Design strategies for adaptive reuse of 20th century industrial heritage with stakeholders' involvement.

The case of Kabelfabriek Delft.

Content

Introduction

This research plan presents the topic chosen for the graduation year of the masters of Architecture & Heritage at the Technical University of Delft. The first two quarters of the graduation year are set up as a research phase, which will be used as the starting point for the design phase of the second half of the year. "Heritage 4all: Univer-Cities" is chosen as the graduation studio. The focus of this graduation studio lies on the following four themes: Co-creation, sustainability, univer-cities and digital heritage.

Firstly, as the name of the studio refers to, "Heritage 4all", the fundamental vision is that stakeholders, people related to a specific debate, are involved and that co-creation is the approach of the research and design assignment. In other words not only experts (e.g. architects, designers, planners), who are educated for it, would produce and decide over the built environment, but also the general public, who are not experts in the field of planning, design and management, would be taken along in such process of producing the built environment. Citizens values, thoughts and experiences must be taken into account since in the end the citizens use, work, live in the spaces created. This represents the heritage that needs to be preserved carefully. This process of co-creation may raise complicated issues, as the values and attributes, thoughts and experiences can be antipodal.

The second theme of this graduation studio is sustainability. Similarly to co-creation, sustainability in its broadest sense of the word, in combination with heritage can culminate in complicated issues and ethical questions. For example how to deal with heritage values whilst adapting a building to make it energy neutral? Sustainability can also be related to Univer-Cities. "Univer-Cities", cities with a symbiotic relation with the university hosted, like Delft with its high ranked Architecture education should have an example function for sustainability (Teo, 2013). Furthermore the theme Univer-City also addresses the phenomenon of co-creation; what is the relation between the city and its university? Are they separated or do they work together and replenish each other?

The fourth research theme of the graduation studio chosen is Digital Heritage. It does not only refer to computer-based information that has lasting values for contemporary and the future society (e.g. pictures, movies, figures, websites), but particularly digital games are addressed in this research. (UNESCO, 2009)

Recapitulating the graduation studio chosen, "Heritage 4all: Univer-Cities", addresses four themes:
o   Co-creation
o   Sustainability
o   Digital Heritage
o   Univer-Cities

Figure 05. Four themes of Heritage4all (Syllabus, 2020)

The old, partly abandoned, cable factory at the Schieoevers in Delft is chosen as a case study for this research and will be redesigned in the second half of this graduation year. The cable factory, in Dutch called De Kabelfabriek, is one of the factories of the former called NKF company. When discussing the cable factory in this research plan, Kabelfabriek II at Schieweg 15 in Delft is meant. It is not listed as a monument, however it is part of Delft's industrial heritage. The city of Delft used to be known for its industry. Yet because of deindustrialization this image of Delft as an industrial city has changed. More elaborate information about this case study can be found in the chapter 'Case study'.

As mentioned before, the research and design phase will go hand in hand. The product of the research semester will provide a methodology process on which the design semester of the Kabelfabriek will be based. The Kabelfabriek is one of the many factories that because of deindustrialization became vacant and obsolete. Nowadays adaptive reuse is an often used design strategy for industrial heritage. Inherently this creates a dilemma; what do you preserve as heritage and what do you adapt? (Canevaro et al., 2019) (Chatzi Rodopoulou, T., 2020) (Villacampa & Poli, 2013) The involvement of stakeholders is of paramount importance to know what the citizens values and what their necessities are. Therefore this research questions how a co-creation approach can be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders. For the stakeholders involvement Minecraft will be used as the heritage game to explore if it could be supporting the value assessment of the Kabelfabriek. Other case studies (e.g. Westergasfabriek, DRU Industriepark, Stanley Mills, King's Cross and The Tobacco factory of Madrid) will be studied to find out how to make the Kabelfabriek sustainable in terms of energy efficiency and social inclusivity. Besides, the relationship and possible supportive role between the Kabelfabriek and the Technical University of Delft and the city Delft will be researched. In the end this research will provide a strategy to redesign the Kabelfabriek.

Research approach

The main research approach for this graduation studio is co-creation. Into this research the four themes of the studio "Heritage 4all: Univer-Cities" are integrated. Therefore, the main research question refers to co-creation and the three sub questions refer to digital heritage, sustainability and univer-cities.

Understanding of the state of the art
- Literature review
- Case study analysis Kabelfabriek

Co-creation & digital heritage
- Stakeholders involvement
- Minecraft game
- Value assessment
- Program & needs

Sustainability
- Case studies review
- Design solutions

Univer-cities
- Relation TU Delft and the city
- Program

Figure 06. Self-made scheme of the different themes

o Research questions

- Stating the problem

In the Netherlands in the 20th century, a lot of industrial areas and buildings, such as factories, silos and hangars became vacant and obsolete. The main reason for this occurrence is the disappearance of its function in society, technological development and/or moving the building use to another area because production increase or reduction. (Canevaro et al., 2019) (Villacampa & Poli, 2013) Some of these industrial heritage buildings are listed and some are not. Either way, on the one hand from a heritage point of view the industrial building should be conserved because of its historical and cultural meaning. Moreover, the historical significance and the cultural and social values can be controversial, since industrial heritage like the Kabelfabriek can be seen as an icon of both progress, innovation, hardship and suffering. Chatzi Rodopoulou (2020) even states that some industrial heritage is not even aesthetically appealing, but the technological and scientific values make the difference compared to other heritage buildings.
On the other hand the building needs to be changed in a sustainable way for adaptive reuse, both in the sense of energy efficient and socially inclusive. This redevelopment needs to be done with the involvement of the stakeholders who related in some way to the building.

An interesting case study of this topic is, as mentioned earlier, the Kabelfabriek in Delft. But how to tackle redesign projects such as the Kabelfabriek? To find out what the state of the art is of the topic chosen, redesigning 20th century industrial heritage together with stakeholders for adaptive reuse, a literature review has been done. For this literature review the database of Elsevier, named Scopus, is used. Scopus provides more than 30.000 peer reviewed articles of the highest level of different sciences. Critical issues that need to be mentioned is the fact that only Scopus is used for this part of the literature review. And with the use of Scopus, only articles with 'open access' and written in Dutch or English are used. For the research paper also other sources will be used.

The first search designation with the following key words, *"Industrial Heritage" AND "adaptive reuse"*, showed search results in six documents. Three of them are valuable according to this research. The key words, *"Industrial Heritage" AND "stakeholders"*, provided seven document search results, of which four are of value. The number of document results increased by 265 documents when leaving the word 'industrial' out of the search terms. Furthermore, the review of Bottero, D'Alpaos, and Oppio (2019), a valuable research about a decision aiding approach in terms of industrial heritage, led to encounter in two further useful literature sources, Bottero, D'Alpaos, and Oppio (2018) and Plevoets & Van Cleempoel (2011). Bottero, D'Alpaos, and Oppio (2018) and Plevoets & Van Cleempoel (2011). Bottero, D'Alpaos, and Oppio (2018) present their applied method to preserve and adapt heritage and Plevoets & Van Cleempoel (2011) exhibit an overview of different strategies for heritage conservation and architecture. All articles present either a design strategy or a methodology to approach the redesign of heritage. For example, as mentioned above, Bottero, D'Alpaos, and Oppio (2019) focus on one specific method, namely PROMOTHEE. "This method allows the evaluation and ranking of alternatives, identifying the variables that affect such a ranking and analyzing similarities and differences between alternatives."(Bottero, D'Alpaos, and Oppio, 2019, p.785) In their conclusion they state that it would be of scientific interest to use a combination of methods.

Design Strategy	Methodology	Author
Adaptive Reuse	Analysis of multicriteria decision making methods.	(Morkūnaitė, Kalibatas, & Kalibatienė, 2019)
Adaptive Reuse	Analysis of three approaches: typological, technical and architectural strategies.	(Plevoets & Van Cleempoel, 2011)
Adaptive Reuse	Stakeholder involvement through a.o. questionnaires and analysis of the existing.	(Gunn, 2012)
Adaptive Reuse	Methodology based on Burra Charter Process. Three stages: 1. understand the significance (value assessment) 2. develop policy (stakeholders) 3. manage in accordance with policy *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Ifko, 2016)
Adaptive Reuse	Multi-methodological approach: SWOT analysis, Stakeholders analysis (interviews and a big group of different stakeholders) and PROMOTHEE.	(Bottero, D'Alpaos, & Oppio, 2018)
Adaptive Reuse	Empirical analysis of design strategies.	(Loures, 2008)
Adaptive Reuse	PROMOTHEE; ranking criteria, using DM's (Decision Makers are all experts) *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Bottero, D'Alpaos, & Oppio, 2019)
Adaptive Reuse	Case study analysis lacking in-depth approach to methodology.	(Villacampa & Poli, 2013)
Adaptive Reuse	Multidisciplinary approach to optimize preservation of the existing and suitable reuse. *note: how the stakeholders are involved (e.g. questionnaires, interviews) is not mentioned.*	(Canevaro et al., 2019)
Adaptive Reuse	Combination of an analysis of the case study (e.g. materiality and values) and stakeholder involvement (e.g. interviews and polls).	(Lo Faro & Miceli, 2019)

Figure 07. Self-made overview of the ten used articles with their design strategy, methodology and author.

Moreover, comparing the different articles on their references different books, articles or other sources are being used to describe this one specific strategy to reuse heritage. One aspect that they all, the above mentioned ten scientific articles, have in common and is found essential for the redesigning process of heritage, from its value assessment till the design, is the involvement of stakeholders. However, even the group of stakeholders differs from people who are educated in the built environment to people who are not. An interesting remark of Plevoets and Van Cleempoel (2011, p. 155) in their article 'Adaptive reuse as a strategy towards conservation of cultural heritage: a literature review' is that the group of stakeholders should not only be the owners and developers of the concerning project since that will be at the expense of the value assessment of the heritage at risk. They state that the assessment of values is the basis for every reuse project and that the owners and developers mostly are interested in only the socio-economic values, which will make the preservation of 'soft values' (e.g. historical, sociological and cultural) of less importance.

Furthermore, of all these ten articles only three of them mention that interviews or questionnaires are used to involve different stakeholders in the process. The others only state that the involvement of stakeholders is of importance, but do not go into dept how to involve

them. This points out the research gap in terms of the approach of co-creation in combination with adaptive reuse projects.
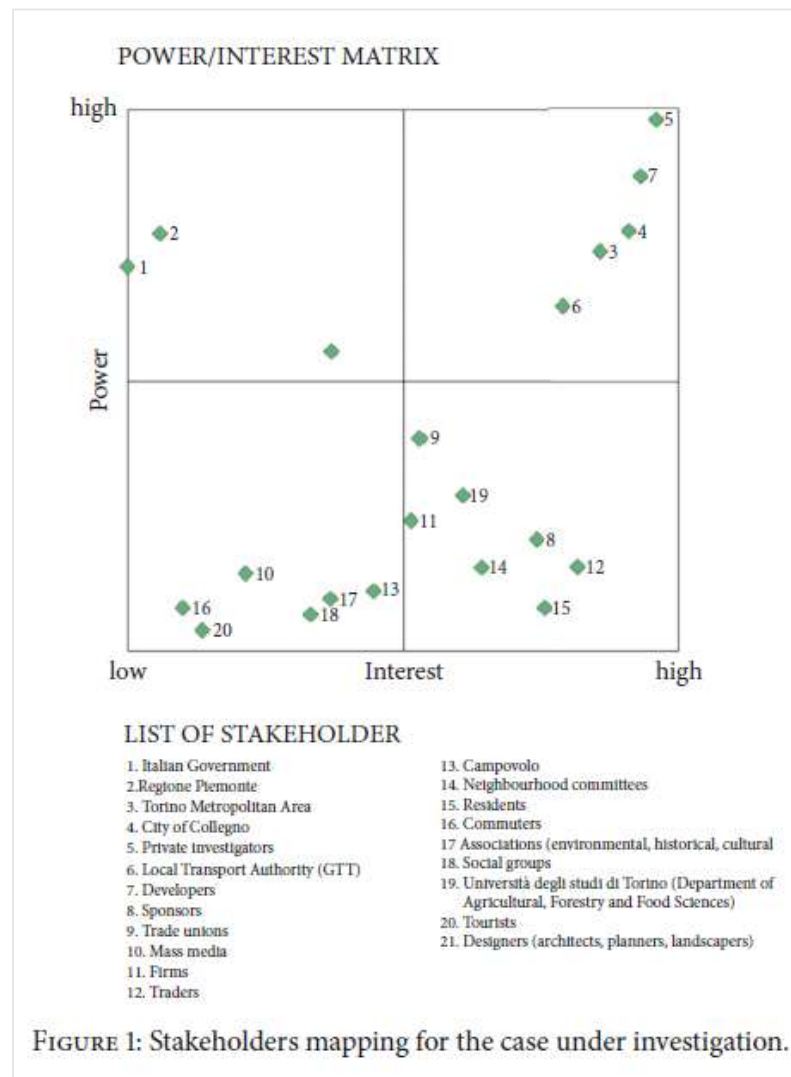

POWER/INTEREST MATRIX

LIST OF STAKEHOLDER

1. Italian Government
2. Regione Piemonte
3. Torino Metropolitan Area
4. City of Collegno
5. Private investigators
6. Local Transport Authority (GTT)
7. Developers
8. Sponsors
9. Trade unions
10. Mass media
11. Firms
12. Traders
13. Campovolo
14. Neighbourhood committees
15. Residents
16. Commuters
17 Associations (environmental, historical, cultural)
18. Social groups
19. Università degli studi di Torino (Department of Agricultural, Forestry and Food Sciences)
20. Tourists
21. Designers (architects, planners, landscapers)

FIGURE 1: Stakeholders mapping for the case under investigation.

Figure 08. Figure and list of stakeholders (Bottero, D'Alpaos, & Oppio, 2018, p. 4)

Concluding one could say that the state of art on preserving and redesigning heritage presents different strategies. Most of the articles are just focussing on one specific strategy, whilst a combination of these would provide a more balanced outcome. This research will investigate which strategies could be combined to make it to one balanced strategy wherein different aspects as co-creation, stakeholders involvement, sustainability and univer-cities are addressed. The research of Morkūnaitė, Kalibatas, and Kalibatienė (2019) show a compilation of these different methods and present a clear figure on the number of the methods identified in their review (see below figure 09). In consonance, Loures (2008) in his research states the following:

> "Moreover, one should notice that the application of these principles is not a sine qua non equation to the success of any project. Site and context research, analysis and synthesis must be performed, once "no size fits all"." (Loures, 2008, p. 300)

MCDM method used (Multi-Criteria Decision Making)	Number of times
AHP (Analytic Hierarchy Process)	20
Fuzzy AHP (Analytic Hierarchy Process)	3
ANP (Analytic Network Process)	8
Fuzzy Delphi	4
Delphi	3
Experts	6
EDAS (Evaluation based on Distance from Average Solution)	1
Fuzzy SAW (Simple Additive Weighting)	1
ELECTRE (ELimination Et Choice Translating Reality)	1
Fuzzy WLC (Weighted Linear Combination)	1
PROMOTHEE (Preference Ranking Organization Method for Enrichment of Evaluations)	2
WSM (Weighted Sum Method)	1
TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)	2
ARAS, ARAS-G (Additive Ratio Assessment with the grey criteria scores)	3
TOPSIS Grey (Technique for Order Preference by Similarity to Ideal Solution with grey numbers)	1
SAW (Simple Additive Weighting)	1
COPRAS (COmplex PRoportional Assessment)	1
Other methods	18
Combination of methods	31

Figure 09. The mostly used MCDM methods used in cultural heritage topic (Morkūnaitė, Kalibatas, & Kalibatienė, 2019, p. 94)

In effect, the terms 'method' and 'strategy' are used disorderly in the different articles. Mainly, the design strategy in these researches is adaptive reuse, but the methods used differ from each other. For a more elaborated explanation on these terms see 'Theoretical Framework'. The acronyms of the table above will be elucidated as well.

Therefore the main research question is:

How can a co-creation approach be applied for redesigning 20th century Industrial Heritage factories for adaptive reuse together with stakeholders?

This research question refers to co-creation design and decision-making. To answer this research question the following sub-questions have been formulated referring to the other themes of the 'Heritage4all' graduation studio:

How can heritage games support the value assessment of stakeholders for the redesign of the Kabelfabriek in Delft? (Digital heritage)

How to redesign Kabelfabriek Delft on sustainable attributes while preserving cultural values? (Sustainability)

What design relation with the TU Delft Campus and the city of Delft could be supported by the Kabelfabriek? (Univer-Cities)

Figure 10. Topics of this research (self-made, 2020)

- Goals

The aim of this research is to develop a co-creation design and decision-making approach for redeveloping industrial heritage with the involvement of stakeholders. In order to do this, a literature review will be done to identify previous methods and tools for adaptive reuse and use them as basis to frame the methodology of this research.

A goal of this research will be to explore Minecraft as a simulation tool for involving stakeholders in co-creation workshops. One of the expected outcomes of such method is to understand and decode citizen's needs, wishes, visions and decode them in a structured value assessment matrix (Pereira Roders & Tarrafa Silva, 2012) (Kuipers & de Jonge, 2017). Another goal is to organize an overview of sustainable design solutions for 20th century industrial heritage based on literature review and case studies review of Chatzi Rodopoulou (2020). A specific interest is directed to the concept of sustainability in Univer-Cities, which defines the last goal related to investigating how the TU Delft Campus and the city Delft can replenish each other.

- Relevance

The relevance of this research lies in the fact that there is still a challenge on how to deal with vacant and obsolete industrial buildings. Heritage that can be considered as crystalized memories of the past or the embodiment of memory should not be demolished, because it is not sustainable in terms of energy and material use, but also in terms of preserving cultural heritage, whether it is listed or not.

The search in literature revealed that the involvement of stakeholders is of paramount importance, however in most articles the methods and tools in which stakeholders are involved is not highlighted or explained properly (Bottero, D'Alpaos, & Oppio, 2019) (Canevaro et al., 2019) (Ifko, 2016) (Loures, 2008) (Morkūnaitė, Kalibatas, & Kalibatienė, 2019) (Plevoets & Van Cleempoel, 2011) (Villacampa & Poli, 2013). No literature was found related to the implementation of serious games for the involvement of stakeholders, which leaves room for further investigation of the advantages and disadvantages of such methods.

o   Research methodology

Different architectural research approaches are applicable for this research. The research approach will be a combination of historical, qualitative, simulation and case studies. This research is related to the following epistemes: phenomenology, praxeology and ecology. (Groat and Wang, 2013).
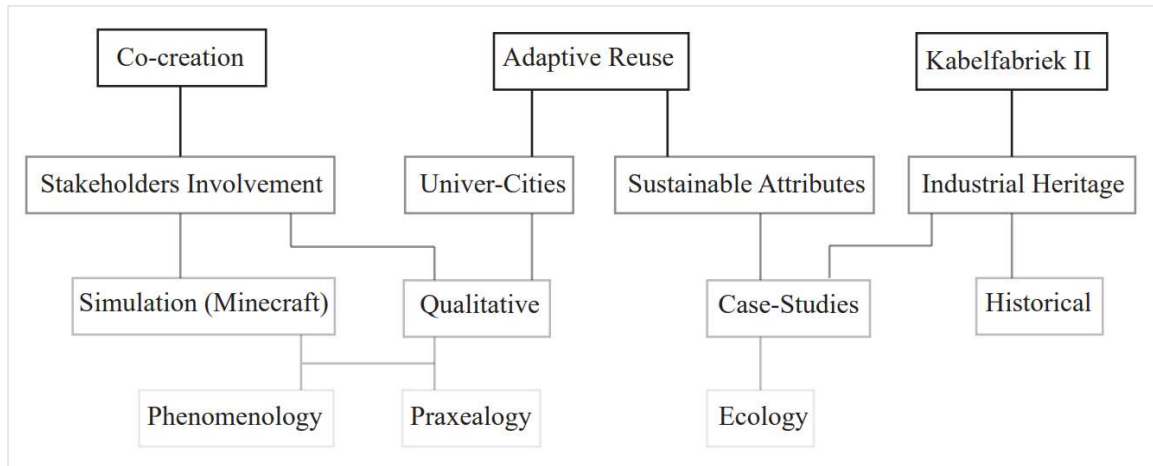

Figure 11. Self-made scheme of the research topics, approaches and epistemes

-   Methods & Tools

Various methods will be applied for the above research approaches. The historical approach consists of analysing the historic evolution of the Kabelfabriek and surroundings through collecting data in (digital) archives. For the qualitative approach a simulation game and surveys, including interviews, will be applied. Through digital gaming models the simulation approach is applicable. The Kabelfabriek will be used as the main case study to answer the different research questions. Besides, other architectural industrial heritage buildings will be analysed to answer the second sub-question about sustainable design solutions. Furthermore, literature review will be done to analyse all the different methods for redesigning industrial heritage.

The sequence of steps to be taken is the following.

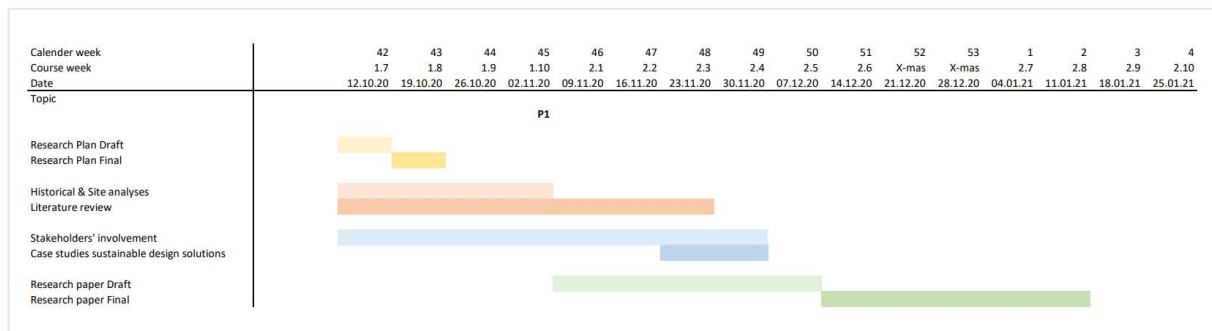|	
Research Plan (draft)	week 42
Research Plan (final)	week 43 (P1)
Historical & Site analyses	week 42-45
Literature review on different methods	week 42-48
Stakeholders' involvement	week 42-49
Case studies sustainable design solutions	week 48-49
Research paper (draft)	week 46-50
Research paper (final)	week 50-02 (P2)

Figure 12. Self-made timetable for the research

Stakeholders involvement & Univer-Cities

For the stakeholders' involvement Minecraft will be used as a medium to interact and to find out the needs of the people and what they value. To be able to properly use Minecraft as a simulation tool to communicate with the stakeholders, it is necessary to follow a training session. This session consists of testing the Minecraft game tool for the co-creation design workshop.

Other ways to involve stakeholders are interviews. Other than that, expert interviews will be done and they will be invited to join the workshop. For example an interview with Anne-Lize Hoftijzer, who is Manager Real Estate Development of the Technical University Delft to find out the relation between the Kabelfabriek and the TU Campus and how they can replenish each other. Furthermore, an interview with developers of the Kabeldistrict Amvest and Kondor Wessels Vastgoed and an interview with Georges van Beers, project leader of the Kabeldistrict, will be done.

Sustainable attributes

To create an overview of sustainable design solutions different case studies will be looked at. The PhD thesis, entitled 'Control Shift – European Industrial Heritage Reuse in Review', of Theodora Chatzi Rodopoulou (2020) will be analysed as some relevant case studies will be selected to integrate this research as good design practices. In order to find out which sustainable design solutions have been applied, it is necessary to compare the context before and after the adaptive reuse is implemented. Drawings, photos and literature will be used accordingly.

Literature review is ongoing to search for relevant scientific articles about various methods on adaptive reuse. Next to Scopus, other sources like the repository of the Technical University of Delft and Web of Science will be tapped. Furthermore expert interviews will be done. For example an interview with Theodora Chatzi Rodopoulou, who obtained her PHD on a review on reuse of European industrial heritage.

Industrial Heritage

To analyse the Kabelfabriek field-work will be done. Pokémon GO, an augmented reality mobile game, will be used to explore the existing values and attributes of the building and site in a different way. This approach to fieldwork is aligned with the Theory of the Derive to ensure that the site visit will guided not by visuals but by the gaming mechanics, making it a spontaneous, surprising, neutral and smooth site visit (Debord, 1958). Archives and libraries will be visited to collect data for the historical evolution analyses. Besides, desk research about the Kabelfabriek will be conducted in consonance with expert interviews. For example an interview with Ilse Rijneveld, monument advisor at the municipality of Delft and an interview with Theodora Chatzi Rodopoulou about the reuse of industrial heritage.

Theoretical framework

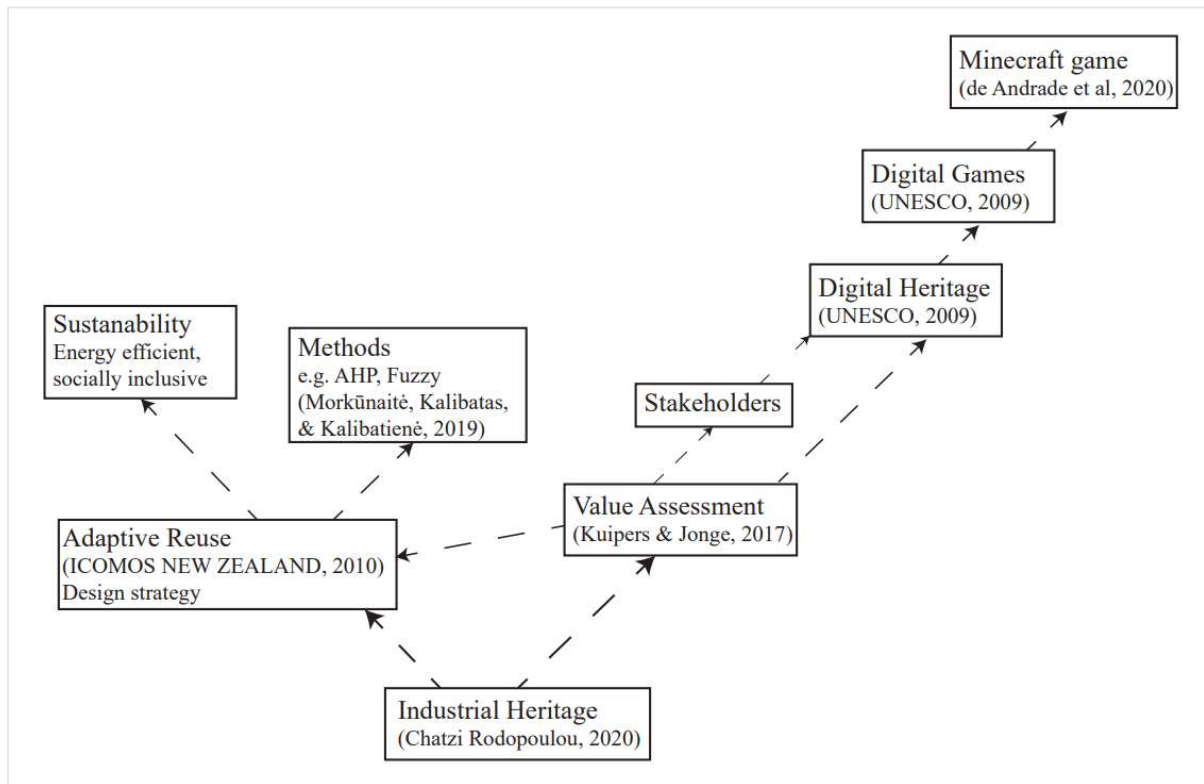This chapter explains the key concepts, which are of importance to this research, and their related theory.

Figure 13. Self-made diagram of the related theories.

Industrial heritage
In her PhD, 'Control Shift – European Industrial Heritage Reuse in Review', Theodora Chatzi Rodopoulou (2020) defines the concept of industrial heritage as follows:

> The Industrial Heritage consists of sites, structures, complexes, areas and landscapes as well as the related machinery, objects or documents that provide evidence of past or ongoing industrial processes of production, the extraction of raw materials, their transformation into goods, and the related energy and transport infrastructures. Industrial Heritage reflects the profound connection between the cultural and natural environment, as industrial processes – whether ancient or modern – depend on natural sources of raw materials, energy and transportation networks to produce and distribute products to broader markets. It includes both material assets – immovable and movable –, and intangible dimensions such as technical know-how, the organization of work and workers, and the complex social and cultural legacy that shaped the life of communities and brought major organizational changes to entire societies and the world in general. (Chatzi Rodopoulou, T., 2020)

The Kabelfabriek is part of the industrial heritage area called the Kabeldistrict. In this research the area of the Kabeldistrict will be taken into account. However the focus lies on the object, the Kabelfabriek.

Adaptive reuse (design strategy)
Several scholars have studied the design strategy of adaptive reuse. The best known scholars in this respect are Eugène Emmanuel Viollet-le-Duc (1814-1879), John Ruskin (1819-1900), William Morris (1834-1896) and Alois Riegl (1858-1905). Viollet-le-Duc was one of the first to acknowledge the potential for adaptive reuse as a strategy to preserve heritage. He stated that the best manner of preservation is finding a new use and adapting the building to the new use in such a way that there is no more need for future adjustments. On the other hand Ruskin and Morris argued against restoration in favor of regular maintenance to preserve heritage. (Plevoets & Van Cleempoel, 2011, p. 156) Riegl added another important feature to this discussion. This important feature is explained in the book 'Designing from Heritage' by Marieke Kuipers and Wessel de Jonge (2017, pp. 68) as a 'dialectic system of essential heritage values'. This will be explained under the subheading 'Value assessment'.

The definition given in the Charter for the Conservation of Places of Cultural Heritage Value is the most concise and therefore best suited for understanding adaptive reuse:
"Adaptation means the process(es) of modifying a place for a compatible use while retaining its cultural heritage value. Adaptation processes include alteration and addition." (ICOMOS NEW ZEALAND, 2010)

Method
As described above, this research aims to investigate which design strategies for adaptive reuse are suitable for the Kabelfabriek as an exemplar of industrial heritage in the Dutch context. The main research question looks at developing an approach for such adaptive reuse strategy. An approach, in this case co-creation, encompasses a direction in which a methodology will be developed as a well-thought-out manner of implementing architectural research. The product of this research therefore will be a methodology, described as a set of methods and tools, to deal with adaptive reuse for 20th century industrial heritage factories. A test will be made at the Kabelfabriek in Delft.
As seen in figure 09, Morkūnaitė, Kalibatas, and Kalibatienė (2019) give an overview of different methods used for decision making process. As a conclusion they state the following:
"Fuzzy, Fuzzy Delphi, ANP and Delphi approaches applied for adaptive reuse. PROMETHEE, ARAS, SAW, TOPSIS, COPRAS used for heritage buildings preservation and renovation." (Morkūnaitė, Kalibatas, & Kalibatienė, 2019, p. 93)
Therefore a description of the methods used for adaptive reuse, heritage buildings preservation and renovation will be given below:

ANP (Analytic Network Process)
"In order to comprehensively analyze the relationship between different levels of factors, the analytic network process (ANP) is widely used." (Dong, Liu, Wang, & Zhang, 2019)

ARAS, ARAS-G (Additive Ratio Assessment with the grey criteria scores)
ARAS (Additive Ratio Assessment) method capable for dealing with problems encompassing qualitative and quantitative criteria being hinged on different units of measurement and a different optimization direction. (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

COPRAS (COmplex PRoportional Assessment)
"COPRAS method as a compromising method evaluating the alternatives on the ratio to the ideal solution and the ratio to the anti-ideal solution." (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

Delphi

"The Delphi method is a common method to collect the consensus of opinions. Influencing factors can be obtained according to the established processes." (Dong, Liu, Wang, & Zhang, 2019)

Fuzzy

"Fuzzy logic is intended to model logical reasoning with vague or imprecise statements." (Stanford Encyclopedia of Philosophy, 2017)

PROMETHEE (Preference Ranking Organization Method for Enrichment of Evaluations)
"PROMETHEE is based on the comparison of alternatives taking into account the deviations that they show according to each criterion." (Selmi, Kormi, & Bel Hadj Ali, 2016)

SAW (Simple Additive Weighting)
"the SAW method is the most popular approach for classical multiple attribute decision-making." (Piasecki, Roszkowska, & Łyczkowska-Hanćkowiak, 2019)

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)
"TOPSIS is based on the principle that the preferred solution should be simultaneously as close as possible to a positive ideal solution, PID, and as far as possible from a negative-ideal solution, NID." (Selmi, Kormi, & Bel Hadj Ali, 2016)

COPRAS (COmplex PRoportional Assessment)
"COPRAS method as a compromising method evaluating the alternatives on the ratio to the ideal solution and the ratio to the anti-ideal solution." (Razavi Hajiagha, Mahdiraji, & Hashemi, 2018)

Values assessment

The Heritage & Architecture Department of the Technical University of Delft set up a valuation tool by way of a matrix. The horizontal axis represents the six layers of Brand, with three more layers added by the H&A Department. The vertical axis represents the heritage values set up by Riegl, with two more values added by the H&A Department. Kuipers and de Jonge (2017, pp. 68) state the following:

> "By filling the boxes of this matrix where relevant with text and images, and leaving non-relevant relationships blank, values are identified and related to tangible and intangible layers. This identification and revealed relationships, once established, become the basis for further understanding the value of a built heritage resource." (Kuipers & de Jonge, 2017, pp. 68)

BRAND + \ RIEGL +	AGE value	HISTORICAL value	INTENTIONAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value	RARITY value [+]	OTHER relevant values [+]
SURROUNDINGS / SETTING [+]									
SITE									
SKIN (exterior)									
STRUCTURE									
SPACE PLAN									
SURFACES (interior) [+]									
SERVICES									
STUFF									
SPIRIT of PLACE [+]									

Figure 14. Value matrix (Kuipers & de Jonge, 2017, pp. 69)

Stakeholders

Stakeholders, the group of people who are in some way connected to the project, should consist of both people who are educated in the built environment and people who are not.

Digital heritage

The fourth research theme of the graduation studio chosen is Digital Heritage. It does not only refer to computer-based information that has lasting values for contemporary and the future society (e.g. pictures, movies, figures, websites), but particularly digital games are addressed in this research (UNESCO, 2009). For this research Minecraft will be the heritage game, used as a simulation tool to get to the value assessment together with stakeholders.

Sustainability

Sustainability has been a hot topic during the past thirty years. It has a broad meaning and therefore the Universal Declaration on Cultural Diversity divided it into "four pillars: economic prosperity, cultural vitality, social equity and environmental sustainability." (UNESCO, 2001) For the second sub research question (*How to redesign Kabelfabriek Delft on sustainable attributes while preserving cultural values?)* case studies will be investigated to create a list of design solutions looking at environmental sustainability, for example systems to control the climate in the building or layers to be added for insulation. Concluding, the focus of this research with regard to sustainability lies in energy efficiency and social inclusivity.

Case study

- Kabelfabriek, Schieweg 15 Delft The Netherlands
- Westergasfabriek, Amsterdam The Netherlands (Chatzi Rodopoulou, T., 2020)
- DRU Industriepark, Ulft The Netherlands (Chatzi Rodopoulou, T., 2020)
- Energiehuis Dordrecht (Chatzi Rodopoulou, T., 2020)
- Stanley Mills, Perthshire Scotland (Chatzi Rodopoulou, T., 2020)
- King's Cross, London England (Chatzi Rodopoulou, T., 2020)
- The Tobacco factory of Madrid, Madrid Spain (Chatzi Rodopoulou, T., 2020)

Kabelfabriek

The Kabelfabriek is located at Schieweg 15 in Delft. The area the factory is situated in is called the Kabeldistrict. The name of the neighbourhood is Schieoevers (Schie shores), since it lies next to the canal Schie. Nowadays Schieoevers is one of the industrial areas remaining in Delft. The city used to be an industrial city, with a lot of factories. However this image of the city has changed and nowadays the city is known for its historic centre and its Technical University. Moreover, the municipality of Delft is planning to redevelop the whole neighbourhood of Schieoevers in collaboration with Mei Architects. The focus of this case study lies on the so-called Kabelfabriek II. Since the Kabelfabriek is one of the remaining factories, a reminder of the industrial city Delft used to be industrial city Delft used to be. Although the Kabelfabriek is a clear example of industrial heritage, it is not listed as a monument.

The first factory of the NKF, short for Nederlandse Kabelfabriek, was built in 1914 in the Schieoevers Delft. In 1949 the first part of Kabelfabriek II was finished and taken into use. Because of the enormous growth of the company the next couple years the Kabelfabriek II was expanded. In 1974 the last part of the Kabelfabriek II was built. At around 1975 after the Second World War the NKF is one of the biggest cable factories in Europe. Because of stagnation the Kabelfabriek II becomes vacant in 1999. From 2009 various small enterprises took place in the Kabelfabriek II. At the moment this is still the situation of the Kabelfabriek II. In 2017 Kondor Wessels Vastgoed gave Mei architects and planners the assignment to create a vision on the area and to design an urban plan. In 2019 a so called, Voorlopig Stedenbouwkundig Plan, Temporary Urban Plan was completed together with the municipality of Delft, Mei architects and planners and other experts. Up to now the Final Urban Plan will be worked out. The Kabeldistrict will be the start of the new developments at the Schieoevers. The main plan is to develop the city of Delft from knowledge city to 'HighTech Capital'. In the Kabeldistrict a living-work environment will be established with a broad mix of dwellings together with enterprises which play an active role in the innovative making industry. In this way the Kabeldistrict will be connected to the knowledge of the TU Delft Campus. (Mei architects and planners, 2020)

Figure 15. Schieoevers Noord. Mei Architects and Planners. (2020).

Case studies sustainable attributes

The following case studies are chosen from the PhD of Theodora Chatzi Rodopoulou (2020) 'Control Shift – European Industrial Heritage Reuse in Review'. These case studies are chosen either because they have been restored recently or because of similarities in their historic and/or new use or because of the size of the project. The case studies can be divided

into three Dutch adaptive reuse projects and three abroad, England, Scotland and Spain. This will provide a comparison between adaptive reuse in The Netherlands and abroad.

- Westergasfabriek, Amsterdam The Netherlands (Chatzi Rodopoulou, T., 2020)
- DRU Industriepark, Ulft The Netherlands (Chatzi Rodopoulou, T., 2020)
- Energiehuis Dordrecht (Chatzi Rodopoulou, T., 2020)
- Stanley Mills, Perthshire Scotland (Chatzi Rodopoulou, T., 2020)
- King's Cross, London England (Chatzi Rodopoulou, T., 2020)
- The Tobacco factory of Madrid, Madrid Spain (Chatzi Rodopoulou, T., 2020)

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Figure Reference

01. Mei Architects and Planners. (2020). Metamorfose van voormalige kabelfabriek [Photo].

In *Metamorfose van voormalige kabelfabriek.*

02. Mei Architects and Planners. (2020). Metamorfose van voormalige kabelfabriek [Photo].

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05. TU Delft. (2020) Heritage4all | Univer-Cities | HEVA – studio text [Figure]

06. Tol, P. (2020). Different themes. [Figure]

07. Tol, P. (2020). overview of the ten used articles with their design strategy, methodology and author. [Figure]

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