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Apples & Oysters

Developing a framework for value-based decision-making in sustainable housing retrofits



TU Delft

DESIGN FOR VALUES

Colofon

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Preface

The English saying ‘comparing apples and oranges’ neatly describes the main problem this research project sought to address. This saying can be traced back to the work of Shakespeare, in which ‘apples and oysters’ were the incomparable foods. With this saying as a guiding theme, this research project sought to develop a framework for comparing incomparable values in sustainable retrofits.

The research goal was to explore the use of Value Sensitive Design and Public Value Assessment in renovation processes for VvEs (Verenigingen van Eigenaren, Homeowners’ Associations). Moreover, the project aims explore the topic and the field as a necessary step for meaningful and successful follow-up research.

This study is the result of seed funding received from the *Delft Design for Values Institute*. The goal of this seed funding programme is to kickstart new avenues of research, as is reflected in the scope of this project.





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Introduction

The built environment is the place where many sustainability challenges become concrete.

Many houses need to become more sustainable, i.e., more resilient to the various aspects of climate change. Moreover, sustainable retrofits must remain affordable, comfortable, and compatible with specific cultural values. Homeowners' associations (VvE's) face challenges balancing these competing values in collective decision-making processes about sustainable retrofits.

In VvE retrofitting projects, there are two important dilemmas:

- 1. Measures to reach one goal can have a negative impact on another target.** For example, insulating the façade of a house can help achieve energy neutrality but may erode cultural value.
- 2. The best retrofit solutions depend on the actor's relationship with the property.** People living on the top floor of an apartment block might want to start renovations by improving the roof insulation, while people with an electric car might want to start by adding solar panels.

Figure 1.1: Inclusion in Decision Making



Research goals

We seek to develop a framework for decision-making in sustainable housing retrofitting. Insight into homeowners' values in the context of retrofitting measures can potentially improve decision-making. Recognising the different and sometimes conflicting aspects of retrofitting can help to start a constructive dialogue among actors, aimed at finding design solutions.

Research objectives:

- > To make the values underlying retrofitting measures explicit
- > To help VvEs (homeowner associations) navigate difficult value trade-offs.

Research questions:

1. What are the most relevant value trade-offs in the context of retrofitting sustainable energy technologies in existing homes?
2. How can we operationalise these value trade-offs in decision-making processes for specific sustainable energy technologies, so that VvEs (homeowner associations) can actively engage in making these trade-offs?



Photo by the authors

Research approach

Value-Sensitive Design (VSD)

VSD is a promising approach to addressing values in a structured and comprehensive way throughout the design process (Flanagan et al., 2008; Friedman, 2004), as it provides an integrative methodology that combines conceptual, empirical, and technical investigations (Figure 1.2).

Conceptual investigations address fundamental issues.

This entails identifying the relevant values. Typical questions raised are: “What are the values at stake?” and “How should we engage in trade-offs between competing values in the design?”

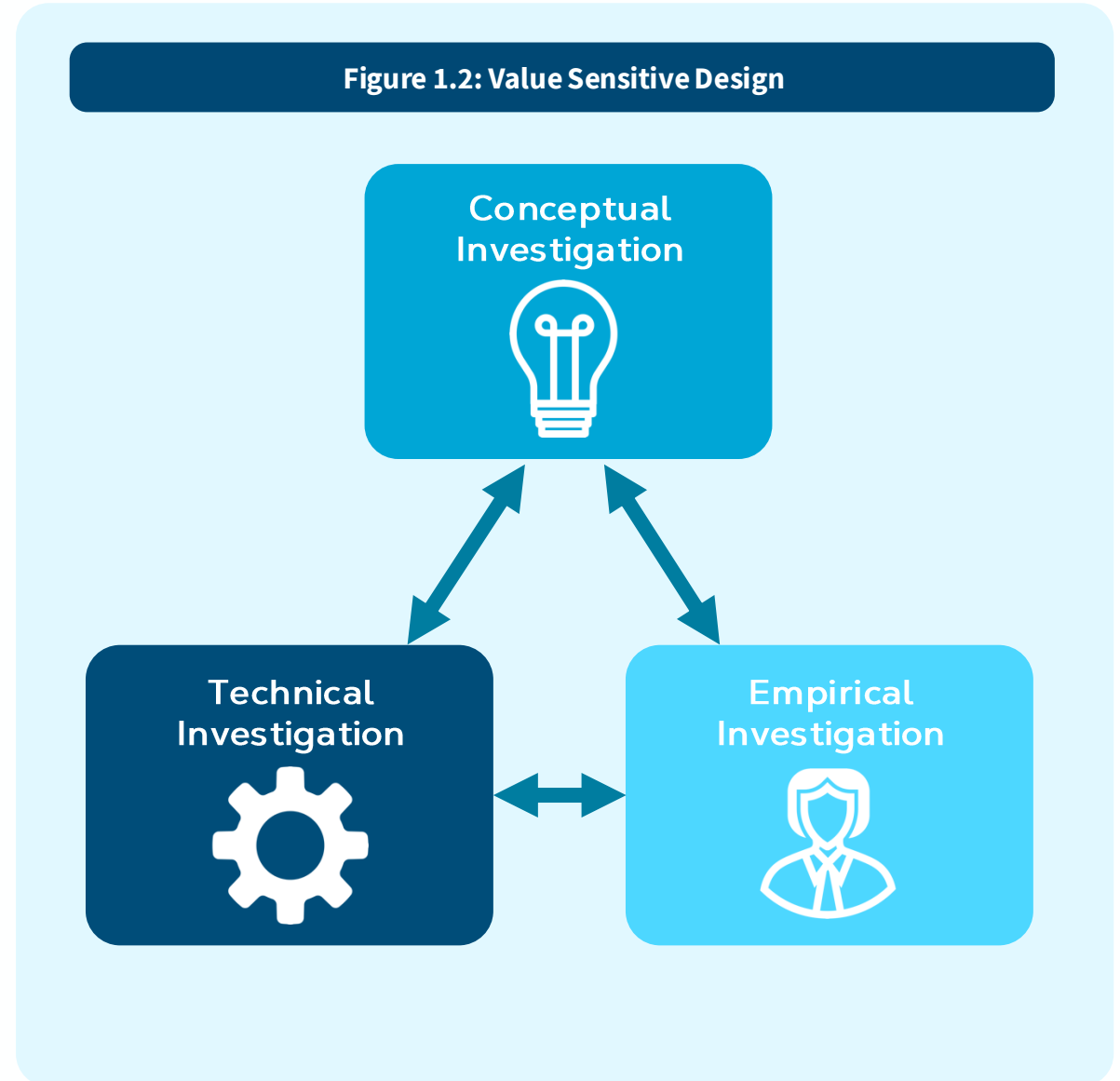
Empirical investigations evaluate the success of a particular design.

Questions addressed are, for example, “How do stakeholders prioritise individual values and usability considerations?” This involves collecting data through observation, interviews, questionnaires, and other methods.

Technical investigations focus on the technology.

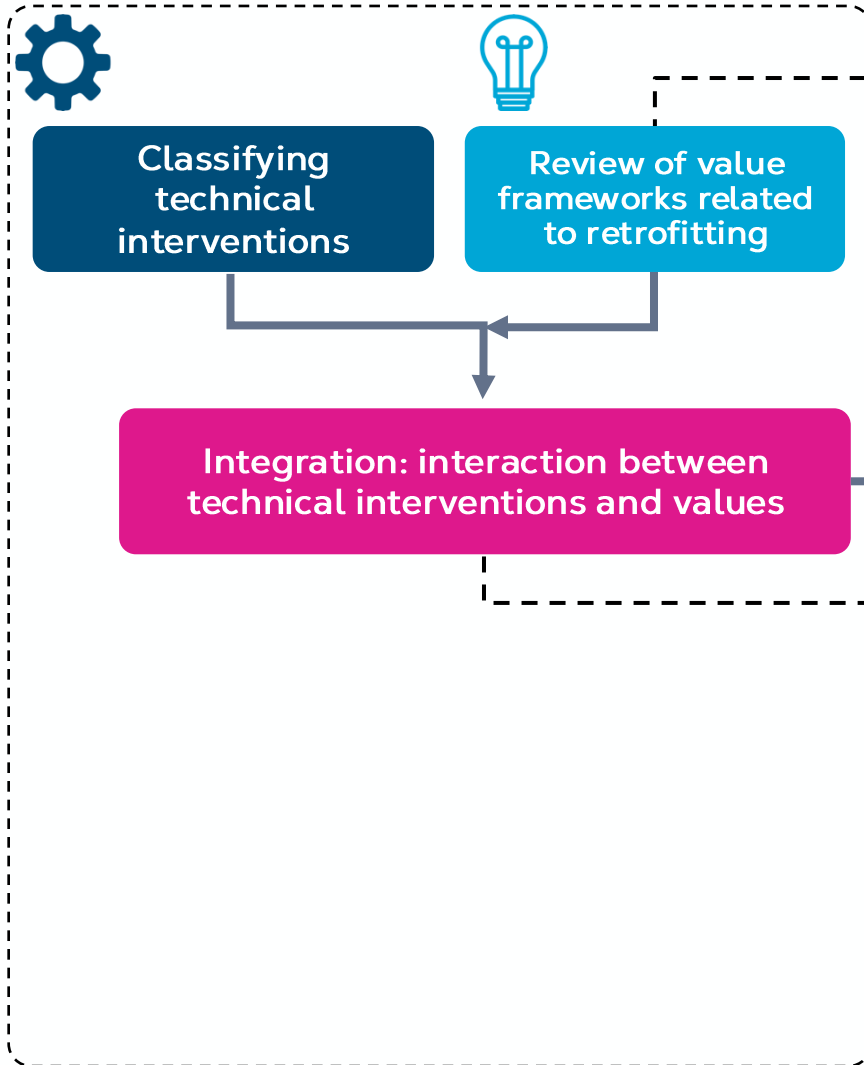
Theoretical studies of technological properties and mechanisms help identify how technologies can support or hinder human values. Later, technical investigations focus more on practical aspects, assessing how design choices influence human values.

Figure 1.2: Value Sensitive Design

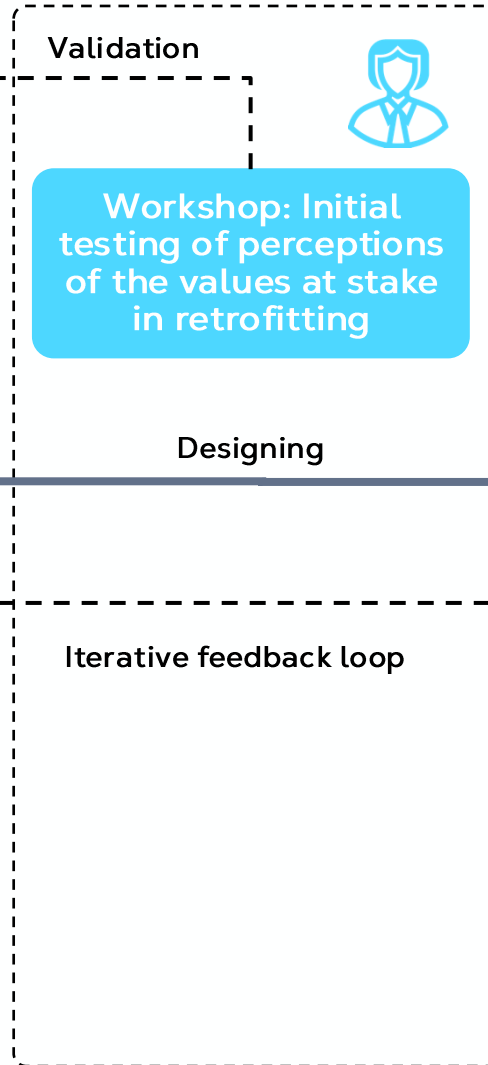


Research overview

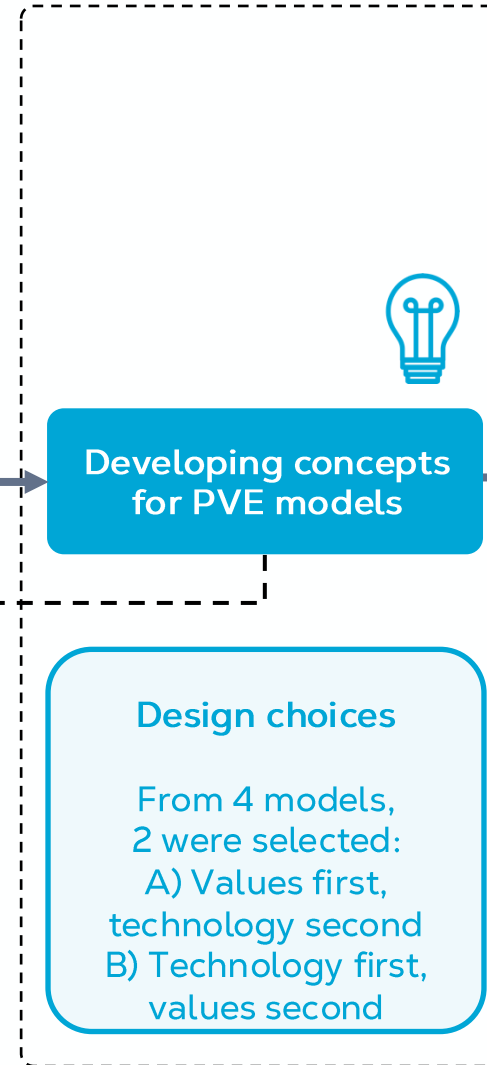
2: Theoretical investigation



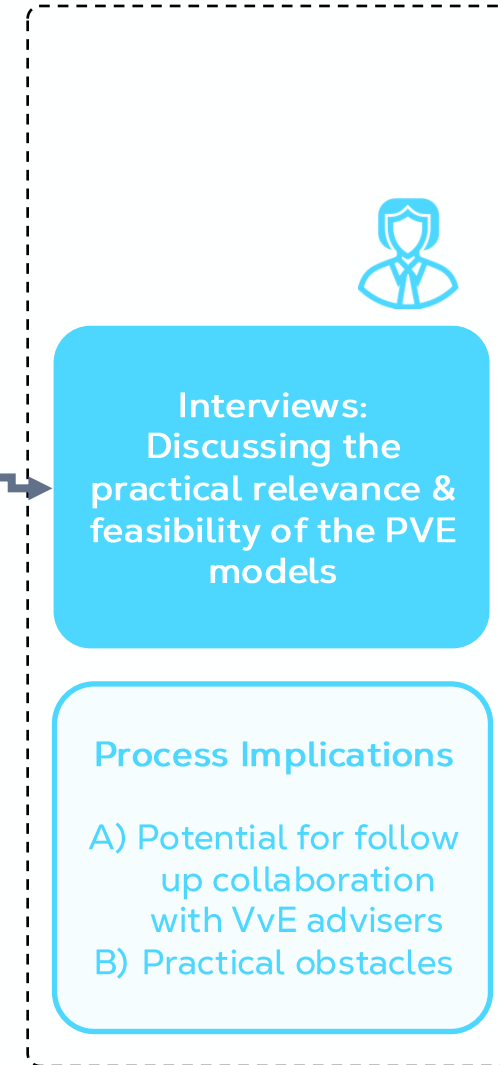
3: Workshop



4: Design concept PVEs



5: Interviews





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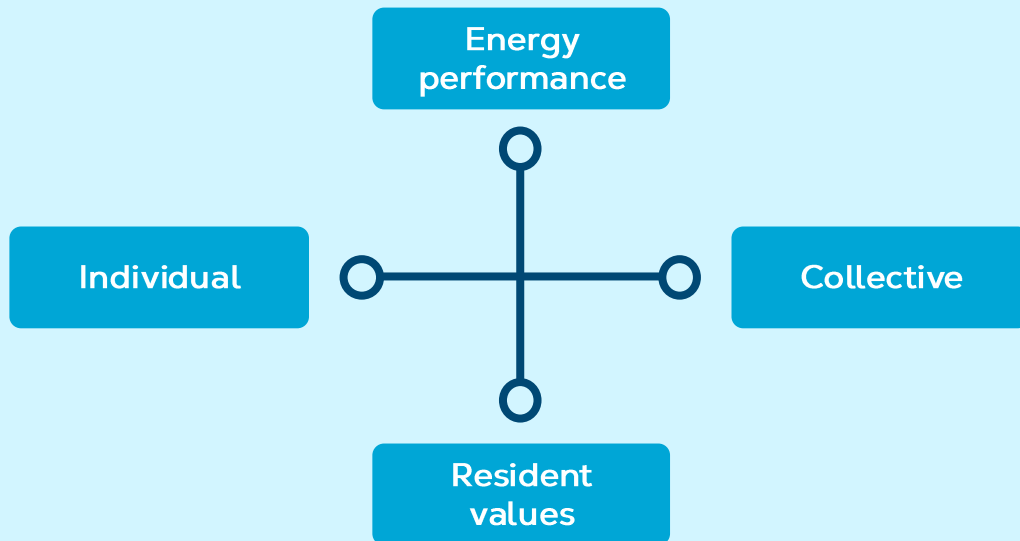
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Figure 2.1: Development of framework



Value trade-offs

Conceptual

Our conceptual framework combines two dimensions. These are potential conflicts and can be visualised as axes (see Figure 2.1). One is the *individual versus the collective*, the other is *resident values versus energy performance*.

When renovating buildings, one inevitably encounters the tension between improving energy performance and preserving various values that are important to residents. While e.g. adding exterior façade insulation might be the best solution to improve energy performance, it also changes the aesthetics of the building and may create a loss of value in the eyes of the residents or the heritage authorities.

In the renovation of buildings with multiple owners (VvE), conflicts often arise between collective and individual interests. A resident living on the first floor does not receive direct benefit from improving the roof insulation, for instance. When retrofitting measures affect the exterior (e.g., façade) of a building, the values of the broader public also need to be considered.

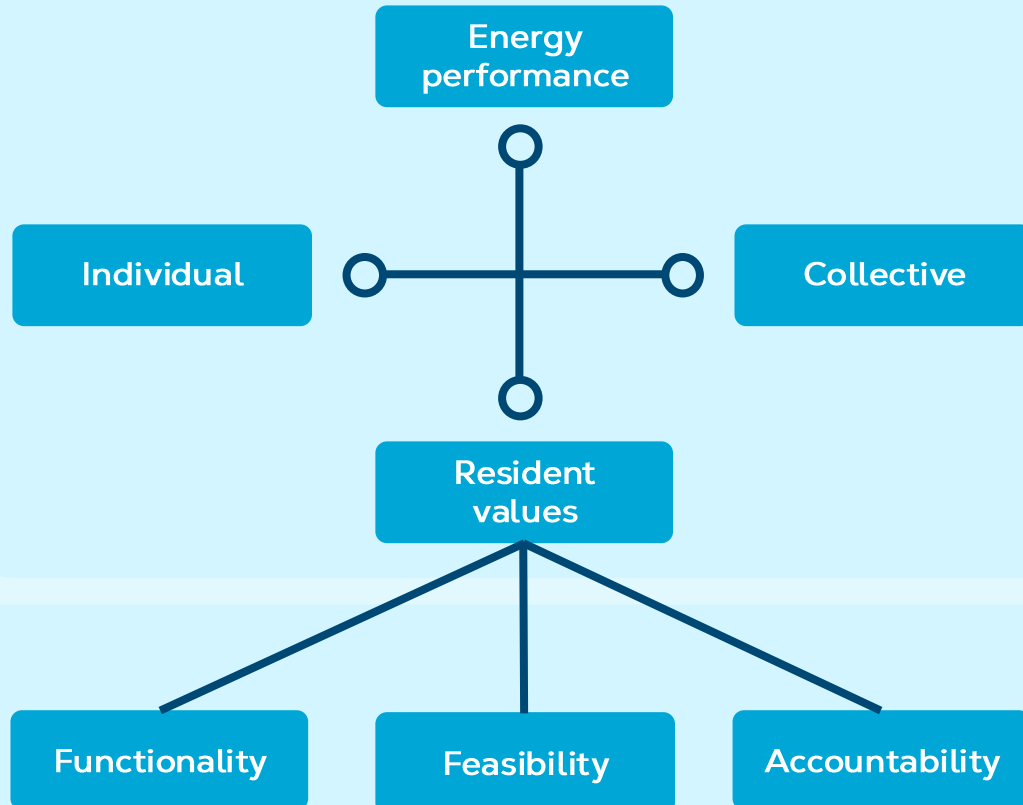
On the next pages, we further operationalise these fundamental value trade-offs in the context of retrofitting sustainable energy technologies in existing housing complexes.

First, we will further operationalise the vertical axis of this framework (energy performance vs resident values) as Participatory Value Evaluation (PVE). The horizontal axis will be addressed at a later stage by designing a decision-making process within which the PVE is embedded.





Figure 2.2: Development of framework



Value framework

Conceptual

The framework was expanded using the Value Map (Kamari et al, 2017) that categorises values into three groups: **Functionality, Feasibility, and Accountability.**

To further operationalise resident values, as defined on the previous page, we compared several value frameworks from the literature on their applicability for retrofitting in housing. This exploration was based on a previous comparative study of methods for assessing values in the built environment (Huizinga et al., 2023). Other methods we considered for application include Erfgoedkompas (NRP, 2022) and the Value Framework (Pereira Roders, 2007). Both present a broad range of values, and the latter in particular includes precise definitions. These models focus on the values that buildings and areas hold for communities and society at large, particularly in relation to heritage. The overlap of the models' value categories is examined and included in Appendix 2.

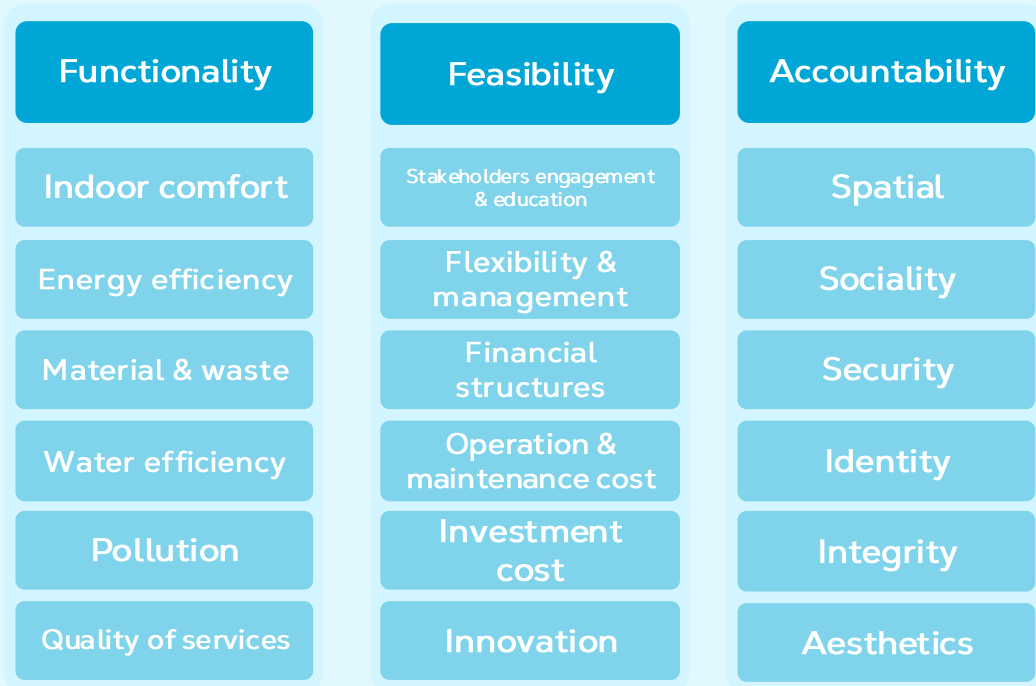
Since our PVE will be used for internal discussions within VvEs, a value model that employs concrete terminology and aligns more closely with residents' lived experiences is preferred. Therefore, we selected the 'Value Map' developed by Kamari et al. (2017). This method was developed through a participatory process and is comprehensive, yet concrete. Moreover, it is easily adaptable to our project and focuses on the lived experiences of residents. This Value Map was adapted for the Dutch context and applied in a previous project, 'Respectful Renovation' of TU Delft (Spoormans et al, 2023).

The Value Map includes three main categories of resident values—Functionality, Feasibility, and Accountability—and can be incorporated into our framework, as shown in Figure 2.2.





Figure 2.3: Development of framework



Value framework

Conceptual

Functionality, feasibility and accountability all consist of six value subcategories, see Figure 2.3

Functionality encompasses how well the building is usable from a resident's perspective. It relates to technical aspects, the environment and used resources. Most of these subcategories speak for themselves, but *Quality of Service* requires some extra explanation. It includes system controllability, adaptability to future changes, usability, and durability and reliability.

Feasibility concerns how well a project can be executed. Across the subcategories, this is approached from process management, maintenance, and financial perspectives.

Accountability encompasses a set of 'softer' values that are not easily quantifiable. These include architectural, cultural, human and community indicators. Because of all categories, these are somewhat abstract and often implicit in decision-making, we provide further clarification.

- **Spatial** includes the view from inside to outside and vice versa, the articulation between spaces and their boundaries, adjacent spaces, and the degree of privacy within the dwelling.
- **Sociality** encompasses all qualities of a building that promote social interaction, such as the height-to-width ratio of internal block spaces, the sense of enclosure, and the composition and permeability of façades.
- **Security** includes the health and safety of inhabitants.
- **Identity** encompasses the value associated with the character or identity of a building and its spaces.
- **Integrity** concerns the relationship between the building and its surroundings.
- **Aesthetics** speaks for itself.





Retrofitting interventions

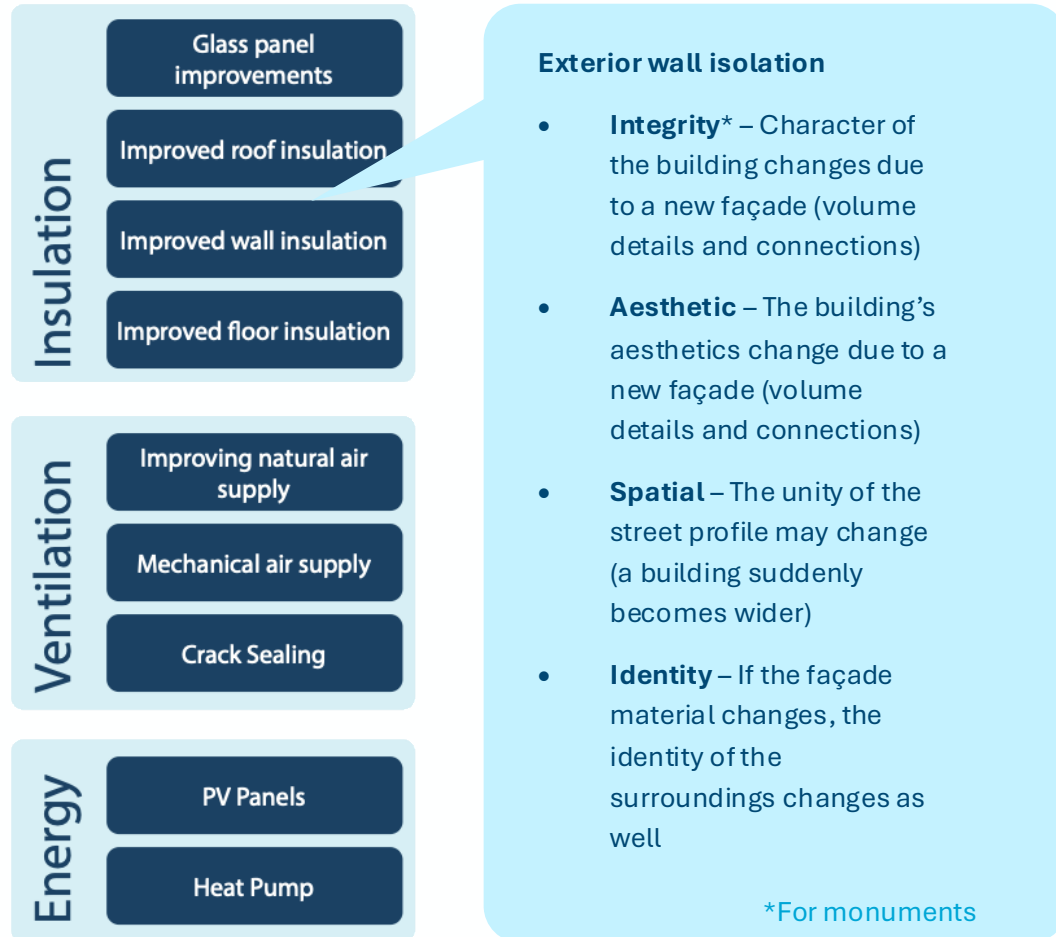
Technical and Conceptual

We connected a list of possible retrofitting measures to the values they influenced.

To operationalise our conceptual framework, we conducted a technical investigation of potential retrofitting measures. Building on earlier research by Dang (2023), we mapped a wide range of potential retrofitting measures for residential buildings. This longlist was then narrowed by selecting the most relevant improvements, which are generally used in Dutch renovation practice, as determined by expert assessment. This process resulted in the list of key technical improvements, as included in Figure 2.4.

In the next step, we reviewed all technical improvements to inventory and identified which values in the Value Map they could affect. This was done by reviewing each retrofitting solution and imagining and cross-referencing them against all values in the Value Map. We further detailed this by explaining, in concrete terms, how each value was affected. An example of this appears in Figure 2.4. The full overview is included in Appendix 3.

Figure 2.4: Retrofitting solutions and values





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Initial testing

Empirical

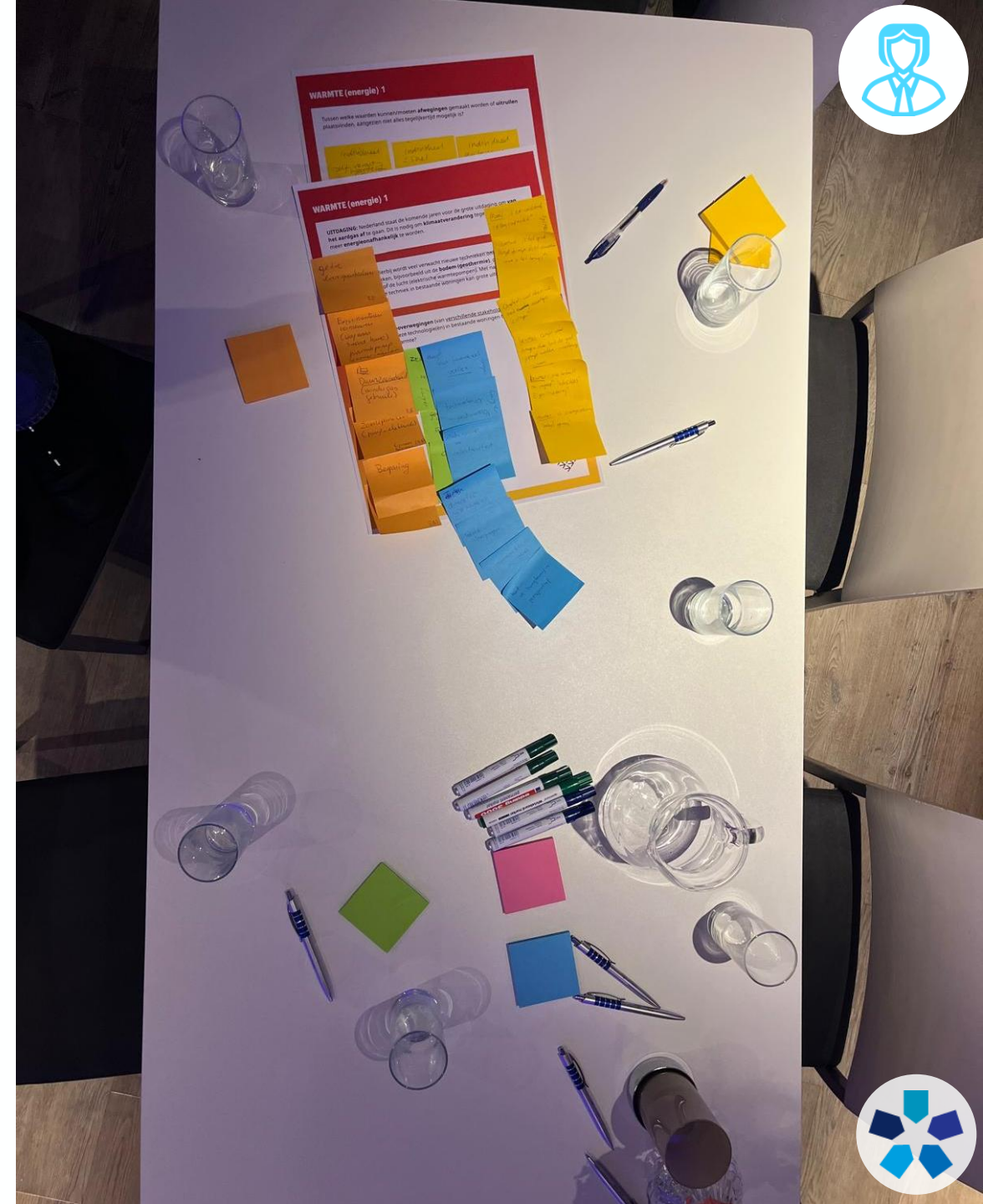
To gain further insight into the feasibility and usefulness of our conceptual framework, we organised a focus group session during a meeting of *Stichting Toekomstbeeld der Techniek* in March 2025. The workshop included two discussion groups with a total of 10 homeowners, most of whom were employed in government or industry.

Protocol

For the workshop, we selected two technical challenges and possible interventions related to the energy transition in the built environment. The first focused on solar panels for energy production, while the second addressed heat pumps for residential heating. During the workshop, each group was assigned one of these interventions and asked to explore the value conflicts associated with it through three guiding questions. These questions were:

1. What value considerations may be relevant with regard to the implementation of this technology?
2. What are the most relevant value trade-offs?
3. Which values and trade-offs are likely to give rise to conflicting perspectives among different stakeholder groups?

The values and considerations were discussed and noted on a collective sheet.





Workshop insights

Empirical

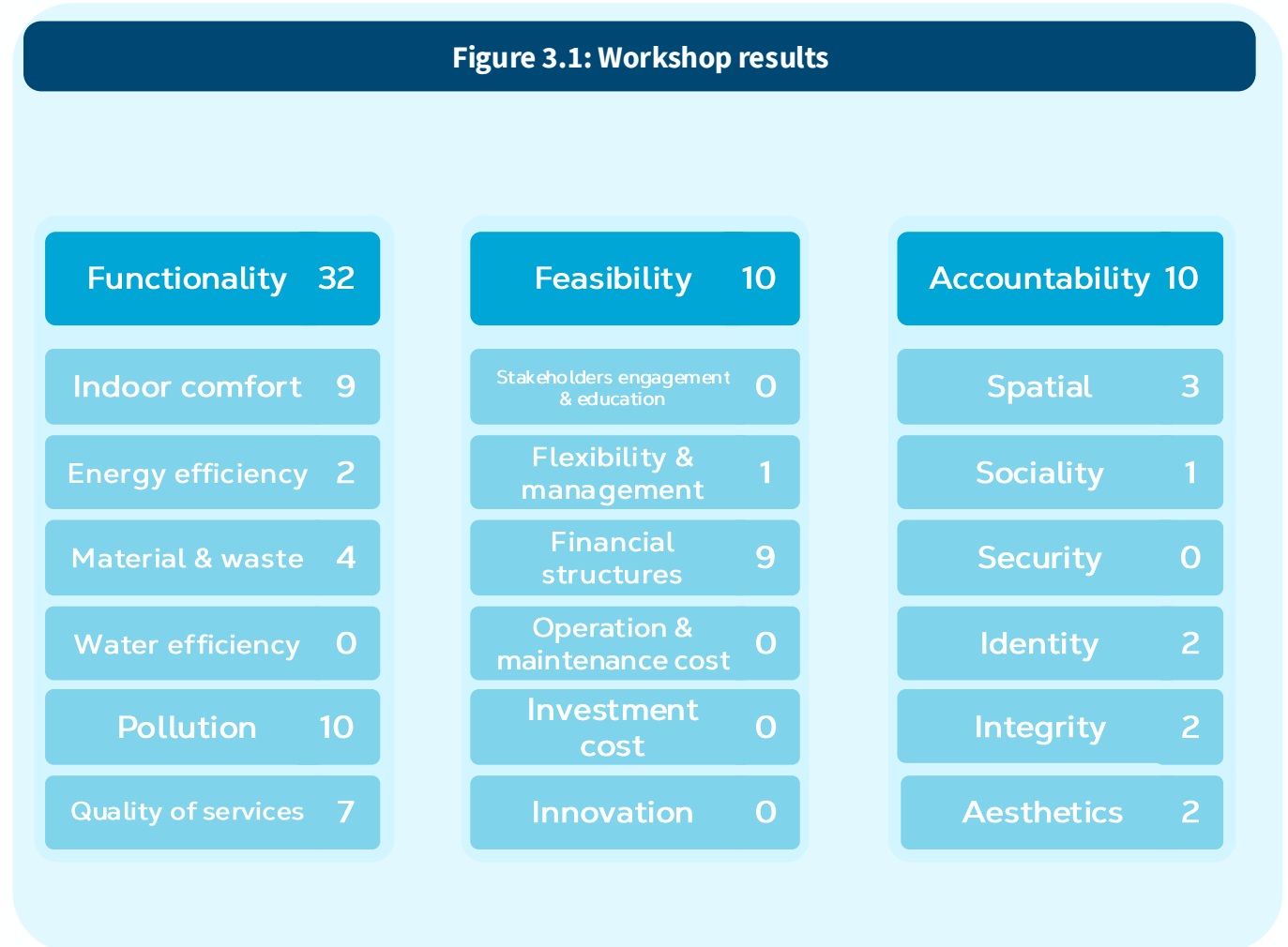
All participant contributions in the memo notes were collected and organised into the Value Map categories. These were discussed by the research team with respect to their content and frequency of occurrence. Figure 3.1 presents a quantitative overview of all contributions. The complete list is included in Appendix 4.

The results clearly show that the discussion centred on values related to **functionality**. Participants' considerations addressed functional values and concerns three times as often as they addressed values of feasibility and accountability. **CO² emissions** were often cited as a priority (under Pollution, 10x), as **were indoor comfort** (9x). We note that **financial aspects** were often mentioned (10x), but in different ways, e.g. relating to the return on investment or the reduction in monthly costs for energy. **Aesthetic** qualities were mentioned much less (2x).

We observed that responses varied according to participants' relationship to the technique. Those unfamiliar with the technology introduced values such as service stability into the conversation. Values such as aesthetics were primarily articulated by those with firsthand experience of applying such sustainable measures (like installing a heat pump or solar panels).

In general, individuals articulated their arguments and placed their Post-it notes, but the conversation revealed a broader range of motivations and values.

Figure 3.1: Workshop results





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Participatory Value Evaluation Conceptual

We operationalise our conceptual framework using the Participatory Value Evaluation (PVE), a value-elicitation method developed in the economic sciences to map the values of a large and diverse group of citizens. PVE has been used for large-scale value mining in the context of various complex issues, including flood protection technologies (Mouter et al., 2021), COVID-19 measures (Mouter et al., 2022), healthcare funding (Rotteveel et al., 2022) and military technologies (Boshuijzen-van Burken et al., 2024).

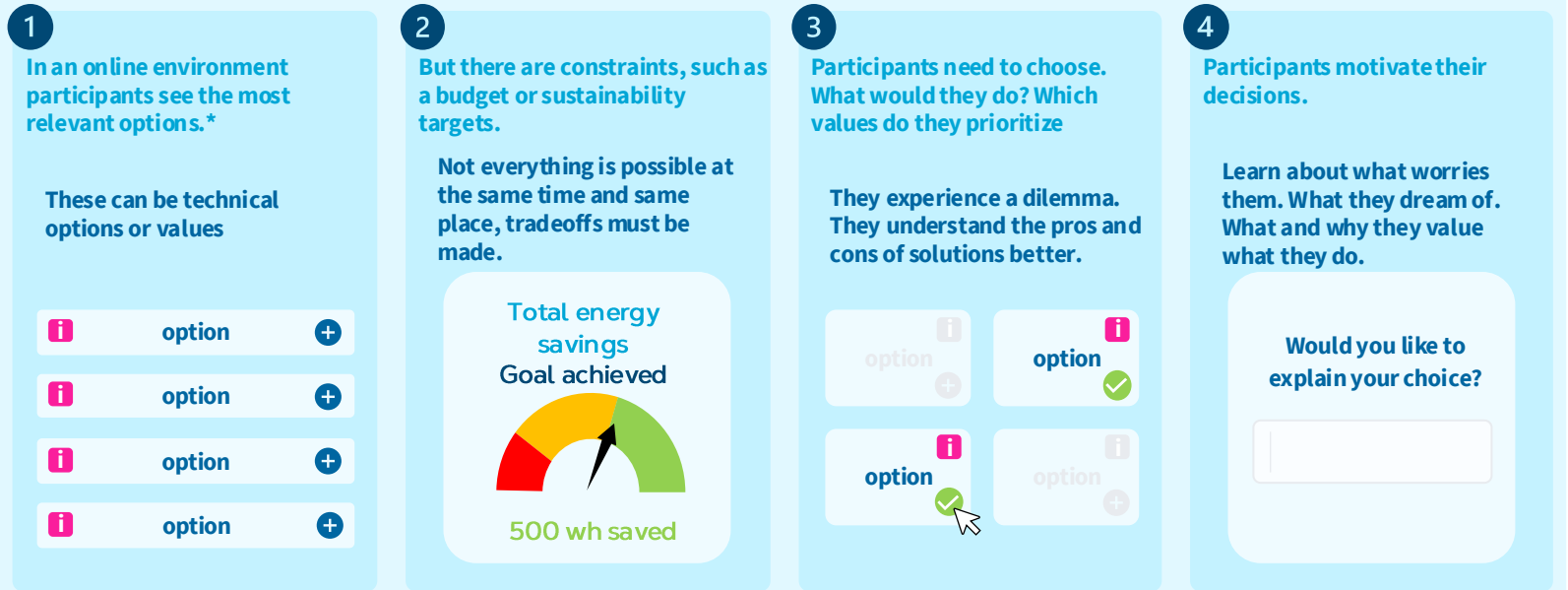
PVE in a nutshell

Participants are invited into an online environment where they see a) relevant choice options, b) concrete impacts of the options, or c) they have to make choices within given constraints. Subsequently, participants are asked to explain their choices. Individuals' preferences over (the impacts of) options can be determined by feeding these choices into behaviourally informed choice models, and for instance can be used to rank options in terms of their desirability.

Advantages of PVE

In our project, we employed the PVE as part of a Value Sensitive Design process. The strength of the method is that participants are not presented with a Likert-scale of options from which they can choose everything they find important, as in a utopian world, but are instead forced to make trade-offs, which reveals what people value under non-ideal, real-world circumstances.

Figure 4.1: Participatory Value Evaluation (PVE) method





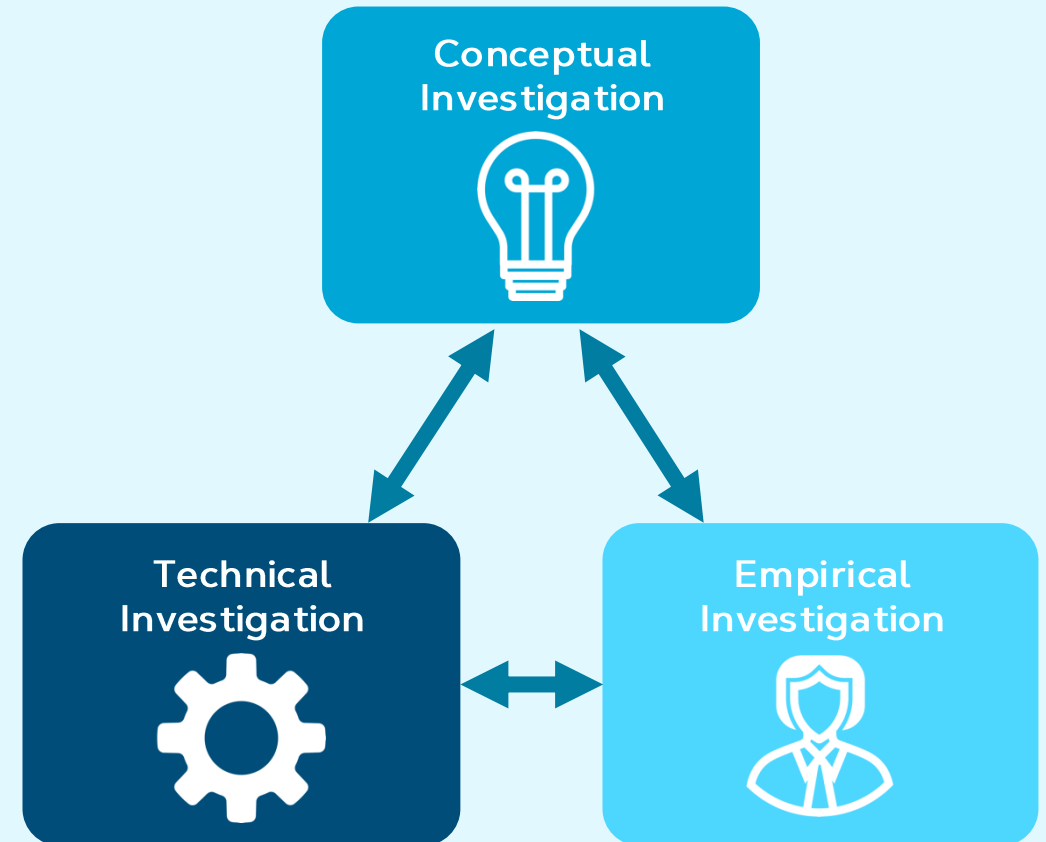
Designing the PVE Conceptual

When designing a PVE, there are several design choices to be made (Mouter & Beumer, 2024), such as the type of constraint to include in the portfolio choice task. This can be a limited budget, energy target, or any other resource constraint.

Following Boshuijzen-van Burken et al. (2024), we adopted a Value Sensitive Design (VSD) approach to designing different concept PVE. The conceptual investigation into different types of PVE which might be suited for our research objectives was based on the technical and empirical investigations discussed in the previous chapters.

In total, four PVE concepts were developed: one focused on values, two with a technically oriented focus, and one in which participants could choose from preselected packages of technical improvements. Of these four concepts, the value-focused PVE (p.21) and the most promising of both technical PVEs (p.22) were selected for further development. The other two concept PVEs were considered technically unfeasible (because they required too much context-specific data) or empirically unfeasible (poorly accessible or too complex for participants).

Figure 4.2: Value Sensitive Design approach





Model A: Values first

Starting with the ‘Why’

In the first PVE Model, participants will be asked directly which building properties should be valued during the retrofitting process. For example, if they prioritise the aesthetics of the windows or the monthly energy bill.

Participants will be forced to prioritise certain properties over others by either having a limited number of “value points” to spend or by having to meet an energy-saving goal, calculated in the background based on renovation options that do not interfere with the properties participants said needed to be valued.

Figure 4.3: Example interface of model A





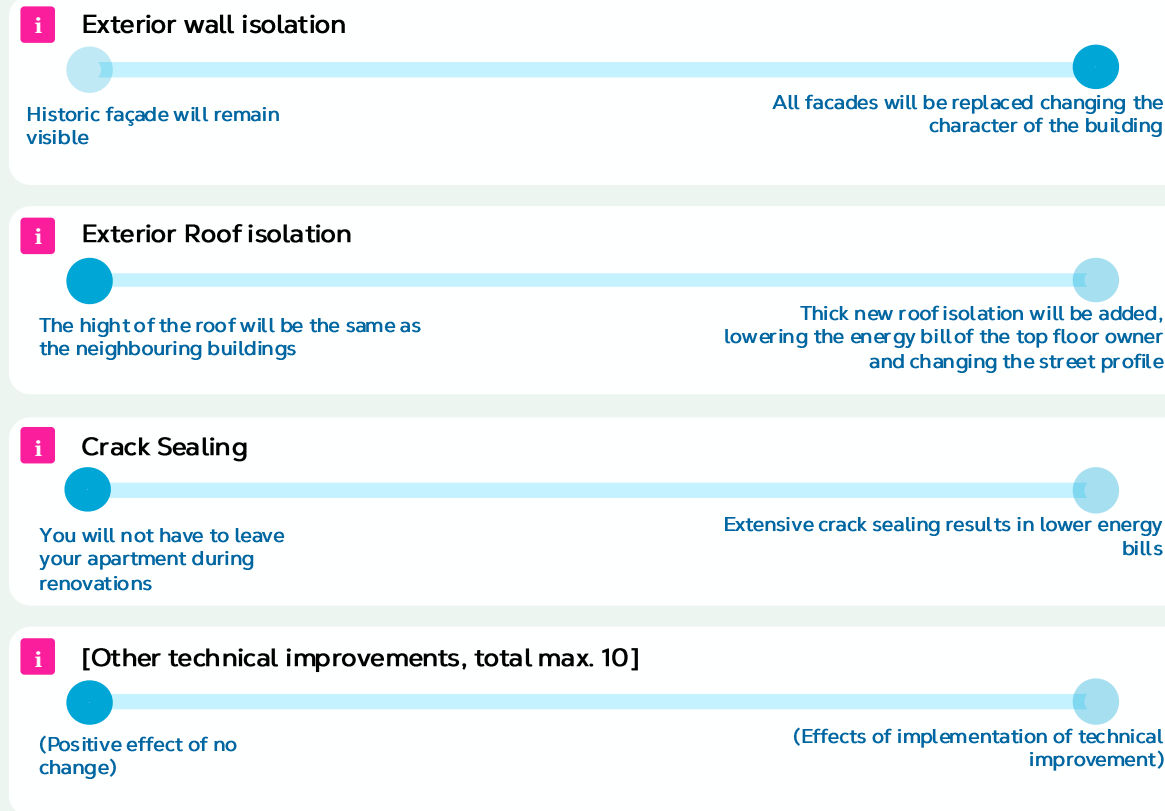
Model B: Technology first

Starting with the 'What'.

The second model would ask participants directly which interventions they prefer in preset cases where values might conflict. They must choose, for example, whether to prioritise the positive effect of (exterior) facade insulation or the preservation of their (historic) facade.

A central aspect of this approach is clearly informing participants about which values would be affected or preserved by the intervention. This is framed as a preference choice but also involves sacrifice. Participants will be forced to make choices by having to meet energy-saving and budget goals.

Figure 4.4: Example interface of model B



Total energy savings
Goal achieved



500 wh saved

Total up-front investment cost
Goal achieved



2.000-euro p/p





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Secondary testing Empirical

Interview protocol

To further refine our framework and investigate how it might assist VvEs in collective decision-making regarding sustainable retrofitting measures, we conducted semi-structured interviews with experts on retrofitting VvE-owned housing complexes (multi-family homes). We interviewed professionals from two organisations that advise VvEs on selecting retrofitting solutions and process aspects, and one resident of a VvE-owned building who initiated the process that led to the installation of green roofs and solar panels.

The interview was semi-structured and consisted of three blocks of questions.

Block 1 addresses the problems the interviewees experienced during the collective decision-making process for retrofitting VvEs.

Block 2 was about our value framework and the selected interventions. Here, we asked whether our values and interventions were also seen in practice, and whether we had missed any.

Block 3 concerned potential improvements to the two PVE models we designed and their potential usefulness in VvE decision-making.

The interview reports are included in Appendix 5.

Figure 5.1: Interview Questions

Block 1

Q1: Do you experience problems with **support** during the collective decision making process in a VvE for sustainability measures?

Q2: Do you experience problems of **fairness** dilemmas during the collective decision making process in a VvE regarding sustainability measures?

Q3: Do you experience problems in **effective learning of knowledge** and resident values regarding energy retrofitting during the collective decision making process in a VvE regarding sustainability measures? If so, what kind of problems?

Block 2

Q4: Do you miss relevant **values** in our framework?

Q5: Do you miss important possible **interventions** in our framework?

Q6: Do you miss **connections between interventions and values** in our mapping?

Block 3

Q7: How would you improve the **understandability / accessibility** of the information provided in the PVA?

Q8: How would you improve **the intuitiveness of the presentation** in the PVA?

Q9: How would you improve the way the **trade-offs** are presented in the questions?

Q10: In what ways do you see **PVE could help address the lack of support** for sustainability measures in a VvE collective bargaining process?

Q11: In what ways do you see **PVE could help address the problems of fairness** in the decision making process during the collective bargaining process in a VvE regarding sustainability measures?

Q12: In what ways do you see **PVE could help effective learning of knowledge** in a VvE collective bargaining process?





Block 1: Problems in the decision-making Empirical

Our hypothesis was that there were issues regarding support, fairness, and knowledge sharing during the decision-making process in VvE's.

The interviewees stated that problems with collective support are present, particularly in larger VvE's. In these large VvE's, subgroups with similar opinions often form. According to the interviewees, once this happens, conversations with these subgroups become largely ineffective. Ideally, differences in opinion should be addressed before such factions can emerge.

Problems regarding fairness were also recognised by the interviewees. These problems arise in the decision-making process—where not everyone is equally heard—and in the selected retrofitting measures —where not everyone benefits equally from the chosen changes. Notably, although the costs of retrofitting measures are distributed equally within a VvE, these costs can have very different impacts on individuals depending on their financial circumstances.

Interviewees did not often face problems with knowledge sharing. The primary challenge was the widespread lack of understanding of ventilation, insulation, and heating systems among the VvE population.

Figure 5.2: Interview Quotes

“In groups, those who oppose something are the loudest. Others have less of a voice and sometimes don't dare to speak up.”

“In some cases, it's distressing what can happen. Sometimes people on minimum incomes are the ones who suffer when, for example, the homeowners' association fee goes up by 150 euros a month. Then they have nowhere to turn.”





Block 2: Value framework and interventions Empirical

Our hypothesis was that while cost would often be an important issue, other values—such as comfort and aesthetics—would also matter to residents, especially when interventions become more concrete later in the process.

The interviewees stated that our value framework and list of interventions cover the most important values and that no others were missing.

Regarding residents' values, they confirmed that cost is often the first point of discussion, but that other values could strongly influence residents' decisions. Comfort and the health effects of the apartment were specifically mentioned as important to residents, although residents often do not realise that these aspects can be improved. Aesthetics also becomes relevant later in the process; however, it is often perceived not as an aspect they can influence, but rather as within the domain of the expert.

Figure 5.3: Interview Quotes

“Tension between the collective and the individual is recognizable in VVE discussions. Tension between energy performance and values as well.”

“Aesthetics are treated as a given. The proposal isn’t questioned or negotiated, unlike, for example, costs and technical measures.”





Block 3: Feedback on PVE models Empirical

Our hypothesis was that both models of the PVE would be of value in the collective decision-making process, but that the intervention-centric option would be more difficult to implement due to the interplay between interventions

When presented with the PVE models, all experts agreed that the option that asked participants for their opinions on retrofitting measures (Model B) would encounter practical obstacles.

Three main reasons were given:

- 1: Participants have insufficient knowledge to make informed decisions.
- 2: Retrofitting measures are interdependent and context-specific.
- 3: Allowing people to focus on individual measures increases resistance to an eventual compromise package.

The interviewees recognised added value in the PVE, in which VvE homeowners were asked directly about the characteristics of the building they valued (Model A).

One interviewee indicated that they already conduct a short, more factual survey at the start of each project. Both advisory organisations interviewed stated that an in-depth PVE would help guide VvEs in selecting retrofitting interventions. Both were open to participating in a pilot study using a PVE tool as part of a potential follow-up project.

Figure 5.4: Interview Quotes

“The first list [Model A] is a good selection of values. That ‘incoming air’ is recognisable – it’s something I want to take into account myself as well. The discussion about values really adds something; it broadens the story.”

“Asking for and presenting options [Model B] can, apart from the fact that it may not even be possible, also create false expectations that whatever is chosen will actually happen.”





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Conclusions

In this research project, we investigated the relationship between values and technical interventions, the possible designs of PVEs based on this relationship, and the practical application of PVEs in VvE retrofitting projects. The aim of this research was to examine how PVEs can be employed in the retrofitting process of VvEs and for which purposes they are most effective. Based on this research, three main conclusions emerge.

Main conclusions:

Conceptual: Theoretical and abstract value frameworks can be meaningfully combined with technical interventions when these are tailored to a specific (housing retrofitting) context.

Technical: There are practical obstacles that limit the use of technology (solution)-focused PVEs, as buildings are too diverse to support effective, widely applicable PVE models of retrofitting and to justify the values, energy savings and costs associated with specific measurements.

Empirical: Values play an important role in the retrofitting process of VvEs; however, they are often addressed late in the project, which frequently leads to increased conflict within the VvE.



Discussion

This project contributes to the field of Value Sensitive Design (VSD) by linking abstract value frameworks to concrete technical interventions. Interviews conducted during this project indicate the potential value of a PVE in the retrofitting of VvEs. However, a trial study is required to adequately explore both the possibilities and the challenges associated with implementing PVEs in this context.

Practical implications of the PVE models

PVEs centred on technical interventions (Model B) face significant practical obstacles in their implementation. First, buildings are too diverse for standardised calculations of costs and energy savings to be sufficiently accurate. Moreover, in some specific context certain benefits or value sacrifices may be mitigated by design solutions. Second, many residents of VvEs are not familiar with the advantages and disadvantages of specific technical interventions, let alone the interactions between different interventions. As a result, participants may choose technical interventions that are either infeasible or not preferred by the VvE as a whole. When participant-selected interventions are not implemented for these reasons, trust in the process may be undermined.

In contrast, a PVE centred on values (Model A) is regarded by sector professionals as a constructive addition to the retrofitting process for VvEs. Such a PVE could help identify participants' most important values, thereby supporting the selection of retrofitting measures in three ways. First, early identification of residents' values enables the early detection of value conflicts, which can limit conflict later in the process when plans become less adaptable. Second, the results of a PVE can be used by professionals advising the VvE to design retrofitting packages that better align with residents' values. Finally, the results of a PVE can support conflict resolution within a VvE by providing an objective basis for democratic decision-making.



Recommendations

Next steps

As this project was the result of seed funding from Delft Design for Values, its primary goal was to pave the way for future research. In line with the project's exploratory nature, the research team plans to continue research into VSD and PVE in the retrofitting of VvE-owned buildings. Future research will focus on a practical trial in partnership with a VvE retrofitting advisory bureau. The aim of this research is to gain further insight into the practical challenges and opportunities that a PVE brings to the retrofitting of VvE-owned buildings.





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Interview Reports



Appendix 1: Literature

Referenced publications in the report

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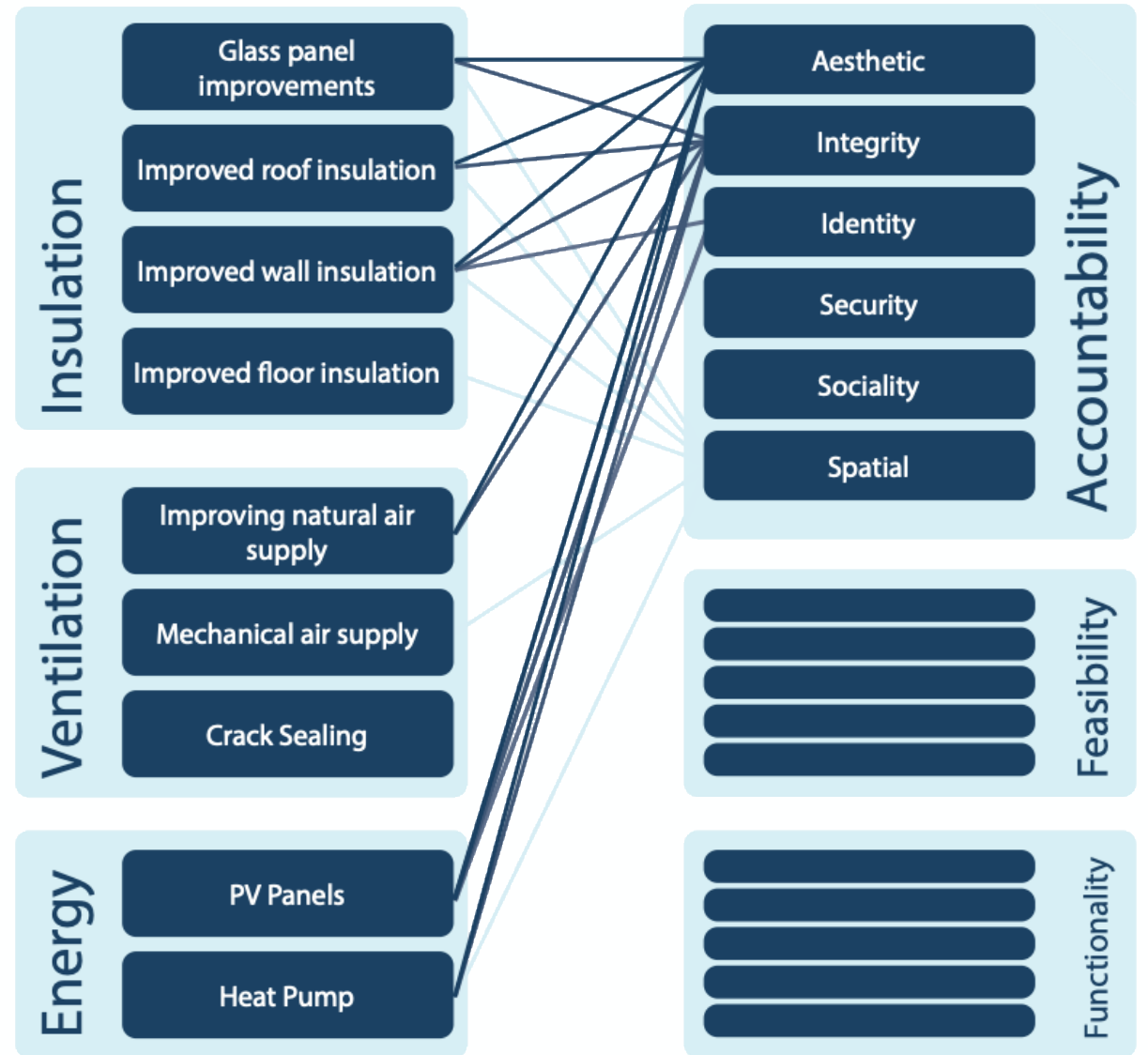
Previous publications relevant to the project

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Appendix 3: Overview of Values and Intervention links

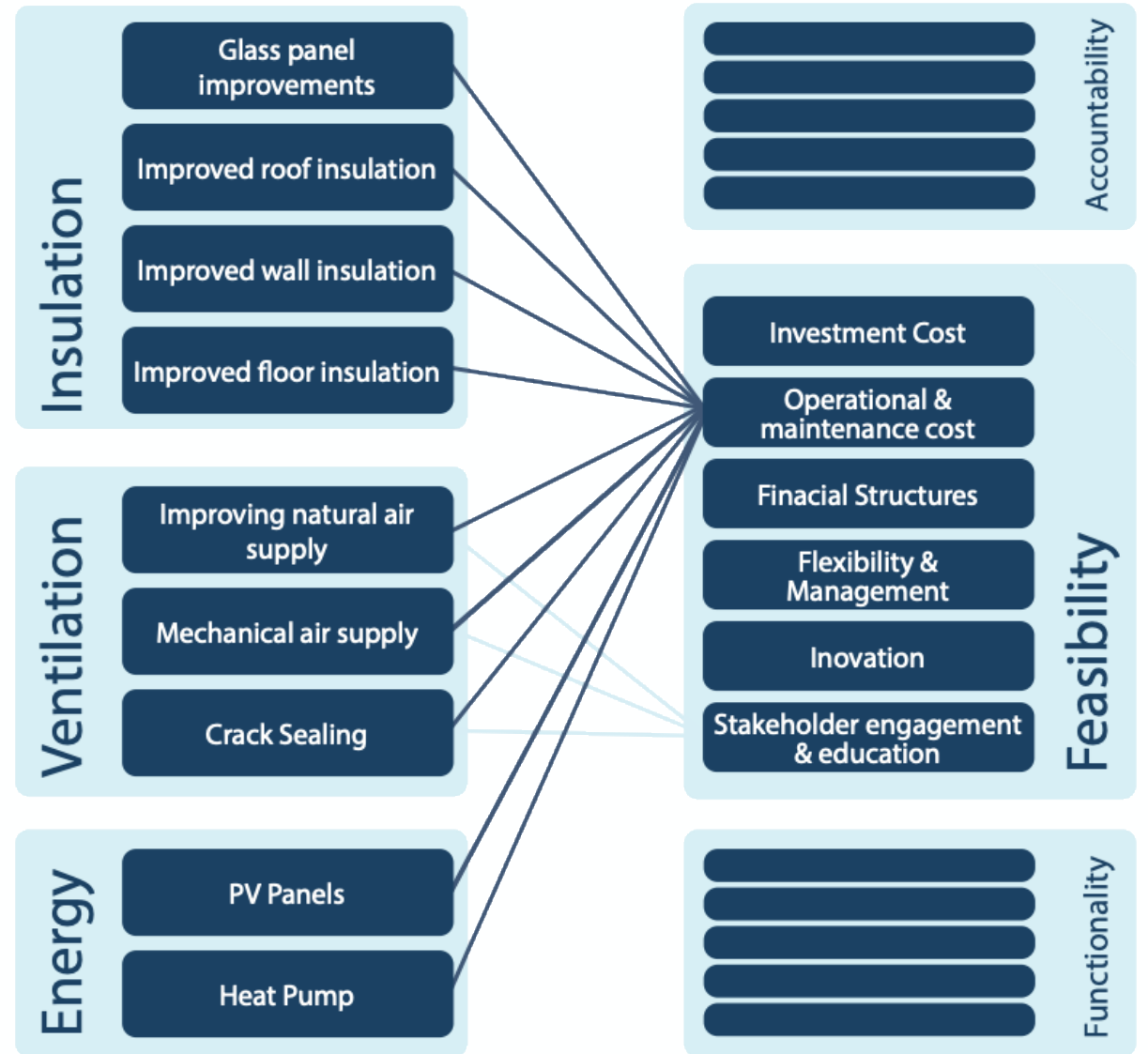
This appendix shows the overview of all links between the selected technical interventions and the values in the value map. The impact of the intervention on a valued attribute within the housing complex is embedded within the underlying framework of the decision-making model.

This scheme illustrates the relationships between potential retrofitting measures and the Accountability category.



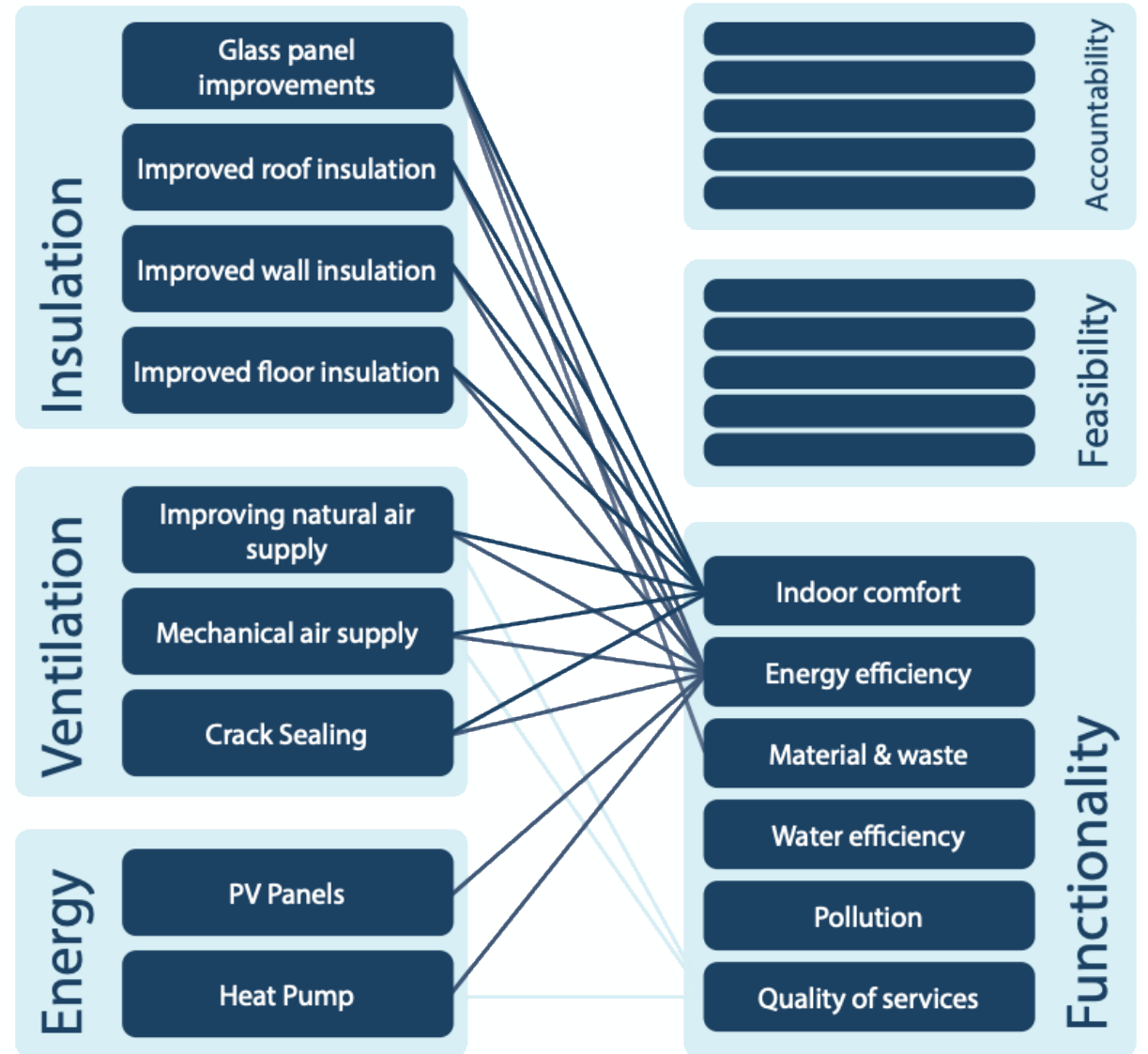
Values and Interventions

This scheme illustrates the relationships between potential retrofitting measures and the Feasibility category.



Values and Interventions

This scheme illustrates the relationships between potential retrofitting measures and the Functionality category.



Appendix 4: Workshop Results

The tables show the categories of the Value Map.

The first table (left) shows the translation of the Value Map as designed by Kamari et. al (2017) to the Dutch context, as also used in the research project 'Renoveren met Respect'.

The second table shows the overview of the Workshop in this Apples and Oysters project. All contributions, written on post-it notes by participants, have been attributed to one of the value categories.

The colours indicate the main categories:
 Yellow = Accountability (Karakter)
 Orange = Functionality (Gebruik)
 Red = Feasibility (Bestuur)

Karakter		Gebruik		Bestuur	
Ruimtelijk	(Uitzicht en lichttoetreding	Binnenklimaat	Verwarmen en koelen	Bewoners participatie	Gebruik
	Ruimtesequentie		Ventilatie		Flexibiliteit
	Privacy		Comfort		Betrokkenheid
	Bruikbare ruimte		Akoestiek		
Esthetiek	Vorm en massa	Energie	Energieverbruik	Keuzevrijheid	Architectuur
	Gevelcompositie		Energieproductie		Techniek
	Materialisatie		Energieopslag		Sociaal
	Kleur en textuur				
Sociaal	Sociale structuur	Milieu	Waterhuishouding	Betrokken partijen	VVE of VVH
	Demografie		Levensduur		Management
	Eigendomssituatie		Biodiversiteit (eco-system services)		Onderhoud
Identiteit	Omgevingsidentiteit	Reststromen	Materiaal afval	Investering	Terugverdientijd
	Gebouw identiteit		Watervulling		Rendement
	Sociale identiteit		CO2 en NOx emissie		Betaalbaarheid
			Collectie & recycling		
Veiligheid	Toegankelijkheid	Diensten	Bruikbaarheid	Exploitatie	Inspecties
	Verlichting		Betrouwbaarheid		Operationele kosten
	Infrastructuur		Kwaliteit & levensduur		Onderhoud

Karakter		Gebruik		Bestuur	
Ruimtelijk	0	Binnenklimaat	2	Bewoners participatie	1
	0		1		0
	0		0		0
Total	2	Total	5	Total	0
2	0	9	1	1	0
Esthetiek	0	Energie	2	Keuzevrijheid	0
	0		0		1
	2		0		0
Total	3	Total	0	Total	0
6	1	2	0	1	0
Sociaal	1	Milieu	0	Betrokken partijen	1
	0		0		0
	0		0		2
Total	0	Total	0	Total	0
1	0	0	0	3	0
Identiteit	0	Reststromen	3	Investering	2
	0		7		1
	0		2		1
Total	1	Total	3	Total	6
1	0	16	1	12	2
Veiligheid	0	Diensten	3	Exploitatie	0
	0		2		0
	0		1		0
Total	0	Total	3	Total	1
0	0	10	1	1	0

Workshop Results

Group 2

Questions and answers		Value Map categorisation (Dutch system)						
ORDEP 2	Warmte-vraag 1	Welke waarden zijn van belang bij deze techniek?	Perspectief	Family 1	Type 1			
Angst bewoners onbekende	!	Risico aardbevingen geothermie						
Autonomie op de grote schaal	!	Europees bed (€ :)						
		Geen/minimale impact omgeving		Identiteit	Omgevingsidentiteit			
		Mate positieve impact CO2 U tstoot		Reststromen	CO2 en NOx emissie			
		Geen/minimaal afval of circulair		Reststromen	Materiaal afval			
		Uitstoot		Reststromen	CO2 en NOx emissie			
		Geluidsoverlast		Binnenklimaat	Akoestiek			
		Geluid		Binnenklimaat	Akoestiek			
		Meer/ minder comfort		Binnenklimaat	Comfort			
		Kosten	Bewoners	Investering	Betaalbaarheid			
		Comfort	Bewoners	Binnenklimaat	Comfort			
		Geluid	Bewoners	Binnenklimaat	Akoestiek			
		Prijs kosten terugverdientijd		Investering	Rendement			
		Betaalbaarheid terugverdientijd		Investering	Rendement			
		Kosten	Woningbouw cooperatie	Investering	Betaalbaarheid			
		Techniek	Woningbouw cooperatie	Diensten	Betrouwbaarheid			
		Kosten		Investering	Betaalbaarheid			
		Kosten (gebruik + aanleg warmtenet)	Municipality	Investering	Betaalbaarheid			
				Exploitable	Operationele kosten			
		Schoonheid, aanpassingen niet mooi		Esthetiek	Materialisatie			
					Vorm en massa			
		Ruimte in en buiten huis		Diensten	Bruikbaarheid			
				Ruimtelijk	Bruikbare ruimte			
		Benodigde aanpassingen		Diensten	Bruikbaarheid			
				Esthetiek	Vorm en massa			
		Ruimte die de warmte pomp in en buiten in neemt		Esthetiek	Vorm en massa			
				Ruimtelijk	Bruikbare ruimte			
Warmte-vraag 2	Tussen welke waarde moeten afwegingen gemaakt worden aangezien niet alles tegelijk	Perspectief	Family 1	Family 2	Family 3	Type 1	Type 2	Type 3
	Kosten vs impact CO2		Investering	Reststromen		Betaalbaarheid	CO2 en NOx emissie	
	Visuele impact vs ruimte impact		Esthetiek	Diensten/Ruimtelijk		Materialisatie	Bruikbaarheid/Bruikbare ruimte	
	Ruimte prijs comfort		Diensten/Ruimtelijk	Investering	Binnenklimaat	Bruikbaarheid/Bruikbare ruimte	Rendement	Comfort
	Levenszekerheid		Diensten			Betrouwbaarheid		

Appendix 5: Interview reports

Interviewee 1

Context

Interviewee 1 owns apartments in two VvE's and has been involved in the retrofitting process for both. In the VvE (14 apartments) she lives in, she started an initiative to install solar panels and green roofs. This project eventually grew to include the other two VvE's that managed other parts of the housing complex and successfully installed solar panels for many of the apartments.

1: Do you experience problems with support during the collective decision-making process in a VvE for sustainability measures?

Summary of answer:

1. The VvE in which the interviewee was trying to add solar panels was generally in favor of climate action and was relatively well-off. This resulted in low opposition from other homeowners.
2. Opposition that did arise in the early stages of the process was because of a previous report looking into installing solar panels. That report concluded that it would not be advantageous.
3. The first enthusiasm came from the idea to change the roof of the storage boxes in the middle of the complex to a green roof. The evident aesthetic improvements appealed to people.
4. The second breakthrough came when the possibility of a building-specific advisory report regarding solar panels for €600 was introduced to the ALV. The costs were low enough per house for all to agree on the execution of the report.
5. Especially advice regarding the management of ownership and the options for cabling proved useful (the complex consisted of three buildings, all with their own VvE. This complicated the ownership and cabling solutions).

Follow-up question: How did you tackle these problems?

Summary of answer:

1. Coming together helps resolve conflicts in a small VvE.
2. The increase in the sale value of the apartment was an important factor for many.
3. Honesty regarding uncertainty is important.

Question 2: Do you experience problems or fairness dilemmas during the collective decision-making process in a VvE regarding sustainability measures?

Summary of answer:

1. Not all VvE's in the complex had an equal amount of space on the roof per apartment. This was solved by following formal ownership divisions.
2. Not all in the VvE wanted to invest in solar panels. Apartments that did not invest maintained the right to the roof space for later. This meant that not the whole roof was covered with solar panels by the end of the process.

Follow-up question: Did you have problems with equality?

Summary of answer:

1. In the other VvE that the interviewee is a member of, retrofitting of the windows was approved by the ALV. People who improved the windows on their own tried to get out of having to pay for this renovation by starting a court case.

Interview reports

Interviewee 1

Question 3: Do you experience problems in effective learning of knowledge and resident values regarding energy retrofitting during the collective decision-making process in a VvE regarding sustainability measures? If so, what kind of problems?

Summary of answer:

1. It would help to see other projects with similar problems so that not everyone has to invent the wheel on their own.
2. The skills and connections of members of the VvE were key in this retrofitting process in the case of the interviewee's VvE.

Question 5: Do you miss important possible interventions in our framework?

Summary of answer:

1. Not only the type of renovation is important; what space gets renovated is also relevant. Sometimes it gives extra usable space.

Question 6: Do you miss connections between interventions and values in our mapping?

Summary of answer:

1. The axes of our model are recognizable in practice.
2. The focus of renovation is often on checking boxes.
3. Starting the renovation project by collecting what the owners think ambitions can be could be advantageous.
4. The conversation quickly turns into a mathematical conversation regarding recuperation times.

Question 10–12: How could these versions of the VvE be useful in the retrofitting decision-making process?

Summary of answer:

1. Option one could be really valuable. Shown values are recognized in practice. It could help to have a broader discussion on what is valuable during retrofitting.
2. Option two is difficult to adapt to the VvE buildings, as these situations are very specific. A PVE might not be the tool to use for a solution-based discussion in this case.

Interview reports

Interviewee 2

Context

This interview is with an advisory bureau that helps VvE's with their retrofitting challenges. They work with an architecture firm and often refer to them when it comes to the design stage. Their usual clients are larger VvE's (50–200 people), and their usual process is as follows:

- Study of the case and the possibilities;
- Information evening during which we provide information;
- Prepare the Q&A documents and send them around;
- Two weeks later, a General Members' Meeting (ALV) is held where they only vote yes or no (after that, either the action groups take over, or we simply continue with the process).

They also send out a survey beforehand. In the survey (mostly multiple-choice questions), they ask, among other things:

- Whether they are a tenant or owner,
- Consumption data,
- Willingness to pay higher costs,
- Whether they know where air enters and exits in the current situation,
- Whether they know what the heat sources are in the current situation,
- How long they plan to keep living there,
- What they would like to see improved.

Conclusions

Question 1: Instrumentive

Do you experience problems during the collective bargaining process in a VvE regarding support for sustainability measures? If so, what kind of problems?

Conclusion of answer:

1. Problems differ between municipalities, with some having a more constructive and others a more obstructive public when it comes to retrofitting.
2. Subgroup formation within the VvE leads to lower cohesion. Groups often form after VvE decisions have been made, in an effort to overturn them.

How do you handle these problems?

Conclusions of answer:

1. It is (interviewed experience) impossible to engage in a conversation with the subgroups of a VvE. It is better to encourage the board to follow the formal decision-making process (follow the results of a general meeting).
2. Cases can be very hard on some people (e.g., low-income households who cannot afford the monthly repayment of the retrofitting).
3. These problems usually arise in large VvE's (200 people).
4. Lawmakers often don't seem to realize that VvE's usually include renters.

Question 2: Normative

Do you experience problems of fairness in the decision-making process during the collective bargaining process in a VvE regarding sustainability measures? If so, what kind of problems?

Conclusion of answer:

1. Problems in this area do exist: not everyone is equally heard.
2. An email address per case is set up and shared to make it as easy as possible to contact the interviewee.

Interview reports

Interviewee 2

3. The board of a VvE often consists of older white men.

4. To counteract problems with the fairness of the outcome of the retrofitting measures, all proposals include at least two interventions (subsidy requirements) that address experienced issues with the building and must improve something for everyone in the VvE.

Question 3: Substantive

Do you experience problems in effective sharing of knowledge and resident values during the collective bargaining process in a VvE regarding sustainability measures? If so, what kind of problems?

Conclusion of answer:

1. Knowledge sharing is difficult; people not in our bubble know little about retrofitting.
2. Explain only what is needed, and repeat it often.
3. Usually, there is no one in the VvE who has a lot of knowledge on retrofitting.
4. Information is only given when it leads to a better understanding required for making the decision between proposed interventions.

Question 4: Values

Did we miss relevant values in our framework?

Conclusions:

1. Cost is the most important value.

2. Inconvenience during construction and certainty regarding future living costs are also important.

3. Comfort is important but is often not brought up during discussions. Lack of comfort is highlighted by surveys.

4. Aesthetics are important but are often not thought of as something that can be changed by participants.

Question 5: Interventions

Did we miss important possible interventions in our framework?

Conclusions:

1. The Interviewee always works with sets of retrofitting measures, not individual interventions, because they depend on each other. An individual approach would be counterproductive.

Question 9: Dilemma

Do the questions highlight the relevant trade-offs in retrofitting effectively?

Is a PvE, in principle, a tool that could be useful in the context of selecting sustainable retrofitting solutions?

Conclusions:

1. The question of which intervention should be applied is something for the experts. The advantages and disadvantages of individual retrofitting measures and combinations of them are not something one without expertise can productively consider.
2. Model 1 asks owners about their expertise, what qualities the house has or lacks, and what qualities should be improved.

Interview reports

Interviewee 2

Question 10: Instrumentive

How would/could a PvE tool help solve lack of support for sustainability measures in a VvE collective bargaining process?

Conclusions:

1. According to the interviewee, the individual vs. collective opposition is not often a problem during their procedures. It is, however, important to note that they specifically design their retrofitting solutions to avoid these problems (making sure that retrofitting helps everyone).
2. Differing interests between the collective and the individual mainly result from individuals who have made improvements to their homes on their own and individuals who cannot afford the higher monthly costs.

Interview reports

Interviewee 3

Context

The interviewee aims to make retrofitting as easy as buying a car. Their company aims to achieve this by providing clear, straightforward options, offering understandable results, and presenting financing options in an accessible way.

The Standard Process:

1. **Compilation of Intervention Sets:** The company compiles multiple sets of interventions tailored to the building type and owners' needs.
2. **Financial Calculation for Apartment Types:** They prepare detailed financial calculations for three different types of apartments, outlining the costs and benefits of the proposed retrofitting measures.
3. **Loan Management:** The company handles the loan process for the retrofitting, making it easier for owners to finance the changes.
4. **Presentation to the ALV:** The proposed plan is presented to the General Members' Meeting (ALV). In about 25% of cases, the ALV approves one of the proposed intervention sets.
5. **Further Development of the Plan:** Once approved, the interviewee's organisation further develops the retrofitting plan. Financing for the project continues through the loan for retrofitting.

Summary of interview

Question 1: Do you experience problems during the collective bargaining process in a VvE regarding support for sustainability measures? If so, what kind of problems?

Conclusions:

1. There is a problem regarding problem ownership. The municipalities have to improve the sustainability of the building stock; they have the problem. It is, however, the VvE's responsibility to solve the problem.

2. This mission of increasing sustainability comes from a democratic mandate, just like decisions in a VvE. These decisions are, however, often thought of as something that comes from outside.

Follow-up question: How do you tackle these problems?

Conclusion:

1. Start by going through the current costs paid to the VvE. These are often too low for the VvE to save for the necessary long-term maintenance.

2. By showing the real cost of maintaining the status quo, including big-ticket maintenance items, a renovation becomes cost-competitive.

Question 2: Do you experience problems of fairness in the decision-making process during the collective bargaining process in a VvE regarding sustainability measures? If so, what kind of problems?

Conclusion:

1. Communication regarding the legal workings of the VvE is key (collective decision-making, collective cost-sharing).

2. In larger VvE's, the conversation quickly turns to money, as it is important to all and therefore functions as a common starting point.

3. The ability to use a loan for retrofitting measures is really attractive in VvE's that have postponed big-ticket maintenance items without saving for them. These maintenance activities would otherwise have to be paid out of pocket.

Interview reports

Interviewee 3

Question 3: Do you experience problems in effective sharing of knowledge and resident values during the collective bargaining process in a VvE regarding sustainability measures? If so, what kind of problems?

Conclusion:

1. People have little knowledge of the mechanical workings of their building, and even less about possible retrofitting measures.
2. An open and transparent discussion is key in the decision-making process. The discussion is therefore documented and shared with VvE owners.
3. By taking out a loan that is to be paid back when the house is sold, less affluent owners in the VvE can also afford the retrofitting.

Question 4: Did we miss relevant values in our framework?

Conclusion:

1. In the minds of the homeowners, energy performance is not a key issue; they don't understand it.
2. Collective private should not be a point of tension, as all are part of the collective. His roof is also your roof. It can, however, be difficult to get people to shift their perspective from their own to that of another.
3. How healthy (functionality) a building is, is important to the owners in a VvE. It is important to translate this to things that matter in everyday life.
4. Municipalities are the ones who seem to value accountability the most. Inhabitants of the buildings are less interested in this.

5. The historical preservation of municipalities is often in conflict with the best improvement measures. They often don't seem to know the implications of policies.

Question 5: Did we miss important possible interventions in our framework?

Conclusion:

1. The list is mostly complete.
2. In ventilation, there are heat recovery systems and CO2-controlled systems.

Question 7: Are the questions and information presented in an understandable way?

Conclusion:

1. Model 2 is too complicated; the consequences of retrofitting measures are not understood by the general public.
2. The tool could also lead to false expectations, as people will think that their chosen solutions can and will be implemented.
3. Tool one could play an important role in the communication process.
4. It can help map willingness regarding retrofitting measures in the inhabitants.

