdam Retrieved from https://www.gebouwvanhetjaar.nl/entry/de-hallen-amsterdam/

Bowitz, E., & Ibenholt, K. (2009). Economic impacts of cultural heritage–Research and perspectives. *Journal of Cultural Heritage, 10*(1), 1-8.

Bryman, A. (2016). *Social Research Methods*. Oxford: Oxford University Press.

Choi, A. S., Ritchie, B. W., Papandrea, F., & Bennett, J. (2010). Economic valuation of cultural heritage sites: A choice modeling approach. *Tourism Management, 31*(2), 213-220.

Consortium, C. (2015). Cultural Heritage Counts for Europe. *CHCfE Consortium: Krakow, Poland*.

Dammers, E., Hornis, W., & Heemskerk, I. (2005). *Schoonheid is geld!: naar een volwaardige rol van belevingswaarden in maatschappelijke kosten-batenanalyses*. Rotterdam: NAi Uitgevers.

Domingo, P. (2015). Foreword. In *cultural heritage counts for europe*. Krakow: International Cultural Centre.

EuropeanCommission. (2018). Horizon 2020 call: SC5-20-2019 Transforming historic urban areas and/or cultural landscapes into hubs of entrepreneurship and social and cultural integration. Retrieved from http://ec.europa.eu/research/participants/desktop/en/opportunities/h2020/topics/lc-cla-04-2018.html

GemeenteAmsterdam. (2017). Gebiedsanalyse 2017 14. Oostelijk Havengebied/ Indische Buurt Stadsdeel Oost. Retrieved from https://www.ois.amsterdam.nl/pdf/2017_gebiedsanalyse_14.pdf

GemeenteAmsterdam. (n.d.). Van Scheepswerf naar nieuwe wijk. Retrieved from https://www.amsterdam.nl/projecten/ndsm-werf/nieuwe-wijk/

Goodman, A. C. (1978). Hedonic prices, price indices and housing markets. *Journal of Urban Economics, 5*(4), 471-484. doi:https://doi.org/10.1016/0094-1190(78)90004-9

Gram, P. (2018). Monumenten bezoek in trek bij Nederlanders Retrieved from http://www.monumentaal.com/monumentenbezoek-in-trek-bij-nederlanders/

Greffe, X. (1999). The economic value of Heritage. *University of Paris I (Pantheon- Sorbonne), 20*, 202014-202015.

Groenendijk, P. (2007). Renovatie Pakhuis de Zwijger Amsterdam. *ArchitetcuurNL, 01*

Haasdonk, M. (2013). Governance. In *Cultureel erfgoed op waarde geschat: economische waardering, verevening en erfgoedbeleid.* Den Haag: Platform 31.

Harmsen, H. (n.d.). De oude kaart van Nederland. Retrieved from http://www.oudekaartnederland.nl/

Herbestemming, D. (n.d.). NDSM-terrein, Amsterdam. Retrieved from https://www.herbestemming.nu/projecten/ndsm-terrein-amsterdam

Kalk, E. (2015). *Nieuw leven in De Hallen: 20 jaar plannen voor hergebruik.*: Pumbo.nl.

Kloek, Y. (2015). *Adaptation of State listed monuments: The added value of the architect in the process.* (Master thesis), Delft University of Technology, Delft.

Koekebakker, O. (2003). *Cultuurpark Westergasfabriek: transformatie van een industrieterrein*. Rotterdam NAi Uitgevers.

Koppels, P. W., Remøy, H., & El Messlaki, S. (2011). Door leegstand verlaagde huren bij de buren. *Real Estate Research Quarterly, 10*(3), 24-34.

Koster, H., & Rouwendal, J. (2015). Historic amenities and housing externalities: evidence from The Netherlands. *Faculty of Economics and Business Administration, VU University Amsterdam, and Tinbergen Institute, the Netherlands.*

Kraut, D. T. (1999). Hanging out the no vacancy sign: eliminating the blight of vacant buildings from urban areas. *NYUL Rev., 74*, 1139.

Lazrak, F., Nijkamp, P., Rietveld, P., & Rouwendal, J. (2014). The market value of cultural heritage in urban areas: an application of spatial hedonic pricing. *Journal of Geographical Systems, 16*(1), 89-114. doi:10.1007/s10109-013-0188-1

Li, M. M., & Brown, H. J. (1980). Micro-neighborhood externalities and hedonic housing prices. *Land Economics, 56*(2), 125-141.

Martens, M. (2015). Oud-west. Retrieved from http://www.woonamsterdam.info/rapport-2015/west/

McDonald, J. F., & McMillen, D. P. (2011). *Urban economics and real estate: theory and policy*: John Wiley & Sons.

MMnews. (2018). HERBESTEMMING VRAAGT OM ONDERNEMERS MET LEF. Retrieved from https://www.herbestemming.nu/actueel/herbestemming-vraagt-om-ondernemers-met-lef

Moro, M., Mayor, K., Lyons, S., & Tol, R. S. J. (2013). Does the housing market reflect cultural heritage? A case study of Greater Dublin. *Environment and Planning A, 45*(12), 2884-2903.

Musil, T. A. (2011). Evaluating economic impacts of corporate real estate activities. *Journal of Corporate Real Estate, 13*(3), 181-196.

Navrud, S., & Ready, R. C. (2002). *Valuing cultural heritage: applying environmental valuation techniques to historic buildings, monuments and artifacts*: Edward Elgar Pub.

NDSM-werf. (2017). Artikel + film, geschiedenis NDSM-werf. Retrieved from http://www.ndsm.nl/story/artikel-geschiedenis-ndsm-loods/

Noonan, D. S. (2007). Finding an Impact of Preservation Policies: Price Effects of Historic Landmarks on Attached Homes in Chicago, 1990-1999. *Economic Development Quarterly, 21*(1), 17-33. doi:10.1177/0891242406296326

Oligschläger, P. (2015). *Uitstralingseffecten van iconen* (Master thesis Master thesis), Delft University of Technology, Delft.

Pallada, R. (2017). *Heritage Reloaded: Exploring complex re-use processes of heritage buildings.* (Master thesis), Delft university of Technology Delft.

Pearce, D., Mourato, S., Navrud, S., & Ready, R. C. (2002). Review of existing studies, their policy use and future research needs. *Valuing cultural heritage: Applying environmental valuation techniques to historic buildings, monuments and artifacts*, 257-266.

Redactieinrenovatie. (2016). 2 miljoen m² aan leegstaande monumentale ruimte. Retrieved from https://bouwenuitvoering.nl/renovatie/leegstaande/

Remøy, H. (2014). Preserving Cultural and Heritage Value. In S. J. Wilkinson, H. Remøy, & C. Langston (Eds.), *Sustainable Building Adaptation*. Oxford: Wiley.

Rijksdienstvoorcultureelerfgoed. (n.d.). Monumenten.

Rosen, S. (1974). Hedonic prices and implicit markets: product differentiation in pure competition. *Journal of political economy, 82*(1), 34-55.

Ruijgrok, E. (2006). The three economic values of cultural heritage: a case study in the Netherlands. *Journal of Cultural Heritage, 7*(3), 206-213.

Saris, J. (2013). Nieuwe waarde maken met erfgoed. *Cultureel erfgoed op waarde geschat: economische waardering, verevening en erfgoedbeleid., 13*, 66-68

Smit, M. (2014). De waarde van cultureel erfgoed voor gebiedsontwikkeling In *Bouwen aan herbestemming van Cultureel Erfgoed* (pp. 25-36): Den Haag: Platform51.

Steenhuis, M., & Meurs, P. (2011). *Herbestemming in Nederland: nieuw gebruik van stad en land*. Rotterdam Nai Uitgevers/Publ.

Steinmetz, B. (2005). De Zwijger wordt beeldschoon. *Parool*

Sylvester, M. (2015). Forse leegstand van monumenten. *Cobouw*. Retrieved from http://www.cobouw.nl/artike¬l/1150491-forse-leegstand-van-monumenten

Throsby, C. D. (2006). Paying for the past: Economics, cultural heritage, and public policy. In K. Anderson (Ed.), *Australia's Economy in its International Context: The Joseph Fisher Lectures* (Vol. Volume 2, pp. 527). Adelaide: The university of Adelaide press.

van Dommelen, S., & Pen, C. J. (2013). Over deze publicatie In *Cultureel erfgoed op waarde geschat: economische waardering, verevening en erfgoedbeleid.* Den Haag: Platform31.

van Duijn, M., & Rouwendal, J. (2013). Cultureel erfgoed en het vestigingsgedrag van huishoudens. *Journal of Economic Geography, 13*, 473-500.

Van Stigt, A. J. (n.d.). Pakhuis de Zwijger. Retrieved from https://www.burovanstigt.nl/wp-content/uploads/2018/10/Pakhuis%20de%20Zwijger%20-%20A.J.%20van%20stigt%20vertelt.pdf

Westergasfabriek. (n.d.). Geschiedenis Retrieved from http://www.westergasfabriek.nl/achtergrondinformatie/geschiedenis/

Zahirovic-Herbert, V., & Chatterjee, S. (2012). Historic preservation and residential property values: evidence from quantile regression. *Urban Studies, 49*(2), 369-382.

Icons

The Noun Project (2018), via: https://thenounproject.com/

Appendices

Appendix 1: Interview Protocol

Semi-structured interview
Interviewees: Praktijk, onderzoek, overheid
- Jos Bazelmans, hoofd archeologie Rijksdienst voor het cultureel erfgoed
- Jan-willem Andriessen, Oprichter Redres de Erfgoedexpert
- Wessel de Jonge, directeur Wessel de Jonge Architecten BNA B.V. (bureau gericht op herbestemming) en Hoogleraar heritage & design
- Sunna Schuijt, Assistent Architect bij VIS restauratie architecten
- Rosan Pallada, ontwikkelaar bij MeyerBergman erfgoed ontwikkeling

Doel interview
Experts kijk op het herbestemmen van cultureel erfgoed onderzoeken. Zien zij herbestemming als iets noodzakelijks, door de groeiende leegstand? En wat voor waarden zien zij in erfgoed, welke waarden zijn belangrijk voor hun werk, op welke aspecten letten zij.
De interviews zijn tevens opgesteld om feedback te krijgen op de beschreven waarden van cultureel erfgoed in het literatuuronderzoek en de categorisatie hiervan. Om zo overbodige of ontbrekende waarden toe te kunnen voegen.

01 Introductie
> Persoonlijke intro en introductie afstuderen (conceptueel model meenemen)

02 Algemeen
1. Wat is uw persoonlijke ervaring met (het herbestemmen van) cultureel erfgoed.
2. Wat is uw persoonlijke motivatie voor het focussen op cultureel erfgoed/herbestemming.
3. Kunt u wat meer over uw bedrijf vertellen?

03 Waardering
4. Welke extra waarde heeft erfgoed naast andere/normale gebouwen?
5. Ziet u een groei in leegstaand van (industrieel) erfgoed?
6. Ziet u dat herbestemmen een steeds grotere opgave wordt?
7. Is er een stijging in markt/vastgoed waarde te zien na het herbestemmen van erfgoed?
8. Heeft deze marktwaarde stijging ook effect op de omliggende omgeving/gebouwen?
9. Welke waarden zijn volgens u van invloed op de marktwaardestijging van omliggend vastgoed/omgeving
10. Ziet u andere opties naast herbestemmen zoals sloop? Wanneer dan, welke gevallen?
11. Welke waarden worden toegevoegd door herbestemming?

04 Persoonlijk
Rosan Pallada
- o Hoe komen jullie aan nieuwe projecten?
- o Op welke manier selecteren jullie nieuwe projecten, welke waarden of aspecten van een gebouw zijn voor jullie van belang?
- o Hoe bepalen jullie de nieuwe functie van een gebouw?

Sunna Schuijt
- o Hoe komen jullie aan nieuwe projecten?
- o Als jullie een nieuw ontwerp maken voor een oud pand, op welke waarde of aspecten van het pand letten jullie dan?
- o Zit hierbij een verschil in jullie werk van bouwhistorisch onderzoek, restauratie of renovatie?

Jan-Willem Andriessen
- o Hoe komen jullie aan nieuwe gebouwen?

- o   Op welke waarden of aspecten van een gebouw letten jullie bij aankoop van een gebouw?
- o   Op welke waarden of aspecten richten kopers zich vooral?
- o   Hoe vertalen jullie deze waarden in een marktwaarde voor het gebouw?

Jos Bazelmans
- o   In uw stuk "waarde in meervoud" in de publicatie van platform 31, cultureel erfgoed op waarde geschat, verteld u dat de definitie en het gebruik van het begrip waarde veranderen, zou u hier iets meer over kunnen vertellen? Hoe heeft u dit zien veranderen in de afgelopen tijd?
- o   U maakt onderscheid tussen economisch en niet-economische waarde, welke wordt het meest gebruikt in de erfgoedzorg binnen de RCE? En waarom?
- o   Naar welke waarde binnen een gebouw kijkt het RCE om een monument status aan een gebouw te verlenen?
- o   Naar welke waarde van een gebouw wordt gekeken om een subsidie herbestemming te kunnen krijgen?
- o   Hoe worden de verschillende monumenten geprioriteerd?

Wessel De Jonge
- o   Hoe komen jullie aan nieuwe gebouwen?
- o   Hoe bepalen jullie welke nieuwe projecten jullie aannemen?
- o   Als jullie een nieuw ontwerp maken voor een oud pand, op welke waarde of aspecten van het pand letten jullie dan?
- o   Welke waardes zijn belangrijk voor herbestemming van een gebouw?
- o   Vindt u als architect andere waardes belangrijk dan uw opdrachtgevers?

Elisabeth Ruijgrok
- o   Waarom koos u ervoor onderzoek te doen naar de waarde van cultureel erfgoed in euro's?
- o   Wat is in uw optiek de waarde van erfgoed?
- o   In uw onderzoek focust u op de economische waarde van cultureel erfgoed, hangt deze samen met de culturele waarde van erfgoed?
- o   Waarom heeft u voor the recreational perception value, the bequest value en the housing comfort value gekozen in uw onderzoek?
- o   Voor uw onderzoek heeft u een variabele lijst gemaakt voor het hedonisch prijsmodel, kunt u mij vertellen hoe u de neighboorhood quality heeft bepaald?
        NQ = Neighbourhood quality (calculated z-score on number of parameters
- o   Heeft u feedback op mijn variabele lijst?

05 Waarden literatuur
Intro verschillende waarden die gevonden zijn in literatuur, plus categorisatie

12. Kunt u zich vinden in het onderscheid tussen economische en niet-economische waarde?
13. Wat is volgens u de samenhang tussen economische en niet-economische (culturele waarde) waarde?
14. Hoe zouden niet-economische/ culturele waarden economisch gemaakt worden
15. Feedback op waarden, ontbreken er nog waarden, waarden overbodig
16. Feedback op categorisatie
17. Welke waarden zijn volgens u het belangrijkst

06 Slot
18. Tips, op of aanmerkingen?

Appendix 2: Recoding variables

Variabel named by NVM	Number of categories	Orginial Categories			Variabel	Number of categories	New Categories	
BWPER	11	-1	Geen bouwjaar mogelijk (geen woning)	→	Construction Year	9	1	1500-1905
		0	Onbekend, voor 1500 of na transactiejaar				2	1906-1930
		1	1500-1905				3	1931-1944
		2	1906-1930				4	1945-1959
		3	1931-1944				5	1960-1970
		4	1945-1959				6	1971-1980
		5	1960-1970				7	1981-1990
		6	1971-1980				8	1991-2000
		7	1981-1990				9	> 2001
		8	1991-2000					
		9	> 2001					
SOORT WONING	22	-1	Geen woning	→	Housetype	9	1	Eengezins
		0	Ander soort huis				2	Grachtenpand
		1	Stacaravan				3	Herenhuis
		2	Eenvoudig				4	Benedenwoning
		3	Woonboot				5	Bovenwoning
		4	Recreatiewoning				6	Maisonnette
		5	Eengezins				7	Portiekflat
		6	Grachtenpand				8	Galerijflat
		7	Herenhuis				9	Beneden- en bovenwoning (samen)
		8	Woonboerderij					
		9	Bungalow					
		10	Villa					
		11	Landhuis					
		12	Landgoed					
		20	Ander soort appartement					
		21	Benedenwoning					
		22	Bovenwoning					
		23	Maisonnette					
		24	Portiekflat					
		25	Galerijflat					
		26	Verzorgingsflat					
		27	Beneden- en bovenwoning (samen)					
TUINLIG	10	-1	Geen woning	→	Garden	3	0	Niet opgegeven of geen tuin mogelijk
		0	Niet opgegeven of geen tuin mogelijk					Noord-West
		1	Noord				1	Noord
		2	Noord-Oost					Noord-Oost

		3	Oost						Oost
		4	Zuid-Oost						Zuid-Oost
		5	Zuid						Zuid
		6	Zuid-West					2	Zuid-West
		7	West						West
		8	Noord-West						
VERW	5	-1	Geen woning	→	Heating	3			
		0	Geen verwarming					0	Geen verwarming
		1	Gaskachel of kolenkachel					1	Gaskachel of kolenkachel
		2	CV-ketel, blokverwarming, stadsverwarming, moederhaard of hete lucht					2	CV-ketel, blokverwarming, stadsverwarming, moederhaard of hete lucht
		3	Airconditioning of zonnecollectoren						Airconditioning of zonnecollectoren
ISOL	7	-1	Geen woning	→	Insulation	3			
		0	Geen isolatie					0	Geen isolatie
		1	1 soort isolatie					1	1 soort isolatie
		2	2 soorten isolatie						2 soorten isolatie
		3	3 soorten isolatie						3 soorten isolatie
		4	4 soorten isolatie					2	4 soorten isolatie
		5	5 of meer soorten isolatie / volledig geïsoleerd						5 of meer soorten isolatie / volledig geïsoleerd
PARKEER	7	-1	Geen woning	→	Parking space	3			
		0	Geen parkeergelegenheid					0	Geen parkeergelegenheid
		2	Parkeerplaats					1	Parkeerplaats
		3	Carport en geen garage						Carport en geen garage
		4	Garage en geen carport						Garage en geen carport
		6	Garage en carport					2	Garage en carport
		8	Garage bestemd voor meer auto's						Garage bestemd voor meer auto's
ONBI	10	-1	Geen woning	→	Maintenance Inside	5			
		1	Slecht					1	Slecht
		2	Matig tot slecht						Matig tot slecht
		3	Matig					2	Matig
		4	Matig tot redelijk						Matig tot redelijk
		5	Redelijk					3	Redelijk
		6	Redelijk tot goed of niet ingevuld						Redelijk tot goed of niet ingevuld
		7	Goed					4	Goed
		8	Goed tot uitstekend						Goed tot uitstekend
		9	Uitstekend					5	Uitstekend
ONBU	10	-1	Geen woning	→	Maintenance Outside	5			
		1	Slecht					1	Slecht
		2	Matig tot slecht						Matig tot slecht

Variable	Type	Code	Value		Variable	Type	Code	Value
		3	Matig				2	Matig
		4	Matig tot redelijk					Matig tot redelijk
		5	Redelijk				3	Redelijk
		6	Redelijk tot goed of niet ingevuld					Redelijk tot goed of niet ingevuld
		7	Goed				4	Goed
		8	Goed tot uitstekend					Goed tot uitstekend
		9	Uitstekend				5	Uitstekend
Monumentaal	2	0	Niet monumentaal		Monumentaal	2	0	Niet monumentaal
		1	Monumentaal				1	Monumentaal
Erfpacht	3	-1	Onbekend		Erfpacht	3	-1	Onbekend
		0	Geen Erfpacht				0	Geen Erfpacht
		1	Erfpacht				1	Erfpacht
m2	continu				Floor space	continu		
NKAMERS	continu				Number of Rooms	continu		

Appendix 3: Mode & Range

Statistics

	Construction year	Groundlease	Garden orientation	Heating	Insulation	Parking	Maintenance inside	Maintenance outside	Monument	Housingtype
Mode	2	1	0	2	1	0	4	4	0	5
Minimum	1	-1	0	0	0	0	1	1	0	1
Maximum	9	1	2	2	2	2	5	5	1	9
	1 1500-1905 2 **1906-1930** 3 1931-1944 4 1945-1959 5 1960-1970 6 1971-1980 7 1981-1990 8 1991-2000 9 > 2001	-1 unknown 0 No groundlease 1 **groundlease**	**0 No garden** 1 NW, N, NO, O, ZO 2 Z, ZW, W	0 No Heating 1 Gas or coal heating **2 CH boiler, block heating, district heating, hot air, air-condition or solar panels**	0 No insulation **1 1 or 2 kinds of insulation** 2 3, 4 or 5 kinds of insulation	**0 No parking** 1 Parking 2 Garage or carport	1 bad 2 mediocre 3 Reasonable **4 Good** 5 Excellent	1 bad 2 mediocre 3 Reasonable **4 Good** 5 Excellent	**0 No monument** 1 Monument	1 Eengezins 2 Grachtenpand 3 Herenhuis 4 Beneden woning **5 Boven woning** 6 Maisonnette 7 Portiekflat 8 Galerijflat 9 Beneden- en bovenwoning (samen)

Appendix 4: Specification Basic model

Parameter Estimates

Dependent Variable: LNpicesqm

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	9,038	,159	56,685	,000	8,725	9,350
LNsqm	-,226	,002	-110,962	,000	-,230	-,222
[Postalcode=1011]	,624	,013	47,366	,000	,598	,649
[Postalcode=1012]	,564	,013	42,605	,000	,538	,590
[Postalcode=1013]	,553	,013	42,907	,000	,528	,578
[Postalcode=1014]	,373	,047	7,890	,000	,280	,466
[Postalcode=1015]	,690	,013	53,502	,000	,665	,715
[Postalcode=1016]	,724	,013	55,772	,000	,698	,749
[Postalcode=1017]	,709	,013	54,950	,000	,684	,734
[Postalcode=1018]	,542	,013	42,195	,000	,517	,568
[Postalcode=1019]	,448	,013	34,860	,000	,423	,473
[Postalcode=1021]	,200	,014	14,559	,000	,173	,227
[Postalcode=1022]	,178	,019	9,599	,000	,141	,214
[Postalcode=1023]	,325	,015	21,940	,000	,296	,354
[Postalcode=1024]	,003	,013	,213	,831	-,023	,029
[Postalcode=1025]	,052	,013	3,988	,000	,026	,078
[Postalcode=1026]	,575	,025	23,077	,000	,526	,624
[Postalcode=1027]	,418	,034	12,308	,000	,352	,485
[Postalcode=1028]	,505	,033	15,116	,000	,440	,571
[Postalcode=1031]	,264	,017	15,481	,000	,231	,298
[Postalcode=1032]	,115	,014	7,967	,000	,087	,144
[Postalcode=1033]	,043	,013	3,215	,001	,017	,068
[Postalcode=1034]	,010	,013	,748	,455	-,016	,036
[Postalcode=1035]	,040	,013	3,029	,002	,014	,066
[Postalcode=1036]	-,052	,028	-1,825	,068	-,107	,004
[Postalcode=1041]	,069	,092	,753	,451	-,111	,250
[Postalcode=1051]	,478	,013	37,102	,000	,453	,503
[Postalcode=1052]	,529	,013	40,821	,000	,504	,555
[Postalcode=1053]	,532	,013	41,380	,000	,506	,557
[Postalcode=1054]	,618	,013	48,268	,000	,593	,643
[Postalcode=1055]	,293	,013	22,848	,000	,268	,318
[Postalcode=1056]	,384	,013	29,980	,000	,359	,409
[Postalcode=1057]	,402	,013	31,034	,000	,377	,427
[Postalcode=1058]	,458	,013	35,777	,000	,433	,484

[Postalcode=1059]	,488	,013	37,488	,000	,462	,514
[Postalcode=1060]	,073	,013	5,580	,000	,047	,099
[Postalcode=1061]	,086	,014	5,983	,000	,058	,114
[Postalcode=1062]	,136	,014	9,890	,000	,109	,162
[Postalcode=1063]	,047	,013	3,627	,000	,022	,073
[Postalcode=1064]	,078	,013	5,960	,000	,052	,104
[Postalcode=1065]	,100	,013	7,446	,000	,074	,126
[Postalcode=1066]	,132	,013	10,095	,000	,106	,157
[Postalcode=1067]	-,028	,013	-2,085	,037	-,054	-,002
[Postalcode=1068]	,033	,013	2,490	,013	,007	,058
[Postalcode=1069]	-,011	,013	-,829	,407	-,036	,015
[Postalcode=1071]	,829	,013	63,744	,000	,803	,854
[Postalcode=1072]	,589	,013	45,722	,000	,564	,614
[Postalcode=1073]	,569	,013	43,984	,000	,544	,594
[Postalcode=1074]	,561	,013	42,493	,000	,535	,587
[Postalcode=1075]	,681	,013	52,478	,000	,656	,707
[Postalcode=1076]	,600	,013	45,508	,000	,574	,625
[Postalcode=1077]	,789	,013	60,409	,000	,763	,814
[Postalcode=1078]	,618	,013	47,870	,000	,593	,644
[Postalcode=1079]	,544	,013	41,819	,000	,518	,569
[Postalcode=1081]	,348	,013	25,890	,000	,322	,375
[Postalcode=1082]	,298	,013	22,996	,000	,273	,324
[Postalcode=1083]	,320	,013	24,179	,000	,294	,346
[Postalcode=1086]	,220	,016	13,813	,000	,189	,252
[Postalcode=1087]	,162	,013	12,267	,000	,137	,188
[Postalcode=1091]	,467	,013	36,310	,000	,442	,493
[Postalcode=1092]	,446	,013	33,496	,000	,420	,472
[Postalcode=1093]	,428	,013	32,095	,000	,402	,454
[Postalcode=1094]	,353	,013	27,331	,000	,328	,379
[Postalcode=1095]	,319	,013	24,054	,000	,293	,345
[Postalcode=1096]	,501	,017	30,361	,000	,469	,534
[Postalcode=1097]	,420	,013	31,253	,000	,394	,447
[Postalcode=1098]	,465	,013	35,898	,000	,439	,490
[Postalcode=1102]	-,119	,013	-9,107	,000	-,144	-,093
[Postalcode=1103]	-,139	,013	-10,439	,000	-,165	-,113
[Postalcode=1104]	-,179	,014	-12,833	,000	-,206	-,152
[Postalcode=1106]	-,129	,013	-9,803	,000	-,155	-,103
[Postalcode=1107]	-,111	,014	-8,201	,000	-,137	-,084
[Postalcode=1108]	-,131	,014	-9,513	,000	-,158	-,104
[Postalcode=1109]	0[a]	.	.	.	.	.
[Saleperquarter=1 Q 2000]	-,766	,006	-122,468	,000	-,779	-,754

[Saleperquarter=1 Q 2001]	-,648	,006	-106,924	,000	-,660	-,636
[Saleperquarter=1 Q 2002]	-,621	,006	-109,040	,000	-,633	-,610
[Saleperquarter=1 Q 2003]	-,647	,006	-110,247	,000	-,658	-,635
[Saleperquarter=1 Q 2004]	-,668	,005	-121,707	,000	-,678	-,657
[Saleperquarter=1 Q 2005]	-,625	,005	-117,585	,000	-,636	-,615
[Saleperquarter=1 Q 2006]	-,558	,005	-112,000	,000	-,568	-,548
[Saleperquarter=1 Q 2007]	-,469	,005	-95,791	,000	-,479	-,459
[Saleperquarter=1 Q 2008]	-,368	,005	-74,000	,000	-,378	-,358
[Saleperquarter=1 Q 2009]	-,426	,006	-77,311	,000	-,437	-,415
[Saleperquarter=1 Q 2010]	-,427	,005	-82,908	,000	-,437	-,417
[Saleperquarter=1 Q 2011]	-,424	,005	-79,443	,000	-,435	-,414
[Saleperquarter=1 Q 2012]	-,463	,005	-84,382	,000	-,474	-,453
[Saleperquarter=1 Q 2013]	-,530	,006	-88,398	,000	-,542	-,518
[Saleperquarter=1 Q 2014]	-,470	,005	-94,042	,000	-,480	-,460
[Saleperquarter=1 Q 2015]	-,371	,005	-77,977	,000	-,380	-,362
[Saleperquarter=1 Q 2016]	-,235	,005	-49,441	,000	-,244	-,226
[Saleperquarter=1 Q 2017]	-,087	,005	-17,479	,000	-,097	-,077
[Saleperquarter=2 Q 2000]	-,732	,006	-125,640	,000	-,743	-,720
[Saleperquarter=2 Q 2001]	-,625	,006	-107,308	,000	-,636	-,613
[Saleperquarter=2 Q 2002]	-,606	,006	-108,518	,000	-,617	-,595
[Saleperquarter=2 Q 2003]	-,663	,006	-117,681	,000	-,674	-,652
[Saleperquarter=2 Q 2004]	-,653	,005	-122,973	,000	-,663	-,643
[Saleperquarter=2 Q 2005]	-,603	,005	-116,691	,000	-,613	-,592
[Saleperquarter=2 Q 2006]	-,533	,005	-109,157	,000	-,543	-,524
[Saleperquarter=2 Q 2007]	-,421	,005	-87,970	,000	-,431	-,412
[Saleperquarter=2 Q 2008]	-,350	,005	-72,963	,000	-,360	-,341
[Saleperquarter=2 Q 2009]	-,422	,005	-81,763	,000	-,432	-,411
[Saleperquarter=2 Q 2010]	-,416	,005	-80,620	,000	-,426	-,405
[Saleperquarter=2 Q 2011]	-,411	,005	-78,035	,000	-,421	-,401
[Saleperquarter=2 Q 2012]	-,472	,005	-89,894	,000	-,482	-,461
[Saleperquarter=2 Q 2013]	-,515	,005	-97,955	,000	-,526	-,505
[Saleperquarter=2 Q 2014]	-,441	,005	-94,036	,000	-,450	-,432
[Saleperquarter=2 Q 2015]	-,333	,004	-74,280	,000	-,342	-,324
[Saleperquarter=2 Q 2016]	-,187	,005	-41,343	,000	-,196	-,178
[Saleperquarter=2 Q 2017]	-,051	,005	-10,649	,000	-,060	-,041
[Saleperquarter=3 Q 2000]	-,687	,006	-114,802	,000	-,698	-,675
[Saleperquarter=3 Q 2001]	-,622	,006	-109,195	,000	-,633	-,611
[Saleperquarter=3 Q 2002]	-,620	,006	-109,262	,000	-,632	-,609
[Saleperquarter=3 Q 2003]	-,679	,005	-125,239	,000	-,690	-,668
[Saleperquarter=3 Q 2004]	-,648	,005	-121,681	,000	-,658	-,637
[Saleperquarter=3 Q 2005]	-,590	,005	-115,501	,000	-,600	-,580

[Saleperquarter=3 Q 2006]	-,515	,005	-104,780	,000	-,524	-,505
[Saleperquarter=3 Q 2007]	-,408	,005	-84,163	,000	-,417	-,398
[Saleperquarter=3 Q 2008]	-,360	,005	-73,590	,000	-,370	-,351
[Saleperquarter=3 Q 2009]	-,428	,005	-84,781	,000	-,438	-,419
[Saleperquarter=3 Q 2010]	-,419	,005	-78,615	,000	-,429	-,409
[Saleperquarter=3 Q 2011]	-,425	,005	-82,098	,000	-,435	-,415
[Saleperquarter=3 Q 2012]	-,493	,005	-90,184	,000	-,504	-,482
[Saleperquarter=3 Q 2013]	-,515	,005	-99,731	,000	-,526	-,505
[Saleperquarter=3 Q 2014]	-,427	,005	-91,379	,000	-,437	-,418
[Saleperquarter=3 Q 2015]	-,307	,005	-66,382	,000	-,316	-,298
[Saleperquarter=3 Q 2016]	-,157	,005	-33,254	,000	-,166	-,148
[Saleperquarter=3 Q 2017]	-,037	,005	-7,556	,000	-,047	-,028
[Saleperquarter=4 Q 2000]	-,659	,006	-111,248	,000	-,670	-,647
[Saleperquarter=4 Q 2001]	-,615	,006	-105,063	,000	-,627	-,604
[Saleperquarter=4 Q 2002]	-,643	,006	-112,848	,000	-,654	-,632
[Saleperquarter=4 Q 2003]	-,682	,005	-128,068	,000	-,692	-,671
[Saleperquarter=4 Q 2004]	-,632	,005	-124,558	,000	-,642	-,622
[Saleperquarter=4 Q 2005]	-,575	,005	-117,165	,000	-,585	-,566
[Saleperquarter=4 Q 2006]	-,493	,005	-101,521	,000	-,502	-,483
[Saleperquarter=4 Q 2007]	-,388	,005	-80,480	,000	-,398	-,379
[Saleperquarter=4 Q 2008]	-,393	,005	-74,419	,000	-,403	-,383
[Saleperquarter=4 Q 2009]	-,428	,005	-87,158	,000	-,438	-,419
[Saleperquarter=4 Q 2010]	-,418	,005	-83,922	,000	-,427	-,408
[Saleperquarter=4 Q 2011]	-,456	,005	-87,614	,000	-,466	-,446
[Saleperquarter=4 Q 2012]	-,504	,005	-103,351	,000	-,513	-,494
[Saleperquarter=4 Q 2013]	-,490	,005	-100,674	,000	-,500	-,481
[Saleperquarter=4 Q 2014]	-,390	,005	-85,509	,000	-,399	-,381
[Saleperquarter=4 Q 2015]	-,277	,005	-61,431	,000	-,285	-,268
[Saleperquarter=4 Q 2016]	-,124	,005	-26,658	,000	-,133	-,115
[Saleperquarter=4 Q 2017]	0[a]	.	.	.	.	.
[Maintenanceinside=1]	-,197	,010	-19,914	,000	-,217	-,178
[Maintenanceinside=2]	-,178	,004	-43,643	,000	-,186	-,170
[Maintenanceinside=3]	-,156	,002	-67,424	,000	-,160	-,151
[Maintenanceinside=4]	-,064	,002	-38,456	,000	-,068	-,061
[Maintenanceinside=5]	0[a]	.	.	.	.	.
[Parking=0]	-,087	,002	-44,493	,000	-,090	-,083
[Parking=1]	-,012	,003	-3,940	,000	-,019	-,006
[Parking=2]	0[a]	.	.	.	.	.
[Groundlease=-1]	,020	,002	11,643	,000	,016	,023
[Groundlease=0]	,058	,001	45,648	,000	,055	,060
[Groundlease=1]	0[a]	.	.	.	.	.

[Monument=0]	-,074	,003	-27,299	,000	-,079	-,069
[Monument=1]	0ᵃ	.	.	.	.	.
[Gardenorientation=0]	-,060	,002	-35,073	,000	-,063	-,057
[Gardenorientation=1]	-,009	,002	-4,968	,000	-,013	-,006
[Gardenorientation=2]	0ᵃ	.	.	.	.	.
[Heating=0]	-,031	,002	-15,451	,000	-,035	-,027
[Heating=1]	-,073	,002	-31,529	,000	-,077	-,068
[Heating=2]	0ᵃ	.	.	.	.	.
[Insulation=0]	-,025	,001	-18,319	,000	-,027	-,022
[Insulation=1]	-,037	,001	-30,609	,000	-,039	-,034
[Insulation=2]	0ᵃ	.	.	.	.	.
[Housingtype=1]	-,015	,005	-3,145	,002	-,024	-,006
[Housingtype=2]	,102	,008	13,531	,000	,087	,117
[Housingtype=3]	,034	,005	6,397	,000	,024	,045
[Housingtype=4]	-,066	,005	-14,385	,000	-,075	-,057
[Housingtype=5]	-,078	,005	-17,027	,000	-,086	-,069
[Housingtype=6]	-,086	,005	-17,157	,000	-,096	-,076
[Housingtype=7]	-,092	,005	-19,177	,000	-,102	-,083
[Housingtype=8]	-,144	,005	-28,379	,000	-,154	-,134
[Housingtype=9]	0ᵃ	.	.	.	.	.
[Maintenanceoutside=1]	-,036	,022	-1,644	,100	-,078	,007
[Maintenanceoutside=2]	-,084	,009	-9,275	,000	-,102	-,067
[Maintenanceoutside=3]	-,059	,003	-18,406	,000	-,065	-,053
[Maintenanceoutside=4]	-,023	,002	-12,284	,000	-,026	-,019
[Maintenanceoutside=5]	0ᵃ	.	.	.	.	.
[LNNumberofrooms=1,10]	,392	,158	2,474	,013	,081	,702
[LNNumberofrooms=1,39]	,394	,158	2,487	,013	,083	,704
[LNNumberofrooms=1,61]	,426	,158	2,688	,007	,115	,736
[LNNumberofrooms=1,79]	,443	,158	2,795	,005	,132	,753
[LNNumberofrooms=1,95]	,478	,158	3,020	,003	,168	,789
[LNNumberofrooms=2,08]	,492	,158	3,107	,002	,182	,802
[LNNumberofrooms=2,20]	,517	,158	3,264	,001	,206	,827
[LNNumberofrooms=2,30]	,551	,158	3,476	,001	,240	,861
[LNNumberofrooms=2,40]	,513	,158	3,239	,001	,203	,824
[LNNumberofrooms=2,48]	,503	,159	3,173	,002	,192	,814
[LNNumberofrooms=2,56]	,486	,159	3,062	,002	,175	,797
[LNNumberofrooms=2,64]	,469	,159	2,945	,003	,157	,781
[LNNumberofrooms=2,71]	,479	,159	3,006	,003	,167	,791
[LNNumberofrooms=2,77]	,453	,161	2,824	,005	,139	,768
[LNNumberofrooms=2,83]	,444	,163	2,732	,006	,126	,763
[LNNumberofrooms=2,89]	,219	,167	1,313	,189	-,108	,546

[LNNumberofrooms=2,94]	,862	,171	5,044	,000	,527	1,197
[LNNumberofrooms=3,00]	,186	,194	,961	,337	-,194	,566
[LNNumberofrooms=3,04]	,027	,194	,138	,890	-,353	,407
[LNNumberofrooms=3,09]	,042	,194	,219	,827	-,338	,422
[LNNumberofrooms=3,18]	0ª	.	.	.	.	.

a. This parameter is set to zero because it is redundant.