



Service tools linking values with technology in a sustainable home refurbishment

Stella Boess

s.u.boess@tudelft.nl

Delft University of Technology, 2628CE Delft, The Netherlands

Abstract

Sustainable home refurbishments are part of the many efforts needed in climate change mitigation. This practice note presents service tools that aim to link the residents' values with the technology they will use after a sustainable refurbishment of their home. This technology will affect their daily living practices. In a recent sustainable refurbishment pilot project, my and colleagues' role was to advise a building company running this process. With colleagues, I developed service tools to communicate with residents about what the refurbishment would mean for them. The service tools and an initial reflection on each one are presented and discussed here. Two types of tools are presented: tools to support residents in bringing their interests to bear, and tools to communicate with the residents about the new technology. I found that level of abstraction, timing, form and familiarity of the tools to stakeholders affect their effectiveness in the process.

Keywords: sustainable refurbishment, service tools, communication tools, values, technology, inclusion

Introduction

Sustainable refurbishment of homes is one of the many efforts needed to meet climate change. In the project presented here, my colleagues and I worked as advisers to a building company who applied facade refurbishment and energy-efficient technologies to convert technically obsolete porch houses into zero energy homes. A pilot block of 12 social housing units was refurbished while residents stayed put. For the residents it was a transition process to new practices in their existing homes. Much can be gained by approaching sustainable home refurbishment as a service design task. It is a way to involve and include residents in the process and its outcomes. It can help facilitate the process so that in the end the residents are able to use the new technology in their home. Without this, the home is less likely to be a zero-energy home in practice, because this outcome partly depends on what residents do in their home. With colleagues I previously presented this reasoning as well as the theoretical underpinnings of the tools presented here (Guerra-Santin et al., 2017). We reported previously that important values for the residents in relation to refurbishment of their home are: having a grip on the future, being treated fairly throughout a refurbishment process, seeing their ideals reflected in process and result, being supported in their activities and lifestyle, and having control over their health, their comfort and the new home systems. These values guided our team in developing service tools to support the residents in their refurbishment journey. In our advising position we had no influence on the technology choices themselves (although we tried), nor did the residents of the pilot project. This was the building company's domain. The technology choices are beyond the scope of this paper. This paper focuses on the service tools colleagues and I developed and evaluated in order to support the residents in articulating their values and in preparing for the changes that were to come. With service tools is meant here: visualisations, artifacts and activities to direct the stakeholders' attention to the service qualities being created – or not created – alongside and through the refurbishment process. This falls within Segelström & Holmlid's (2009) categorization of visualisations as tools for research. I present some initial personal reflections on the effectiveness of the tools in the pilot project, in order to invite commentary and evaluation from the service design community. Due to space constraints I focus on the pre-refurbishment phase only.

Methodology

My colleagues and I had an advisory role to the building company in charge of the pilot refurbishment project. We met regularly with the building company and thus were able to respond to and develop these service and communication tools based on what was needed at each point of the process. Since some of my colleagues either have different foci in their own research or provided only brief contributions at various points in the process in which they helped with research, design and communication, this paper is a first-person reflection account in which their contributions are acknowledged.

Tools developed

Two types of tools we developed and used are presented here. (Figure 1). They served to:

- Support residents in bringing their interests to bear on the process, and
- Communicate with the residents about the new technology in their home.
- A third set of tools that served to facilitate the residents' journey through the refurbishment process has been presented elsewhere (Boess et al, 2018).

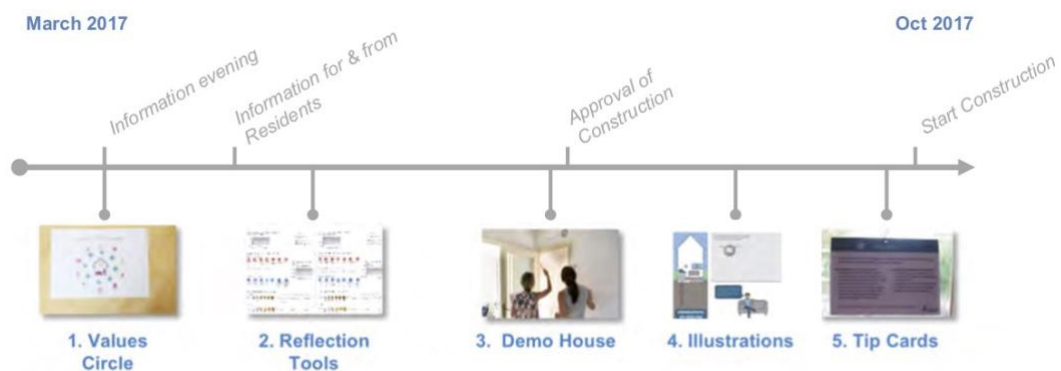


Figure 1: overview of the tools presented in this paper that we developed and used and their positioning on the timeline of refurbishment preparation.

Tools to support residents in bringing their interests to bear on the process

The first type of tools were tools to support residents in bringing their interests and values to bear on the process. There were two of them: the value circle (Figure 2) and the reflection booklet (Figure 3).

Interests tool 1: value circle

The value circle was adapted from the values we had researched previously with other residents (Guerra-Santin et al., 2019). The results were presented in a simplified version for the purposes of communication with this new group of residents. During the first resident information evening in which the tenants learned about the plan for refurbishment, we presented the value circle to them and invited them to add their own experiences and values to it, either verbally or by drawing or writing on it. Its purpose was to enable the residents to develop a vocabulary for their wishes in terms of their own values. This should serve to reveal requirements beyond the financial and technical considerations that are normally discussed at this stage. In turn, this should facilitate the residents' influence on the process and results of refurbishment.

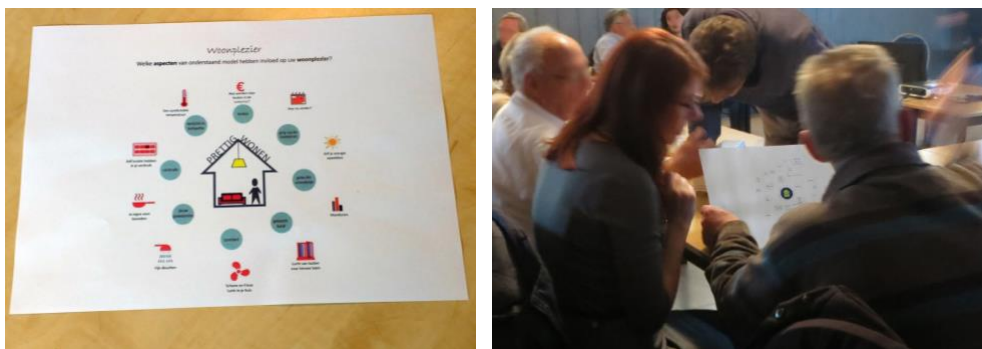


Figure 2, left: the value circle as it was used to communicate with residents about their values for their home. It shows the categories derived from prior research with residents: comfort, health, usability, a grip on the future, habits, control, diverse needs and cost. Right: two residents using the value circle to aid discussion during the first resident evening.

Initial reflection

Though intended as a communication tool, the value circle as presented was alienating for residents even though it was based on prior in-depth research with residents. These residents preferred to talk about values using concrete examples from their own lives, rather than using an

abstract overview like this. This was a valuable insight to carry forward into later upscaling of the process. The presentation of the value circle did not impede the rest of the process. In my subsequent interactions with residents and building company stakeholders, I addressed and elicited values by means of short anecdotes or images from residents' lives.

Interests tool 2: reflection booklet

We invited the residents to let us know more about their daily practices and indoor comfort via reflection booklets we designed, informed by earlier similar methods designed to reconstruct day life experiences (Herrera, 2017). The purpose was to use the learnings to then be able to support residents later. For example, to inform the residents of how the refurbishment would affect them in a way that connects with their prior experiences. They could fill in the booklets whenever they wanted, in the privacy of their own home. Four of the 12 households chose to participate in this. Parts of the reflection booklets were put to all 12 households and they filled them in during information events (Figure 3).



Figure 3: pages from the reflection booklet filled in by a resident. For example, temperature preference, related to what a resident was wearing. Inset, upper right: A researcher asks a resident to fill in reflection materials during an event.

Initial reflection

The reflection booklets were adapted from earlier work designed to elicit day-to-day accounts of residents' practices in their home, with the purpose

of eliciting practice-oriented insights into energy consumption. Reflection tools such as these are not suitable for all residents. Several residents emphatically rejected using them, while others were enthusiastic and filled them in several times. They were valuable resources for conversation with the residents. They revealed, for example, the variation in indoor temperature preferences among residents, and how this was connected to their activities and what they wore.

Tools to communicate with residents about the new technology

The second type of tools were tools to communicate with the residents about the new technology they would be using after the refurbishment. Three tools were designed for this: Demo house (Figure 4), Cards with Tips (Figure 5), and Illustrations (Figure 6).

Technology tool 1: Demo house

This was a currently empty apartment of the same type as the apartments of the current residents. To create the demonstrations in it, we use cardboard props, similar technology (such as a portable infrared cooker) and an experiential guided tour in which participants got to experience their future technologies in simulation.



Figure 4, left: the communication expert from the building company shows a resident what the ventilation will look like in a demo home, and asks her to give her response as if it was her own home. Right: the resident tries out cooking on an induction stove in the demo home.

Initial reflection

It might be expected that the demo house would be the most insightful tool for residents to understand how they would engage with the future technology in their home. It was certainly effective in addressing all aspects of the refurbishment and prompted residents to ask numerous questions. Most importantly, it built trust with the residents. However, the refurbishment was still three months away at this point. Lessons from the demo house did not turn out to be clearly discernible in what residents said later about their understanding of their home. Later they only mentioned lessons learnt after the refurbishment completion.

Technology tool 2: Cards with tips

Following the reflection booklets as well as the active forms of communication described above, the insights were collected and a set of tips and recommendations was generated for residents that took up their values so that they could prepare for the changes the refurbishment would bring for their lives. I decided to create this in the form of cards that were distributed neatly bundled as 'gift packages' to the residents together with the regular newsletters they received in the run-up to the refurbishment. Magnets and suction cups were added to the package so that residents could hang up the cards in their home. This was a period of low time resource for us as academic researchers in the project, so we were only able to produce these cards in text form, and not hand them over personally.



Figure 5: Card with tips for residents explain what will change and what will remain the same after the refurbishment. For example, a change: inlets will provide fresh air in the house, so windows do not have to be opened. Example of what stays the same: if you feel cold, it might help to move about a little.

Initial reflection

My estimation is that the cards did not have the desired effect of preparing residents for the change in their daily life practices. Several of the

residents shied away from reading most text-based materials, including these. The fact that the cards were nicely bundled up had the effect that the residents stored them away with the rest of the materials, as one resident said: "Oh yes I have them. I store them all safely in a drawer". Later I also learned from some residents that understanding the changes, and changing their habits, took half a year to a year after the refurbishment, and was a gradual process. It follows that the cards are unlikely to have had the desired effect of preparing residents for the changes.

Technology tool 3: Illustrations

The last type of tool that we developed to help residents understand their systems, were illustrations about the systems. They were presented to residents in an information session shortly before the refurbishment. Later, some of them were re-used in the user manuals the residents received for their new systems. The illustrations spanned several aspects. They showed schematically where the systems were located in the house and how they were connected, to help the residents develop ownership. Additionally, the illustrations contained simple explanations of the user interfaces. Lastly, the illustrations contained tips similar to the cards described in the previous section, only this time, in illustrated form. These served to help residents adapt their daily life practices and understand the new systems' behaviours. For example, that heating system only slowly reaches a temperature set on the thermostat.

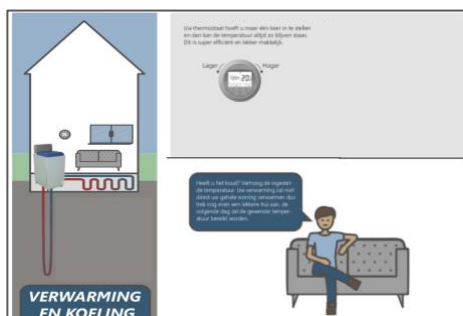


Figure 6: Illustration to explain the technology to the residents: what it is, how it works in principle, how it can be adjusted. This example provides explanation on the heat pump and tips for use.

Initial reflection

The illustrations served well to give the residents an accessible, visual understanding of their new home systems. It enabled them to ask follow-

up questions about what their home systems do for them. The illustrations are not sufficient to uncover and highlight all usability problems. They do not reflect the dynamics of daily use, nor the partially faulty functioning that often goes hand in hand with newly installed home systems. An unexpected additional aspect was that the building industry and installation professionals were not used to communicating with residents in this way. Some of these stakeholders preferred to continue relying on thorough verbal explanations of how the systems work.

Discussion

I have presented some of the tools we developed throughout this pilot project to bridge between new technical configurations and residents' values and the (future) changes in their daily life practices. Adding to the analysis of residents' values (Guerra-Santin et al, 2018), colleagues and I developed and evaluated the specific tools that can help carry residents' values forward in a refurbishment process. I found that level of abstraction, timing, form and familiarity of the tools affect the tools' effectiveness in the process in terms of including residents' values. The tools were partly effective in that they increased the residents' trust of being treated fairly and gave them some grip on the future, but there were also shortcomings. For example, a representation based on thorough research with residents turned out to be alienating to a new group of residents because of an undesirable level of abstraction. The shortcomings were however also compounded by the fact that technological decisions were made that were not optimised for the residents' control over their new technological configurations but rather for generalised models of energy efficiency.

As more sustainable home solutions get introduced and applied over time, more tools of the kind presented here will be needed to engage residents. They go beyond the role of user manuals, because the technologies require significant changes in daily life practices in the home. We do not have a language yet that helps people to navigate these developments. Technical home systems are traditionally introduced to residents with instructions of correct use rather than an engagement with their values. The challenge is compounded by the need for rapid upscaling to increase environmental sustainability.

This practice note has presented the tools used within a recently conducted pilot case study. I hope to generate discussion on suitability of these and other tools in accompanying technological home

refurbishments. We have yet to find the best ways to facilitate the inclusion of residents' values in future technical configurations. This would help facilitate the important and topical task of making housing sustainable, as well as helping the residents to be included and not disadvantaged by this change.

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