

# FRAMING RESIDENT ACCEPTANCE OF SUSTAINABLE RENOVATION

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## ABSTRACT

This paper presents the initial theoretical framework adopted for a study into resident acceptance of sustainable renovation. Seven expert interviews and two retrospective case studies revealed that the relationship between social housing residents and the renovation process requires careful attention. Rather than performance indicators and liveability, acceptance and practices should be the first priority in planning the process. This is because residents' future behaviour will be a crucial aspect in the actual energy-saving outcome, and disappointments should be avoided. The paper sets out a number of cornerstones for a process to foster acceptance, and presents an outlook towards participatory tools that could be used in such a process.

## INTRODUCTION

In the Netherlands and several other European countries, a major initiative is underway to give the next wave of housing renovation a sustainability push. Many houses built in the 1950s to 1970s are coming up for an update and are deemed worth renovating rather than replacing. The houses are not up to current standards of energy and comfort. Technology is developed far enough to renovate these houses to 'zero-energy' sustainability standards. But success still requires innovation on several levels simultaneously, such as technological integration, planning process, laws, business models, and resident acceptance. The research reported here focuses on the latter. Enough residents of these types of houses have to be willing to undergo a renovation of their home, so that the needed numbers

are achieved. Moreover, the house should facilitate post-renovation living practices that support a zero energy outcome. This paper presents the framework that is adopted in order to address residents' interests. This work is part of a research project that seeks to facilitate such renovation processes, the Building Technology Accelerator project. The author is experienced in facilitating user-centred design processes (e.g. Boess and Van der Bijl-Brouwer, 2013). However, in those processes we usually assume that the success of a user's encounter with a product, service or system will mainly be influenced by the design itself and its characteristics. Initial encounters with the building process however, showed that here, users have an intimate and long-term history with the product, service or system: it is their dwelling. Even when the dwelling changes or becomes a new one, still a large complexity factors come to play for the user in this process. They are, for example, user memories, experiences, habits, attitudes towards the owner of the building and events occurring during the process of moving from new to old. What can the expertise of user-centred design contribute to this process, and what can user-centred design learn from it in turn?

## LITERATURE AND THEORY

Efforts to improve housing stock primarily have the main goal to improve its physical quality and potential for energy saving. Secondly, they contribute to improvement of the quality of life of neighbourhoods (Koopman, 2008). However, the perspective of tenants is becoming increasingly important. On the one hand, it is known that fewer than half of residents in a given project are usually willing to consider a renovation that serves sustainability. More support from residents is needed to make the initiative work. On the other hand, residents in social housing are often willing to consider a renovation that would improve the safety of themselves and family members, the quality of the surroundings, and the comfort in their own homes. Even if residents are willing, they may not be aware of the consequences, such as that they themselves might foot the bill for their future energy use. This lack of insight into long-term consequences has long been known as the participation paradox (Langton, 1978), Figure 1.

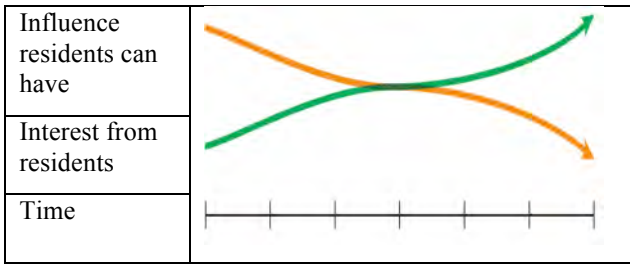


Figure 1: the participation paradox (Langton, 1978). Figure adapted from Talsma (2011).

The work described in this paper therefore develops a framework for an approach that, firstly, serves residents' interests in renovation and secondly, facilitates energy sustainability. This is the initial part of a research project to develop a tenant involvement tool on the neighbourhood level. The researcher's background is in interaction design research. Since this topic touches on an extremely wide range of disciplines, from urban planning via political science, technological sustainability research to activism, the researcher started to frame the issue by means of expert interviews. Rather than an extensive literature review, this should reveal the key points to address across disciplinary fields. The research question for this initial phase was: what should be the prioritisation in goal setting to ensure the future participation of residents in ensuring actual energy savings?

#### DATA AND METHODS

The initial framework generation phase of the research, of which the results are presented in this paper, consisted of a preliminary literature research, 2 post-hoc case studies of resident involvement in renovation processes and 7 expert interviews. They are presented in Table 1. All of the activities were carried out as part of a project to design a new sustainable renovation method for social housing of the 1950s to 1970s.

An exploratory literature research was conducted on the topics of housing adaptation, participatory design for communities and energy use in the home. The aim was to understand the key concepts to be addressed in this field, such as livability. The aim was not to gain a complete picture of the field. Both the interviews and case studies were sampled by convenience as part of the project work within the Climate-KIC Building Technologies Accelerator (BTA) project (Climate-KIC, undated). The goal of conducting the case studies and interviews was to identify the main characteristics of resident acceptance in the current stakeholder processes. The case studies self-selected by claiming an innovative and user-centred approach to sustainable housing renovation. The interviews were convenience-sampled by approaching members and contacts of the Climate KIC BTA project. The interviews took between one and one and a half hours and took place as part of the planning process. They were scheduled as research visits and recorded by note-taking. They were analysed for the purposes of this paper by selecting key statements that reveal the stakeholder's concept of

resident acceptance. They revealed many concepts that can later be explored in a more goal-directed manner through further literature review. Where the expert statements directly led to literature sources, these are included in the results presentation.

#### EVALUATION OF DATA

These data were subjective statements from individual players within this field. Nonetheless, they efficiently provided an overview of the issues. This was a qualitative research to provide key themes (Graneheim and Lundman, 2004). The field of sustainable housing renovation, however, is very much ruled by numbers, by hard data on energy use. This is It remains further work for this research to develop concepts and analyses that will be reportable in that field. Here, the research seeks to contribute to innovation of the design process by characterising processes and identifying key factors that contribute to their success in terms of resident acceptance. In order to have relevance to the topic context of sustainable renovation, however, number-based analyses will be needed because the field is likely not to be able to engage with qualitative data.

#### RESULTS

Table 1: data overview and key results for a framework for resident acceptance.

data source	key statements
<b>Interviews</b>	
E1: innovation manager advising Dutch housing corporations	"We want to develop even better personas than the four lifestyle colours (SmartAgent, 2012). Because we will approach it like a showroom. Residents can choose their house renovation as from a catalogue."
E2: sustainability consultant to a Dutch housing corporation	"Sometimes, residents are angry after waiting for renovation for 30 years. A letter is not the way to approach them ... you have to get in touch with the neighbourhood very carefully."
E3: Design researcher in the Netherlands, focusing on sustainable housing and resident behaviour	"We don't know why residents of sustainably renovated housing currently save less energy than expected".
E4: sustainable housing innovator in architecture and building technology	"Many problems like bad ventilation come from user behaviour. But how can you address that?"
E5: environmental	"You need to take away

stakeholder group advising citizens	people's fears, financially and about the renovation process'. "We offer calculations of energy effects and costs to tenants and buyers, looking at things together with them".
E6: Design researcher in the UK, focusing on sustainable housing user interfaces and resident behaviour	"We realised through research that what people lack is knowledge, understanding of the energy systems in their house."
E7: building company building site manager	"The residents did not agree to the most expensive insulation measures because of how it would raise their rent. So we did not do those".
<b>Case studies</b>	
B1 Project 'careful sustainable renovation', a renovation project carried out by BAM Woningbouw in the Netherlands	"Through a very careful collaborative planning process of more than two years, we work in a trust relationship with the tenants and also compromise according to their wishes". "The tenants cooked burgers for the builders".
B2 Project 'stroomversnelling', demonstration house in Amersfoort, the Netherlands.	By demonstrating the new situation in a model house, a neighbourhood is activated and can tangibly start to consider

#### PERFORMANCE

In the first instance, sustainable renovation is an issue of energy performance during use (E3, E4). Nieboer (2008) describes how social housing building stock decisions, while laid down in a portfolio policy, are actually usually "a result of negotiations of different parties." Because of the complexity of the context, it is difficult to define specific performance indicators at the portfolio level. It is, however, possible to use them to measure outcomes (Nieboer, 2008, p 37). In fact, this is essential in order to engender trust (Hasselaar, 2008, p. 100). Hasselaar points to the issue of repairs and reparations, of existing building stock and renovations. These are currently not part of the considerations in planning such a renovation (B2).

#### LIVEABILITY

The examples given by E2 (see table 1) point towards a situation that is often not neutral, but rather, a delicate issue of how to approach and convince residents of renovation at all. Their liveability is decreased. Trust has to be built up so that they believe that their future situation will have better liveability and personal comfort. Tools to measure Liveability are well developed since the 1990s (Koopman, 2008). Local governments are required to measure liveability (Koopman, 2008). Liveability is "the subjective assessment of living quality in the surrounding area of the home" (Marsman and Leidelmeijer, 2001) and "is considered one of two components of residential satisfaction, alongside dwelling satisfaction" (Koopman, 2008, p. 56). It therefore seems essential to place liveability at the helm of any performance measures, and to address sustainable renovation in an integrated manner. Liveability is currently only used as an intermittent, survey-based measure. Koopman (2008) warns that it is not fine-grained enough, averaging over neighbourhoods with different living conditions. A project-based approach is recommended in order to be able to have input-outcome measures. Any strong involvement with residents is recommended against, since this would make an independent measure more difficult (p 65). A strongly contrasting perspective is developed by Botero and Saad-Sulonen (2010). In a case study in which young people's participation was elicited in planning a skate park, they found that the municipality's need to work entirely with spreadsheets removed all of the young people's ideas from the planning process. Conversely, they found in another case study that citizens were motivated to contribute to city quality if they were able to contribute their own scenarios. A perspective focused on the measurement of liveability as proposed by Koopman (2008) would prevent this citizen involvement from succeeding.

#### ACCEPTANCE

The two case studies revealed two different approaches to residents with regard to housing renovation acceptance.

*Process type 1.* The first, a result of recent years' adoption of user-centred thinking in the building sector, takes its point of departure from the fact that housing corporations often have to be very economical with renovations for their residents, and that the trust relationship is not always good (E2). This type of process (B1) therefore follows a very careful approach in which housing corporations even support residents by giving them access to external, neutral advisors (E7) and creating a careful collaboration (Figure 2). This type of process typically takes two years or more.



Figure 2: the 'tailor' model renovation process approach.

*Process type 2.* The second type of process is exemplified in the Dutch sustainable renovation project 'stroomversnelling' ([www.stroomversnelling.net](http://www.stroomversnelling.net)). Its principle is to offer a complete prototype renovation within a neighbourhood that people can visit and experience. Even activities are organised in such demonstrator houses. From a participatory design perspective, this approach seems very beneficial because it enables residents to imagine their new lives through such a house as a prototype (Ehn, 2008). Simply being in the new house and being able to imagine one's future comfort is a successful way of gaining residents' trust and enthusiasm (E1). In the Dutch housing sector, it is common to build and plan housing according to a four-part lifestyle division called "Brand Strategy Research Model" (SmartAgent, 2012). Proponents of the 'showroom' model aim to create more detailed personas in order to address resident types even better, based on their adoption behaviour (E1). Figure 3 summarizes the approach of the 'showroom' process.

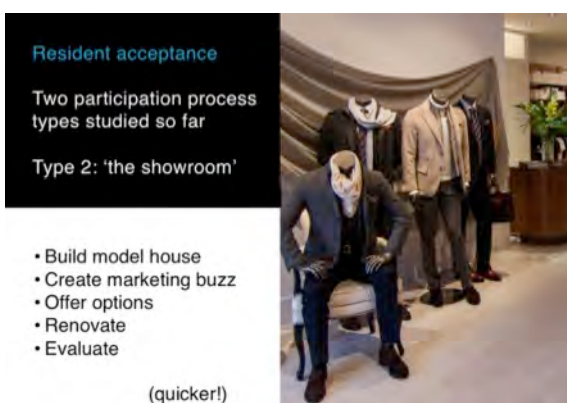


Figure 3: the 'showroom' model renovation process approach

A visit to such a prototype house (B2) revealed that the new sustainable living environment sometimes also contains new home technology that is different from the technology participants currently have (Figure 4). In consequence, it seems valuable to pay careful attention

to the way living practices might change when moving house. This process should receive careful attention in the showroom model, which aims for a much faster process of adoption.



Figure 4: this figure illustrates a prospective resident's interaction with the technology of a new house - the cooking area with its ventilation, and highlights an issue that can influence later resident acceptance.

#### A BLIND SPOT: FUTURE LIVING PRACTICES

Neither of the process models seen so far have a clear strategy to ensure and monitor post-renovation living practices of residents. In B1, a visit to a resident was made. The resident proudly showed the new energy-efficiency measures and also illustrated the good process relationship with the builders by mentioning an intervention that the builders had removed again at the request of residents. However, the resident was not able to demonstrate and explain the functioning of the new energy-control systems in the house. In B2, the house featured a cooking technology that was different than most residents were used to. There was no program in place to guide residents through such a transition, or enable them to experience it ahead of the building renovation. Ensuring future usability of energy-efficient building technology contributes to actually achieving the desired energy savings. Wever, Van Kuijk and Boks (2008) have shown that usability greatly influences effectiveness of home system use. And Kuijter, De Jong and Van Eijk (2013) have shown that resident system use requires a long term view to assess integration in living practices, beyond a momentary usability assessment. Because the residents will have to (directly or indirectly) contribute to the costs of future energy use, this attention to usability guards against late-emerging decrease of acceptance.

#### DISCUSSION

The research has revealed four concepts that are interrelated and relevant for sustainable renovation evaluation. They are performance, liveability, acceptance and practices. Performance cannot be directly predicted. Liveability is a combination of neighbourhood and direct residence liveability. It should be seen mainly as a measuring instrument of improvement projects. There is a dilemma in engaging resident participation and still retaining variables to measure. However, insights from Participatory Design (Botero and Saad-Sulonen, 2010) have shown that

participation has value in itself and therefore should not be avoided for the sake of measurement. Acceptance is a possible output measure for liveability, but should be seen as a participation opportunity within a project.

Only by opening up the process somewhat to explore the key factors and unexpected insights further, can the framework be strengthened and an efficient and effective path to resident acceptance be found.

Acceptance can be speeded up compared to current processes (case studies B1 and B2), but requires careful attention to the changes this brings for residents' lives. This attention is important in order to not jeopardize the somewhat fragile trust that sometimes exists between housing corporations and their tenants. Lastly, attention to practices calls for scenarios in the renovation planning process that will enable project teams to look ahead to the capability of residents to use the implemented systems in a way that will lead to a zero-energy outcome.

The framework therefore posits this prioritisation of goals when the aim is to increase adoption, and later acceptance, of energy-efficient building improvement (Figure 5):

1. acceptance
2. practices
3. liveability
4. building energy performance.

Figure 5: recommended prioritisation of goals to ensure later energy-saving outcomes.

The framework furthermore recognises and reflects the complexity of acceptance as a concept.

Firstly, acceptance is the necessary *condition* for any renovation project to go ahead. For that, by Dutch law, 70% of the residents have to agree to the process if it results in a higher rent (Stroomversnelling, undated). This requirement could turn out to slow down European greenhouse gas emission reduction aims, and in turn requires careful addressing of the residents' attitude to renovation.

The success of resident acceptance as an *outcome* is framed in two parts. Firstly, it is the self-reported acceptance of residents. This is framed as the documented *outcome* of a renovation process whereby occupants self-report the following, to a level agreed for the project: trust in the process, trust in the stakeholders organising the process, autonomy as occupants and citizens, social embeddedness as occupants and citizens, being respected and supported in their needs (e.g.: safety, health, stability, privacy, participation)

Secondly, the success of resident acceptance is framed as the facilitation of life practices that support zero energy use of a dwelling. This is framed as expert

assessment, based on user experience research in context, of the following, to a level agreed for the project: usability, facilitation, acceptance of the new living situation and livability (e.g. comfort). These factors are expected to facilitate reduction of energy use. (Figure 6).

1. acceptance as a <i>condition</i> of the going forward of the renovation or building process	2. a acceptance of the building <i>outcome</i> , self-reported  2. b acceptance of the systems in the house and their functioning as intended observed in household practices
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Figure 6: in order to highlight the complexity of acceptance, this figure highlights its two-part framing as *condition* and *outcome*, with outcome again split into two factors influencing the zero-energy result

The process aspect of the framework concerns the fact that renovation is a disruptive process in people's lives that is outside of the normality of dwelling. Living at home is structured by routine human practices, for example food-related, sleep-related, hygiene-related, comfort-related. Renovating, on the other hand, is non-routine, with lots of opportunities, but also uncertainties and risks. How could a housing association help residents look ahead to their future living practices? What could be done for and with them, beyond calls to live more sustainably? Context-based scenarios and interaction concepts are needed for such information and participation processes.

The framework therefore suggests a conceptualisation of ensuring resident acceptance in four stages, based on the characterisation of the processes and the analysis of their advantages and necessary conditions. These stages should be aligned with a renovation planning process (Figure 7). Currently no representation of such a process exists that highlights the resident acceptance result. This initial representation therefore serves as a prototype, to be used to align it with the technical process representations currently used in planning renovations.

trust-building stage	experience stage	renovation stage	evaluation stage (including use)
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Figure 7: proposed four-stage process to integrate resident acceptance with the renovation process.

## LOOKING AHEAD TOWARDS TOOLS FOR PARTICIPATION FOR THE EXPERIENCE STAGE

Botero and Saad-Sulonen (2010) noted that the parties involved in the planning generally have no meta-awareness of the tools they are using for collaboration. However, these tools play a role in enabling the parties to elicit citizen participation. Possibly, such tools may also enable the stakeholders to align the four-part resident acceptance process with their planning process. Botero and Saad-Sulonen (2010) recommended to continually redefine what participation might mean for those involved, through the technologies themselves (design-in-use). They furthermore distinguish between 'reporting practices' (such as telling the city that there is trash somewhere) and 'sharing practices' (such as imagining scenarios for participation and close others), noting that the latter seem to offer "more possibilities for multidirectional perspectives". They note that current efforts to collect data unidirectionally result in many problems such as forgetting, contentious authorship and follow-up. The shared perspective offers another route and connects with the knowledge built up in Participatory Design. Even here, though, ownership and accessibility of data remains an issue to address carefully. Online environments such as the Slim Wonen initiative (<http://slimwoneninrotterdam.nl>) provide promising starting points to integrate.

This paper has shown that the integration of user-centred design in an analysis of resident building renovation processes results in new avenues to ensure that a desired outcome is achieved, in this case, a zero-energy outcome.

This paper serves to invite feedback on the framework. The next step in the research will be to map the process steps and stakeholder involvement needed in order to try and achieve success in sustainable renovation, by applying and modifying aspects of the framework.

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