THE RESEARCH PLAN

Change of user and facade adaptability

Denise Kiers
4430670

Ae studio: Second Life
Design tutor: Mo Smit
Research tutor: Bob Geldermans

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Personal fascination

Architects often have a higher regard for new construction than for the transformation of existing buildings (Bijdendijk, 2012). During my Architecture Bachelor and Master, I have also seen this emphasis on new construction in contrast to transformation or renovation. I believe it is important that this emphasis will change, since the question of how to accommodate the changing demand in the existing stock will become more and more important in the future (De Jonge, 2012). Therefore I am motivated to learn more about the transformation of buildings, since this task requires a different set of knowledge and competencies; ''*You really have to know what is technically possible and where the limits lie, you have to be able to see through the logic of the built environment.*'' (Bijdendijk, 2012).

In addition to this motivation for learning about transformation projects, I have a personal fascination with adaptability. Unconsciously, this topic comes up in many of my previous design projects and I think it forms a perfect match with the studio theme 'Second life'. The existing stock is often static and to stimulate transformation it is important to look for adaptable solutions. Looking for adaptable solutions also has further benefits, such as contributing to the creation of a circular economy. These fascinations ultimately led to my research topic, where the focus lies on change of use and façade adaptability.

Problem statement

Society is very dynamic. We experience physical, economical, functional, technological, social and legal changes (Austin & Schmidt, 2016, p. 48). On the contrary, buildings are often static; ''*Most modern and post-modern buildings and their constituent parts are not designed (and accordingly build) to change easily and building products were not designed (and manufactured accordingly) for recovery and reuse*.'' (Debacker & Manshoven, 2016, p. 18). This contradiction between society and buildings can cause, among others, a mismatch of supply and demand of functions, which leads to vacancy. There are three ways to cope with the vacancy; consolidation, demolishment or transformation. When choosing consolidation, the building remains vacant indefinitely, which can create economic and social problems, such as income loss for the owner and social uncertainty. This causes the area as well as the building to deteriorate (Remøy & van der Voordt, 2007). Demolishment creates a lot of waste. The waste produced during the construction and demolition of buildings makes up approximately 35% of the CO2 emissions in the Netherlands (Nelissen et al., 2018). By choosing for transformation, buildings could get a second life and their environmental impact regarding materials and waste would be lowered (Thomson & Van der Flier, 2008). Transformation thus can help create a more circular economy. Because of higher building costs, this is not applied widely yet. In transformation projects the façade is often one of the highest cost items (Remøy & van der Voordt, 2009).

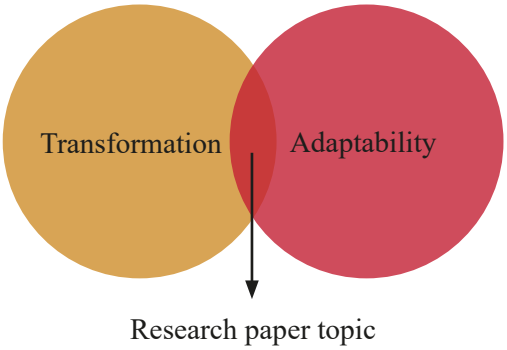

Figure 1: Personal fascinations (source: own)

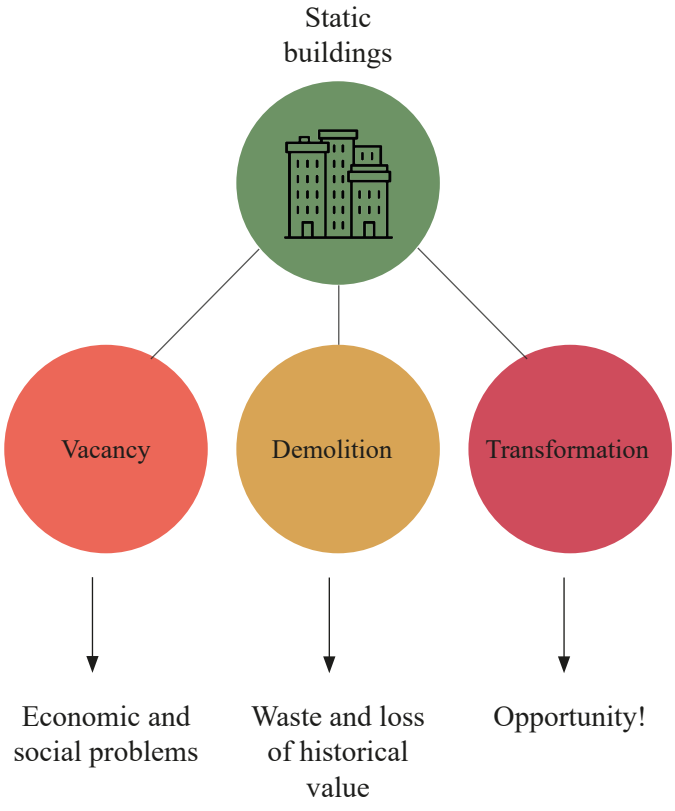

Figure 2: Ways of coping with vacancy (source: own)

Relevance, linked to architectural and societal issues

Designing for change is one of the key elements to create a circular economy (CGRI, 2020) and is a way to lower costs when transformation is necessary. That is why research on how facades can accommodate change of use of a building in the future is relevant. Only 24% of the Dutch economy is currently circular, so there is a big gap to bridge towards a complete circular economy (CGRI, 2020). Creating a circular economy can in its turn help achieve the sustainability goals formulated by the United Nations (2020). Furthermore, most of the attention nowadays is focused on the new real estate stock, even though the annually added stock accounts for only 1% of the total stock (De Jonge, 2012). If the attention is shifted to the existing stock, transformation projects could help provide dwellings for the growing demand in cities. Finally, extending the life span of buildings has a social relevance, by preserving the historical and social value (Konstantinou, 2016).

Literature on possible design solutions for adaptable buildings is already available. However, the existing literature often does not make clear which changes really play an important role in relation to function change. Neither does it discuss how applicable the criteria are in practice. The research paper will further explore the information missing in literature and give a generally applicable list of façade qualities that can accommodate change.

Research questions

As regards, this research focusses on changes that occur in the façade during change of use and how to cope with these changes. This brings us to the research question of the paper: '*What qualities should a new façade have to accommodate change of use of a building in the future?*'

To answer this question the following sub-questions need to be answered:
- *What kind of changes occur in the facade when a building is transformed to accommodate a different function?*
- *How can be dealt with the changes that occur in a facade due to change of use of buildings?*

Relation of Thematic Research with the Overall Design question / objective

The project 'De Knip' is located in Sloterdijk-Centrum. This area is currently slowly changing from a monofunctional office area to a lively area that houses various functions (Gemeente Amsterdam, 2020). De Knip currently forms a mono-functional and static building in this new area. Since this is a high rise building, it can easily lose its connection with the public life, since meaningful contact already decreases between the third and the fourth floor of the building. This has a negative impact on the activeness of occupants and thus the liveliness of spaces (Gehl, 2011, p. 97-98). To prevent this, the building should accommodate various functions, including public spaces throughout the building. This would mean that the building should function as a vertical neighborhood that is well connected to its environment. This brings us to the overall design question of this project: '*How can 'De Knip' in Amsterdam Sloterdijk be transformed to function as a neighbourhood connected within the city?*'. A well-functioning neighborhood must meet several criteria. It should be well connected, diverse, nature inclusive, provide accessible public spaces and be able to adapt to societal changes. When it comes to the latter, the demand for the required functions in a neighborhood will change over time. This change of use will be explored in the thematic research paper. In order to deal with change of use in the future, the design project will be designed in an adaptive way. This means that all different layers of the building, so the stuff, space plan, servicing, skin, structure and site (Brand, 1995) will be designed to change over time. To delineate the thematic research, only the façade was investigated in relation to change of use. In order to get results that are applicable to the building "De Knip", the research uses case studies with a multistory skeleton construction. 'De Knip' will accommodate the following main functions; housing, offices and educational facilities. That is why this research will also limit itself to these functions. The results of the research will be generally applicable. It will provide an overview of different changes that need to be accommodated and which criteria architects can use to design for change.

Research framework

Key terms, concepts, theories, methodology

For the design project, the focus lies on three key notions; permeability, nature inclusiveness and adaptability (see figure 3). These three elements can transform the monofunctional and static office building into a well-functioning neighbourhood connected with the city. Permeability is about the connection between inside and outside, private and public and also relates to the infrastructure within the building. Nature inclusiveness is important, since the Knip is located in the Brettenzone, a green wedge. To make the building part of its environment, the green zone should be extended into the building. This has several benefits, such as minimizing noise pollution from the surrounding infrastructure, the reduction of greenhouse gasses, increase of the mental health of the occupants and increase of the biodiversity. The last key notion is adaptability, which is related to several fields of which the change of use is investigated in the research paper.

This research relates to the research-by-design domain stock, since it focusses on the reuse of the existing. It is a qualitative and correlational research; patterns of change are analyzed in case studies and the relationship is then measured between the facade change and the change in use of the building. The type of research also relates to the episteme typology, since repeating patterns are found through analyses.

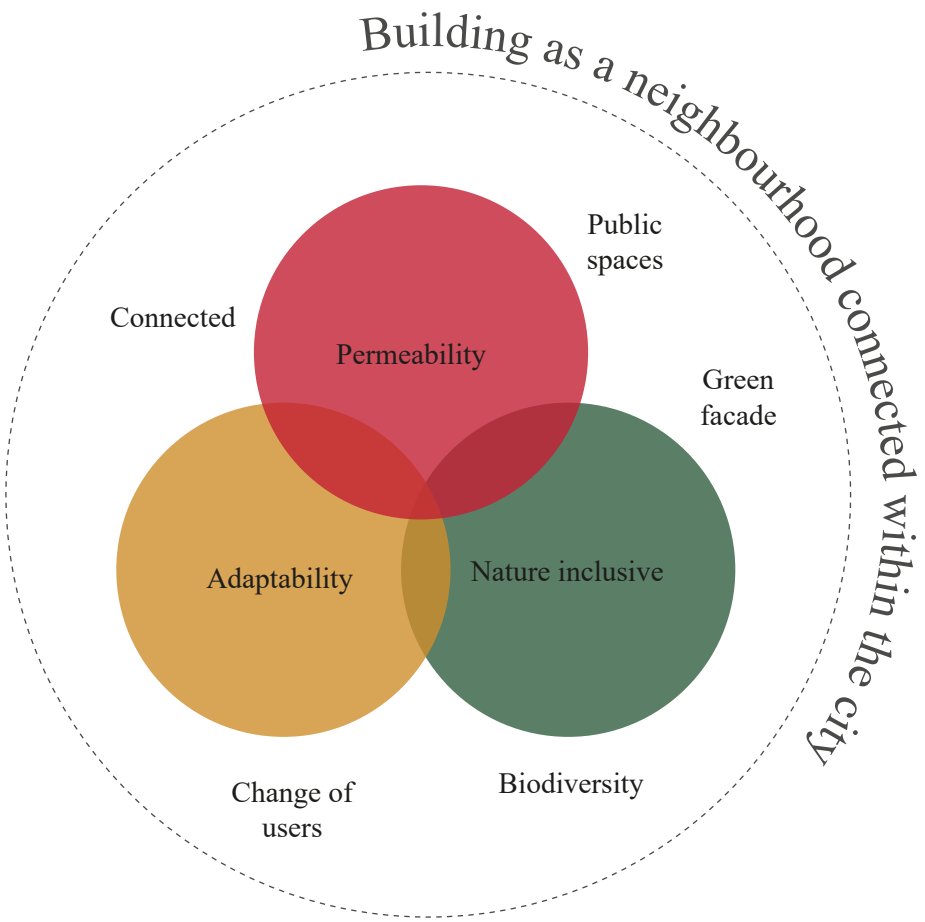

Figure 3: Key notions (source: own)

Methods

The objective of the research paper is to determine what qualities a façade should have to accommodate change of use of a building in the future. To answer this question the paper starts by answering the following sub question; '*What kind of changes occur in the facade when a building is transformed to accommodate a different function?*' The first step in answering this sub question is to create a general overview of the functions of a façade. This overview serves as a base to investigate the building code, literature and case studies. The building code as well as literature on function neutral buildings and differences between functions regarding the interior climate or dimensions give direct insights in the façade changes in differing functions. Case studies are used to fill gaps and add to the information found in the building code and literature. The case studies meet the following set of requirements;

Requirement	Explanation
Derived from the submissions from the National Renovation Platform (NRP) Gulden Feniks	The National Renovation Platform is a foundation that promotes the sustainable reuse of existing buildings. Each year a competition is held where renovated, transformed buildings and transformed areas are evaluated on sustainability, sublimation, economic value creation, social value creation and innovation. It is a requirement for the submissions of projects that in the opinion of the submitter the project meets the requirements for this prize (NRP, n.d.). This indicates that the case studies used have been successful in the eyes of the developer, owner or designer of the building.
Located in the Netherlands	The same climate requirements apply for each of the case studies.
Have a multistorey skeleton construction, preferably concrete	The found conclusions relate and can be implemented in the design project 'De Knip'.
Transformed after 2012	This year a new building code was installed. This criterium also ensures that the used projects are recent.
Build between 1950-1990	A lot of multi-year vacant offices are available from this time period (Voordt, 2007, p. 215). Besides, these buildings were all build in the modernistic or post modernistic time period (Schmidt & Austin, 2016, p. 9) and have similar typologies. De Knip was built in 1990 and thus also falls within this time range.

Figure 4: Requirements of the case studies (source: own)

Sections, floorplans and pictures were used for these analyses. Four of the architects of the case studies and an expert on the concept of Open Building and on transformation projects were interviewed in a semi-structured manner to fill in knowledge gabs. Results are drawn in the form of parameters that are involved in the façade change. Then conclusions are drawn on the correlation between the parameters and the change of user. This resulted in a list of façade changes that related to the change of use.

The second sub-question incorporates the found façade changes of the first sub-question; '*How can be dealt with the changes that occur in a facade due to change of use of buildings?*'. Literature on function neutral buildings and adaptable or flexible buildings can shed light on the different possible solutions. An interview with an expert on Open Building adds new information to the literature and confirms if the literature is applicable to the architectural practice. Design criteria that could possibly accommodate the change of use are then linked to the different found façade changes and evaluated on appropriateness, which results in a list of general criteria for a façade that can accommodate change of use.

For the design research thus far, maps of the context have been analysed as well as architectural drawings of the building de Knip. During these analyses strengths, weaknesses, opportunities and threats were located. The vision plans of the municipality have been explored and the most important points for the design have been pinpointed. Literature and case studies have also been used as a start in investigating the key notions; nature inclusiveness, permeability and adaptability. Future research will include additional literature and case studies on all three of the key notions. This includes research on green facades, reference projects of buildings with high permeability rate and case studies that focus on adaptability, such as the building Patch22. A site visit inside the building is also an important way to develop my design ideas further.

A visual translation of the complete research is presented in figure 5.

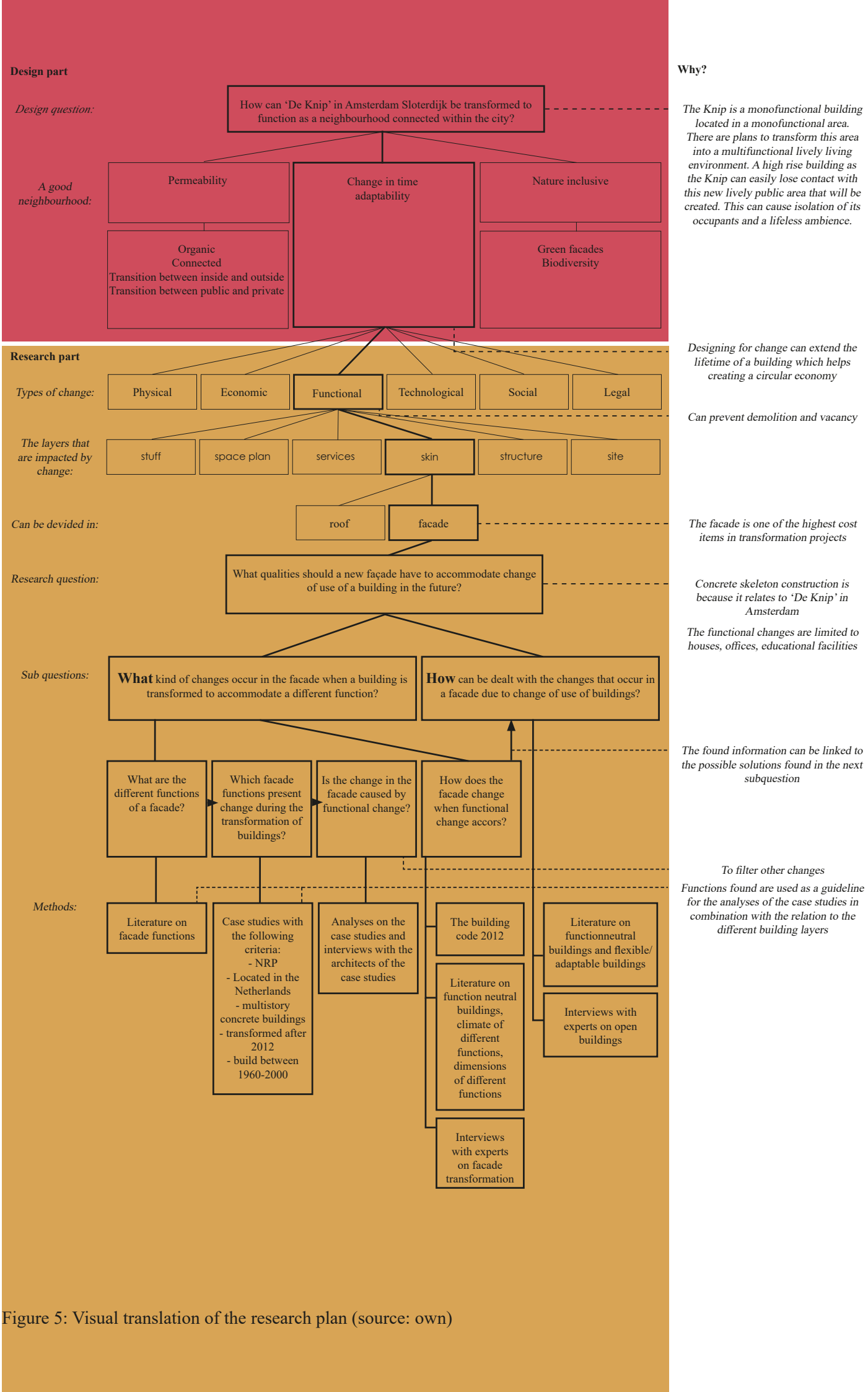

Figure 5: Visual translation of the research plan (source: own)

Preliminary conclusions, choices and design strategies

The objective of the research paper was to answer what qualities a new façade should have to accommodate change of use of a building in the future. It was concluded that a facade that can accommodate change should have certain qualities, the design: makes use of scenario planning, has a good balance between different design considerations, meets the strictest regulations of all the functions and is modular, standardized, prefabricated and demountable. These qualities accommodate changes, such as openable windows, the addition of balconies and changes in the spatial formation of the building best.

These findings will be incorporated into the design, but attention also has to be paid to the other key notions that were mentioned previously in the explanation of the used methods; permeability and nature inclusiveness. This leads, for example, to the design choice to have a green façade in the form of horizontal plantings connected to the floor structure, which ensures that the facade remains freely adaptable in between these planters. The horizontal planters can make it more difficult to add an external balcony, which is why plant containers and balconies can be alternated with a similar system or internal balconies could be applied. This configuration of planters and balconies can in turn affect the permeability of the building. This shows that the findings of the research cannot be directly implemented into the design project, but have to be considered in a broader perspective. In addition, there are the sustainability goals to be achieved, which can also impact the façade in the form of the installation of solar panels.

To conclude now that the basic information is gathered, considerations must be made and a balance must be sought between the various design goals. In figure 6 a sketch with the first thoughts is presented, which is of course an image that can change during the design process.

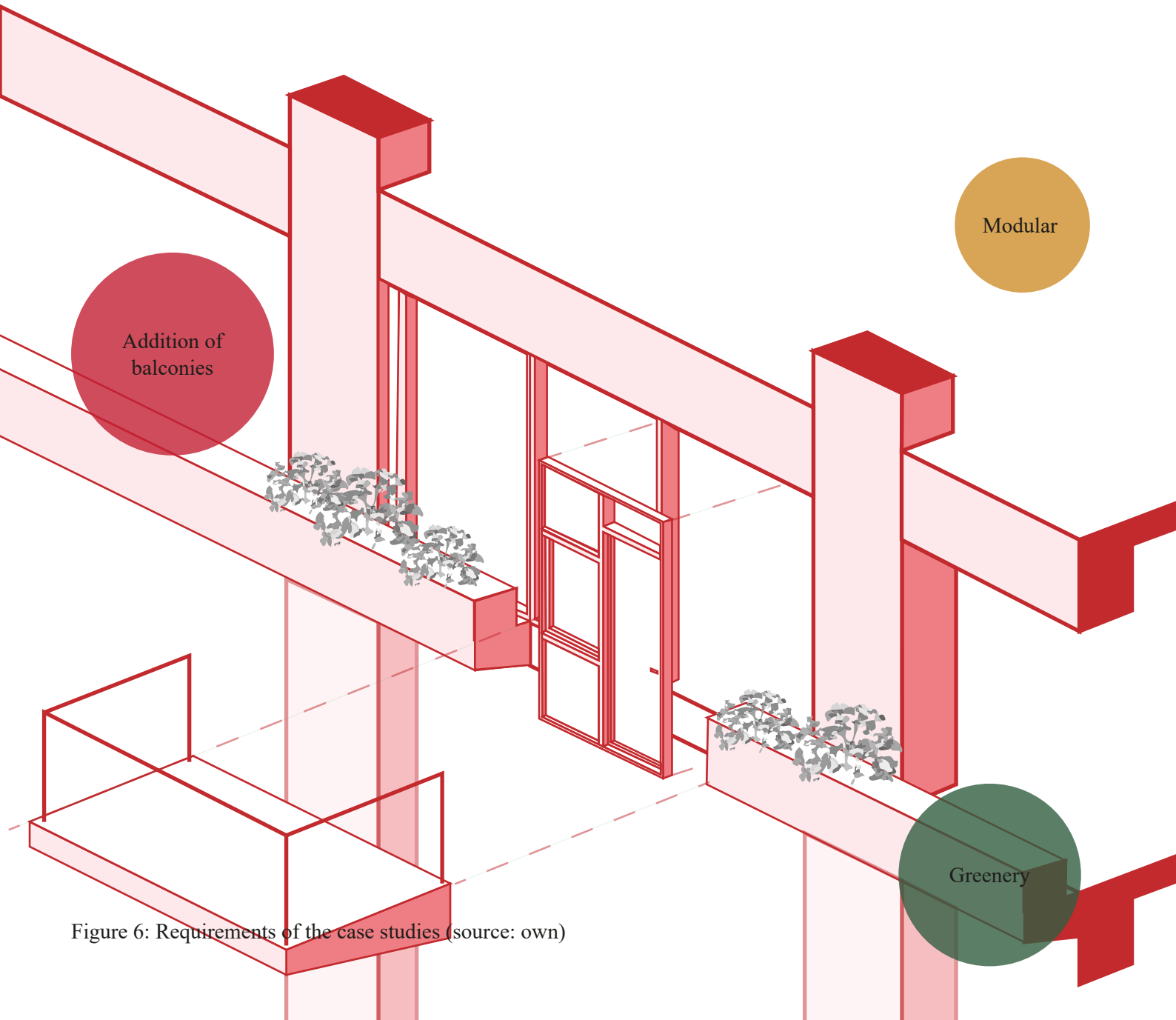

Figure 6: Requirements of the case studies (source: own)

References

- Austin, S. A., & Schmidt III, R. (2016). *Adaptable architecture: Theory and practice*. London, England: Routledge/Taylor & Francis Group.
- Bijdendijk, F. (2012) *Over het belang van (gebieds)transformatie en renovatie en de 'Gulden Feniks'*. Retrieved on 22-12-2020 from: https://www.gebiedsontwikkeling.nu/artikelen/over-het-belang-van-gebiedstransformatie-en-renovatie-en-de-gulden-feniks/
- Brand, S. (1995). *How buildings learn: what happens after they're build*. London, England: Penguin group.
- Circularity Gap Reporting Initiative (CGRI) (2020). *The circularity gap report the Netherlands*. Retrieved on 4-10-2020 from: https://www.circularity-gap.world/netherlands
- Debacker, W., & Manshoven, S. (2016). *D1 synthesis report on State of the art: Key barriers and opportunities for Materials Passports and Reversible Building Design in the current system*. Retrieved on 05-10-2020 from: https://www.bamb2020.eu/wp-content/uploads/2016/03/D1_Synthesis-report-on-State-of-the-art_20161129_FINAL.pdf
- De Jong, H. (2012). *Hans de Jonge (TU Delft): ''Aanzienlijk deel leegstaande kantoren kan gesloopt worden''*. Retrieved on 05-10-2020 from: https://www.platformduurzamehuisvesting.nl/2012/02/09/hans-de-jonge-tu-delft-maximaal-20-procent-leegstaande-kantoren-goed-voor-transformatie/
- Gehl, J. (2011). *Life between buildings: Using public space*. Washington, DC: Island Press.
- Gemeente Amsterdam (2020). *Visie 2040 Sloterdijk centrum*. Retrieved on 18-09-2020 from: https://www.amsterdam.nl/projecten/sloterdijk-centrum/plannen-publicaties/
- Konstantinou, T. (2016). *Refurbishment is sustainable*. Retrieved on 16-12-2020 from: https://issuu.com/rumoer/docs/rumoer_62-sustainability
- Nelissen, E. et. al (2018). *De Transitieagenda Circulaire Bouweconomie*. Retrieved on 21-10-2020 from: https://www.rijksoverheid.nl/onderwerpen/circulaire-economie/documenten/rapporten/2018/01/15/bijlage-4-transitieagenda-bouw
- NRP Gulden Feniks (n.d.). *Archief*. Retrieved on 25-10-2020 from: https://www.nrpguldenfeniks.nl/archief/jaargangen/
- Remøy, H.T., & Van der Voordt, D.J.M. (2007). A new life: conversion of vacant office buildings into housing. *Facilities*, 25 (3/4), 88-103. Retrieved on 18-10-2020 from: https://doi.org/10.1108/02632770710729683
- Remøy, H.T., & Van der Voordt, D.J.M. (2009). Sustainability by adaptable and functionally neutral buildings. In AAJF. van Dobbelsteen (Ed.), *Conference proceedings SASBE 2009, 3d CIB international conference on smart and sustainable built environments* (pp. 1-8). Delft, The Netherlands: Delft University of Technology.
- Thomsen, A. F., & Van der Flier, C. L. (2008). Replacement or reuse? The choice between demolition and life cycle extension from a sustainable viewpoint. *ENHR International Research Conference Shrinking Cities, Sprawling Suburbs, Changing Countrysides* (pp. 1-13). Dublin, Ireland: Centre for Housing Research, UCD.
- United Nations (2020). *The Sustainable Development Goals Report 2020*. New York, The United States of America: United Nations.
- Voordt, T. V. (2007). *Transformatie van kantoorgebouwen: Thema's, actoren, instrumenten en projecten*. Rotterdam, The Netherlands: 010 Publishers.