

Article

# Concerns of Owner-Occupants in Realising the Aims of Energy Transition

Mieke Oostra <sup>1,\*</sup> and Nelleke Nelis <sup>2</sup><sup>1</sup> Applied Urban Energy Transition, Utrecht University of Applied Sciences, The Netherlands<sup>2</sup> Making Space, The Netherlands

\* Corresponding author (mieke.oostra@hu.nl)

Submitted: 31 October 2021 | Accepted: 15 February 2022 | Published: in press

## Abstract

Although there is an array of technical solutions available for retrofitting the building stock, the uptake of these by owner-occupants in home improvement activities is lagging. Energy performance improvement is not included in maintenance, redecoration, and/or upgrading activities on a scale necessary to achieve the CO<sub>2</sub> reduction aimed for in the built environment. Owner-occupants usually adapt their homes in response to everyday concerns, such as having enough space available, increasing comfort levels, or adjusting arrangements to future-proof their living conditions. Home energy improvements should be offered accordingly. Retrofit providers typically offer energy efficiency strategies and/or options for renewable energy generation only and tend to gloss over home comfort and homemaking as key considerations in decision-making for home energy improvement. In fact, retrofit providers struggle with the tension between customisation requirements from private homeowners and demand aggregation to streamline their supply chains and upscale their retrofit projects. Customer satisfaction is studied in three different Dutch approaches to retrofit owner-occupied dwellings to increase energy efficiency. For the analysis, a customer satisfaction framework is used that makes a distinction between satisfiers, dissatisfiers, criticals, and neutrals. This framework makes it possible to identify and structure different relevant factors from the perspective of owner-occupants, allows visualising gaps with the professional perspective, and can assist to improve current propositions.

## Keywords

built environment; customer satisfaction; energy efficiency; energy transition; owner-occupants

## Issue

This article is part of the issue “Zero Energy Renovation: How to Get Users Involved?” edited by Tineke van der Schoor (Hanze University of Applied Sciences) and Fred Sanders (TU Delft).

© 2022 by the author(s); licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

## 1. Introduction

Since the built environment is one of the main emitters of CO<sub>2</sub> globally, a substantial impact can be expected from large scale implementation of energy-efficiency measures in the form of building retrofitting and the substitution of fossil fuels for renewable energy sources (International Energy Agency, 2017; Lucon et al., 2014; Sandberg et al., 2021). To get these implemented, large scale retrofitting programmes and renewable energy generation plans have been developed. Additionally, smooth customer journeys and neighbourhood approaches are being created (Bader et al., in

press). Although there is a wide array of technical solutions available to improve the energy efficiency of the built environment and to generate renewable energy for heat and power, the uptake of these solutions by owner-occupants is lagging (Brouwer, 2019; House of Representatives of the States General, 2019; Netherlands Environmental Agency, 2019). It is suggested that these programmes are too closely focused on the optimisation of technology and economic factors (Bergman & Foxon, 2020). Energy performance improvement is not included in maintenance, redecoration, and/or upgrading activities of owner-occupants on a scale necessary to achieve the CO<sub>2</sub> reduction aimed for.

Owner-occupants usually adapt their homes in response to everyday concerns, such as having enough space available or adjusting arrangements to future-proof their living conditions (Joint Centre for Housing Studies, 2009). Research shows that renovation intentions usually emerge from specific conditions in domestic life (Wilson et al., 2015) in which energy efficiency has a minor role at most. According to Wilson et al. (2015), efficiency measures should be bundled into broader types of retrofitting and home improvements, and incentives should target the underlying reasons why homeowners decide to retrofit in the first place. Retrofit providers typically offer energy-efficiency strategies and/or options for renewable energy generation only and tend to gloss over home comfort and homemaking as key considerations in the decision-making for home energy improvement. In fact, retrofit providers struggle with the tension between customisation requirements from private homeowners and demand aggregation to streamline their supply chains and upscale their retrofit projects (Oostra & Been, 2016). To get a better understanding of consumer satisfaction of owner-occupants concerning energy retrofit, this article will zoom in on concrete experiences from Dutch practices.

From marketing theory, it is known that it is very important to address needs fulfilment in combination with customer satisfaction (Dowling, 2002; Giese & Cote, 2000; Klasens & Oostra, 2016; Kotler & Armstrong, 2017). In management literature, customer satisfaction is considered important because of its role in creating competitive advantage (e.g., Kotler & Armstrong, 2017; Matzler & Hinterhuber, 1998; Mittal et al., 2005). Therefore, it seems fair to conclude that insight into customer satisfaction during the customer journey of energy retrofit projects is important to be able to increase the number of households interested in energy-efficiency measures. In this article, the following hypotheses are therefore tested: A customer satisfaction framework can help to (a) identify and structure factors in customer journeys of energy retrofits, (b) visualise gaps between the owner-occupants' perspective and the take professionals have on propositions, and (c) provide us with insights on how current propositions can be improved. Before the case studies are introduced, the conceptual framework on consumer satisfaction is presented.

## 2. Customer Satisfaction: On Dissatisfiers, Satisfiers, Criticals, and Neutrals

Most satisfaction research concentrates on confirmation and/or disconfirmation of a pre-consumption standard responsible for satisfaction and dissatisfaction (Oliver, 2015). Several additional determinants of satisfaction have also been linked to satisfaction (Heitmann et al., 2007), such as perceived equity, product quality, post-decision regret, consumption-related emotion, and need fulfilment. In his seminal work on customer satisfaction, Oliver (2015) distinguishes three impor-

tant approaches: the desires, expectations, and needs approach. In this research, the needs approach has been used. Needs are mostly aligned with the fulfilment of deficits, as are most services like home repair, health care, and legal redress (Oliver, 2015). There are two dominant needs theories: Maslow's theory and Herzberg's theory. Maslow's theory is discarded since it raises several issues which make it difficult to apply it in a marketing context. Herzberg's theory, in contrast, is presented as useful (Oliver, 2015). Theorising about satisfiers and dissatisfiers dates back to the days when human resources management emerged as part of management theory. Herzberg et al. (1959) were studying the working conditions in factories and discovered motivators and hygiene factors, which would later lead to the motivator-hygiene model or the two-factor theory. Hygiene factors are conditions workers consider to be self-evident, like safety measures, physiological conditions (e.g., lighting, temperature, noise levels). Motivators, in contrast, are factors that increase personal satisfaction and motivation to increase production. While their presence increases motivation, their absence does not cause dissatisfaction.

Other researchers built on these results, extending theory formation on the topic of job satisfaction (e.g., Soliman, 1970; Wolf, 1970). Later, these ideas were adopted in marketing when analysing and evaluating the satisfaction of customer products (e.g., Maddox, 1981; Oliver, 1995; Swan & Combs, 1976), engineering (e.g., Kano et al., 1984; Matzler & Hinterhuber, 1998), service industries (e.g., Brandt, 1988; Cadotte & Turgeon, 1988; Silvestro & Johnston, 1990), and website design (e.g., Holloway & Beatty, 2008; Zhang & von Dran, 2000). Several terms are used to refer to the different antecedents of dissatisfaction and satisfaction (see Supplementary Material). In this study, we adopt the terminology of Cadotte and Turgeon (1988):

- Dissatisfiers: Factors that can cause dissatisfaction but will not increase satisfaction when addressed. These usually relate to the minimum requirements concerning functional performance and the extrinsic needs of customers. If a gap occurs towards customers' perception, this can result in complaints.
- Satisfiers: Factors that increase satisfaction but do not increase dissatisfaction while not included. If these factors exceed customer expectations, it might lead to a compliment. Satisfiers will stimulate customers to come into action.
- Criticals: Factors that impact both satisfaction and dissatisfaction. Examples include the organisation of information.
- Neutrals: Factors with no impact on both satisfaction and dissatisfaction. Although not mentioned by Cadotte and Turgeon (1988), the authors will use this category to identify factors that are essential in the eyes of professionals but causes no dissatisfaction or satisfaction of owner-occupants.

Satisfaction and dissatisfaction are not to be considered as two extremes on one scale (Kano et al., 1984). They have separate scales (see Figure 1): unfulfilled or fulfilled satisfaction factors vs. addressed or not addressed dissatisfaction factors.

The scientific community is still debating on the exact definitions of consumer satisfaction (Souca, 2014). Although the concept of consumer satisfaction is still not fully understood, and a standard form of measurement is lacking (Souca, 2014), it has proven helpful in a wide array of sectors, e.g., sports products, cosmetics, durable products, food products, web pages, hotel bookings, health care, and bank services (for more, see Oliver, 2015; Souca, 2014; Vargo et al., 2007). The authors could not find studies evaluating the energy retrofitting of dwellings, although there is a study that evaluates retrofitting of shopping centres (Haase et al., 2015). The term “customer satisfaction” is also used concerning the quality evaluation of builders (e.g., J. D. Power, 2020; Klantgericht Bouwen, 2021). When using this model in the context of energy-efficient retrofitting, the following insights from research in other sectors can be of value: First, the category to which a factor belongs is not static. Over time, product attributes that once were satisfiers tended to become criticals, and eventually dissatisfiers (Brandt, 1988; Cadotte & Turgeon, 1988; Kano et al., 1984). Second, in a study by Maddox (1981) on clothing, personal care, and durables, it was discovered that findings in one industry can differ from another, indicating that findings are, therefore, context-specific. Third, the behavioural economics research of Kahneman and Tversky (1979) suggests that loss aversion concerning dissatisfiers outweighs the impact of satisfiers. Giese and

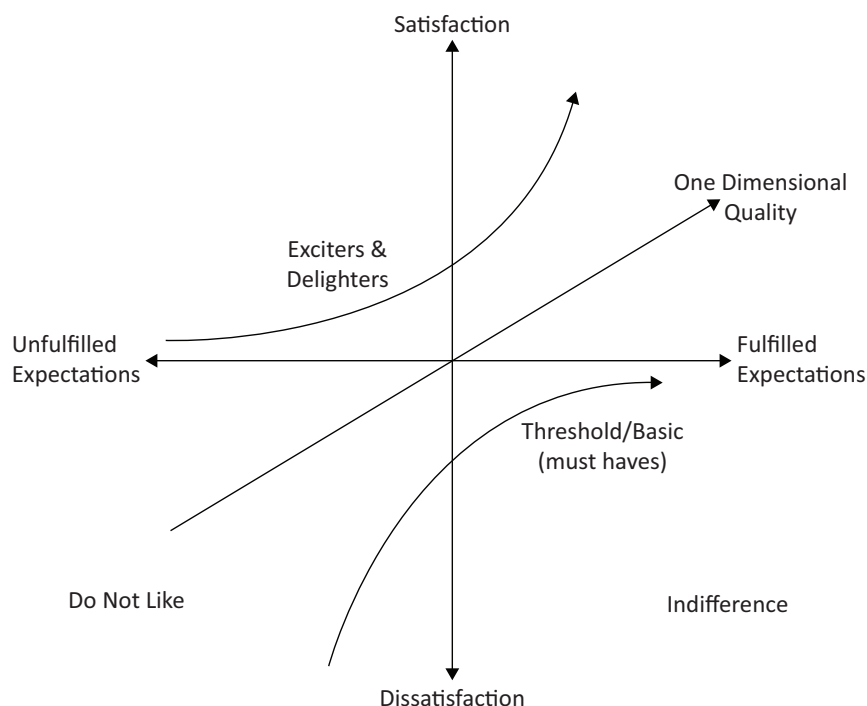
Cote (2000) noted that customer feedback is stronger concerning dissatisfiers. Several satisfiers are necessary to compensate for one dissatisfier to make this strategy work at all. The implication is probably that dissatisfiers in the form of minimal functional requirements should be met first, for market pull to emerge. Dissatisfiers, therefore, seem to have priority over satisfiers (Vargo et al., 2007). Satisfiers, however, can also be used to create additional market pull. Finally, a warning is made not to remain focused on the physical aspects, attributes, and actions of products and services only. Attention should also be given to customer thinking (Oliver, 2015). Most technical specifications and product features are irrelevant to most residents. The crux is to discover what factors within energy-efficient retrofitting do matter to make sure the propositions meet the minimum requirements and, additionally, to identify what factors can be used to make energy-efficient retrofitting more appealing.

### 3. Methodology

This section describes both case study selection and case study methodology. The analysis of the case studies is based on the framework of satisfiers, dissatisfiers, criticals, and neutrals presented in the previous section.

#### 3.1. Case Study Selection

The Netherlands provides an interesting context for case studies on owner-occupied retrofitting due to a rather large percentage of owner-occupied housing (57.2%) in combination with a rather large social housing



**Figure 1.** Kano's model. Source: Kano et al. (1984, p. 41).

sector of 29.1% (Housing Europe, 2021). The main focus of research aiming to further the retrofitting of residential buildings was first on housing associations and renters. The relatively large social rental sector in the Netherlands allowed firms to bundle individual dwellings into larger, commercially more attractive assignments. First, these solutions were applied in larger retrofit projects of social housing only. Later, some of these solutions also became available for individual owner-occupants. The three case studies selected used different instruments implemented to further the uptake of energy efficiency for private homeowners.

Energy Expedition Apeldoorn (#ENEXAP) was part of Energiesprong, a Dutch innovation programme commissioned by the Dutch Ministry of the Interior and operated by Platform31. The aim was to make various types of buildings zero-energy and to boost large-scale market initiatives. In the sub-programme Lokaal Alle Lichten Op Groen (LALOG), the owner-occupants were challenging professionals to help them make their homes zero-energy. It was a process of learning-by-doing by residents, builders, municipal officers, installation contractors, appraisers, and other professionals. The subsidised #ENEXAP project ran from January 2012 to December 2014. One of the authors, Mieke Oostra, was a member of the #ENEXAP board from November 2013 to April 2015.

The Duurzaam Thuis Twente (DTT), loosely translated as “Sustainable Home Twente,” a cooperation of 14 municipalities focusing on the energy efficiency of owner-occupied dwellings, applied successfully for a grant of VNG (the association of Dutch municipalities), the VNG scheme for cooperating municipalities. DTT also applied for grants from the province, as well as additional funding from the municipalities part of DTT. The description of DTT is based on Mieke Oostra’s experience as part of the initiative: She was a member of the DTT board from April 2016 to January 2020.

Verenigingen van Eigenaren (VvEs) is loosely translated as “association of owners.” The 13 associations are based in the cities of Breda and ‘s-Hertogenbosch. Both cities have a subsidy programme in which VvEs are encouraged to draw up an energy plan. By Dutch law, someone who owns an apartment is automatically a member of the subsequent owner’s association (VvE). The VvE looks after the joint interests of the owners of the apartments, like making sure the building is maintained, cleaned, and insured. Decisions in the VvE are

taken democratically. A major challenge for VvEs is to make progress in energy efficiency. The process can be complicated because the owners must tackle this together. One of the authors, Nelleke Nelis, from the company Making Space, advised and guided the VvEs in drawing up a plan. She did this together with a cooperative of energy consultants, who all have specific expertise (financial, technical, legal, and process supervision).

### 3.2. Case Study Methodology

The three case studies were studied retrospectively. For these case studies, the following materials were available for a qualitative analysis using the theoretical framework presented in Section 2:

- #ENEXAP: Memos of board meetings (8); notes of residents’ meetings (4); notes of meetings with one of the energy directors (3); notes of meetings with Energiesprong (2); report from Energiesprong (1); notes of study meetings for associated companies (5); notes (1), videos (4), and documents (3) from a meeting in which the propositions were scrutinised; impressions of a public event (1); and conversations with people related to #ENEXAP (3). The data used in this article is from October 2013 to June 2015.
- DTT: Notes of board meetings (30); notes of strategy meetings (2); notes on conversations with the organiser of owner-occupant meetings (2); notes of meetings with municipalities (3); study meeting for the companies (1); and conversations to reflect on the outcomes of DTT with people related to DTT (3). The data used in this article is from April 2016 to January 2020.
- VvEs: Notes of the board meetings with the VvEs (25); a residents’ survey (1); and technical and financial analysis of all the VvEs involved (13). The data (see Table 1) used in this article is from January 2017 to September 2021.

To strengthen the validity of the data collected, the outcomes from the case study analyses were triangulated with (a) observations during the retrofit trajectories, (b) the evaluation studies from #ENEXAP (Oostra & Been, 2016) and DTT (Oostra & Bader, 2021) on the execution of the programme, as well as the outcomes, and (c) findings from the literature.

**Table 1.** Case study overview.

Case Study	#ENEXAP	DTT	VvEs
Type of dwellings	Row housing and detached housing	Row housing and detached housing	Multi-family housing
Amount of buildings	38	4,350	13
Households involved	38	4,350	612

#### 4. Energy Expedition Apeldoorn (#ENEXAP)

In 2011, Apeldoorn saw the launch of #ENEXAP, a group of around 33 households interested in making their homes zero-energy. During the process, the group expanded to 38 households. The #ENEXAP team was founded with participants from local owner-occupants of businesses, civil society organisations, the municipality of Apeldoorn, and the local University of Applied Sciences (Saxion). The owner-occupants fuelled professionals with their ideas and wishes; professionals helped the owners make their wishes achievable.

The specific goal of the LALOG-subsidy was to put clients at the centre of the development of propositions of local companies to improve the energy efficiency of occupant-owned homes. These propositions should de-burden owner-occupants in increasing energy performance towards zero-energy. The planned result of this programme: 20 retrofitted dwellings. Secondary aims were many. Not only was a considerable reduction of the energy bill required, but also improvement of the overall comfort level, a healthier indoor climate, the application of environmentally friendly building products, and an increase of property value. During the programme, business cases for companies also had to be drawn up that would prove energy-efficient retrofits for private homeowners to be an interesting market niche.

In June 2015, after a process of roughly four years, five dwellings were well on their way to becoming zero-energy. Other households had started to save

energy. Through all sorts of presentations, meetings, workshops, and excursions, both residents and professionals increased their knowledge levels considerably. For professionals, it was not always easy to keep up the pace, especially with the very involved retired occupant-owners with technical backgrounds. Owner-occupants were sharing experiences on the things they had implemented, like the use of LED lighting, the discontinuation of built-in kitchen boilers, the energy demands of waterbeds, and how to persuade teenagers to reduce their time in the shower. Three different consortia were polishing their propositions for owner-occupants (Oostra & Been, 2016). Dissatisfiers, satisfiers, criticals, and neutrals identified in the analysis of the material available can be found in Table 2.

#### 5. Duurzaam Thuis Twente (DTT)

Fourteen municipalities in Twente, the eastern part of the Netherlands, decided to collaborate in their efforts to improve the energy efficiency of owner-occupied housing: Almelo, Borne, Dinkelland, Enschede, Haaksbergen, Hellendoorn, Hengelo, Hof van Twente, Losser, Oldenzaal, Rijssen-Holten, Tubbergen, Twenterand, and Wierden (see Figure 2). Their first joint action was the development of a media campaign promoting the uptake of energy-efficiency measures by owner-occupants. Several PR agencies were asked to pitch a media campaign concept. A consultant presented a plan to facilitate citizens in making their homes more sustainable based

**Table 2.** Dissatisfiers, satisfiers, criticals, and neutrals in the perception of owner-occupants involved in #ENEXAP.

Category of Assignment	Factor	Description
Dissatisfiers	Communication	Complaints were made about the time businesses took to prepare an offer, or that no follow-up was received when questioned.
	Lack of choice	The first group of three selected owner-occupants received an offer from three different consortia (April 24, 2014). They were disappointed to find that the consortia came up with a similar set of energy measures. They had hoped to receive alternative retrofit concepts.
	Demolition of recent improvement	For several households, it was necessary to take out the flooring to ameliorate the energy performance of the ground floor. When this turned out to be a recent home improvement, households preferred to skip this intervention.
Satisfiers	Home extension	One household just fell for the idea of adding a conservatory to the house as a way to improve energy efficiency. The idea was introduced by students of the TU Delft as a proof of concept for the Solar Decathlon, an American contest for student teams.
	Future-proofing of the home	One of the households was interested in energy-efficiency measures in combination with the future-proofing of their home. Unfortunately, the consortium considered the combination too complex.
	Direct feedback	With a plug-in set from #ENEXAP, residents could temporally measure the energy usage of different appliances. This direct feedback opened the eyes of owner-occupants for the impact, e.g., the built-in kitchen boiler, waterbed, or shower time had on their overall energy consumption.

**Table 2.** (Cont.) Dissatisfiers, satisfiers, criticals, and neutrals in the perception of owner-occupants involved in #ENEXAP.

Category of Assignment	Factor	Description
Criticals	Comfort improvement	Energy-efficient retrofitting was being promoted with the advantage of improved comfort levels. Consequently, this is what residents expected. When problems with draft and cold traps occurred after retrofitting the owner-occupants turned out to be disappointed.
	Reduction of the energy bill	Complaints were made when the energy bill did not reduce, at least not as much as expected. The residents suspected the supplier was unqualified or, worse, that they were being cheated.
	Financial loan	Several households indicated the availability of financial loans as important.
	Advice report	Much time and effort had been spent into the assignment of elaborated reports from energy advisors (EPA Super Luxurious). The contractors never seemed to take the outcomes of the reports into consideration.
	Performance guarantee	Owner-occupants indicated valuing a performance guarantee from the consortia. In practice, however, no one actually paid the additional sum to secure the guarantee. The simple fact that the consortium dared to offer a performance guarantee functioned as a proof of quality in the perception of owner-occupants.
Neutrals	Coaching and training of the firms	For the companies, this was essential. For the clients, this was not relevant.

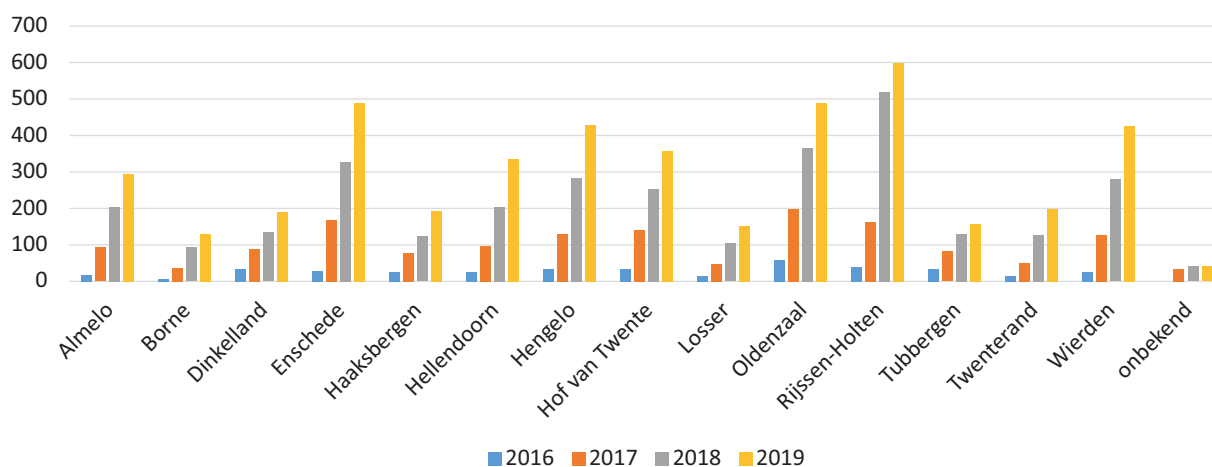
on insights from consumer marketing, not the anticipated plan for a media campaign. This was the route the municipalities decided to take. Other stakeholders of DTT were owner-occupants, coaches, companies and consortia, communication office, Pioneering (local innovation network in construction), the VNG, and other supporting organisations (e.g., Bouwend Nederland, Techniek Nederland; Oostra & Bader, 2021).

An approach was drafted and executed to support owner-occupants in making their homes more energy-efficient. A network of energy coaches was to be created, and, additionally, a network of companies able to take on the work. This eventually led to the start of

DTT in 2016. The themes were: improving comfort levels, energy-saving, future-proof living, retrofit and maintenance, energy generation, and preparation to disconnect from natural gas. Dissatisfiers, satisfiers, criticals, and neutrals identified in the analysis of the material available can be found in Table 3.

## 6. Owner Associations (VvEs)

In the period between 2017 and 2021, 13 VvEs started by drawing up an energy plan. The process always included a “do-it-yourself” survey of the residents. The themes were: residential data, usability of apartment building,



**Figure 2.** Cumulative amount of advice sessions booked by households in various municipalities of the Twente region. Source: DTT (2020).



**Table 3.** Dissatisfiers, satisfiers, criticals, and neutrals in the perception of owner-occupants involved in DTT.

Category of Assignment	Factor	Description
Dissatisfiers	Communications	Complaints, questions, and suggestions were made concerning information on energy-efficiency measures, subsidies, and/or events.
	Low quality of work	The work of the associated firms did not always meet the benchmark of owner-occupants.
Satisfiers	Future-proofing	A household member was developing difficulty walking and climbing stairs. The couple had the choice to move or to future-proof their home. They preferred to stay. An extension was made for a new wheelchair-friendly bathroom, while the insulation value of the façade was ameliorated at the same time. Additionally, the heating system was compartmentalised, which made it possible to only heat the rooms in use.
	Home extension	Another household wanted to extend their kitchen into the garden. The kitchen also got a new tile floor, underfloor heating, and floor insulation. Electrical cooking replaced natural gas cooking, as is common in the Netherlands.
	Subsidy	A household that did not expect to be eligible for a subsidy was pleasantly surprised to find out via DTT that they had. This extended their budget and, as a result, they could make a larger investment in energy efficiency than initially expected.
	Direct feedback	Direct feedback on what members of the household could do to reduce energy consumption by closing a door, switching off a radiator, or reducing time in the shower came as a surprise to most people. Thermography also proved a valuable feedback instrument when people were considering a retrofit. As a means to attract newcomers, this motivated a lot of new households to contact DTT. However, these new appointments did not result in more households taking energy measures.
Criticals	Comfort improvement	Extra comfort was welcomed. Discomfort was, however, sometimes experienced due to sitting next to a cold window after retrofitting, causing complaints.
	Reduction of the energy bill	A household in which the breadwinner became unemployed was looking for ways to lower the monthly payments. One of the options they saw was to reduce the energy bill. A folder informed them about the existence of DTT's energy coaches. The household was already considering generating their own electricity with solar panels, but they were also interested in infrared panels. After the advice, they decided to install 20 solar panels and not to opt for the infrared panels. Instead, they chose to purchase new radiators, which can be regulated to only provide heating when necessary.
	Energy coaches	Advice from the independent energy coaches was highly appreciated by owner-occupants. The coaches provided advice on behavioural aspects (e.g., closing of internal doors), available subsidies in combination with advice on insulation, heat pumps, solar panels, LED lighting, etc. This helped people to structure the available information and to draw up a concrete plan for their homes. Not every energy coach was an asset. A specific coach criticised measures owner-occupants had taken in the past, which resulted in complaints.
Neutrals	—	—

safety and security, health and comfort, and complaints and wishes of residents. These surveys were carried out together with the VvE board. The survey ensured that all residents were involved in the advice process from the start. The average response was about 70%. The survey was followed by energy advice with both a step-by-step plan and a total approach. The retrofitting processes of all

13 VvEs are still in progress. Dissatisfiers, satisfiers, criticals, and neutrals identified so far can be found in Table 4.

## 7. Analysis

In this section, the combined outcomes of the three analyses are described, using the four categories: dissatisfiers,

**Table 4.** Dissatisfiers, satisfiers, criticals, and neutrals in the perception of owner-occupants involved in VvEs.

Category of Assignment	Factor	Description
Dissatisfiers	Low quality of work	Many maintenance solutions appeared to be of low quality, were poorly monitored during execution, and, as a result, new repair work was required. The VvE board usually consists of volunteers with little or no technical knowledge. They expected a professional approach from their contractors but were often disappointed by the quality of the work.
Satisfiers	Beautification	The residents considered the appearance of their property to be very important. The option for a new façade made them feel proud and would also have positive effects on the resale value of their apartments. A new, energy-efficient façade was, therefore, an interesting offer for most apartment owners.
Criticals	Generation of funding for retrofitting	The idea for the possible addition of an extra layer of apartments on top of the block was appealing to the owner-occupants since it would generate part of the budget needed for retrofitting. However, this brought all sorts of additional questions to the table that required additional time and effort of the board, especially regarding the feasibility of the idea. This caused mixed feelings.
Neutrals	Fire-safety	Occupants were rarely aware of the importance of fire safety. Additionally, the (ageing) population of the building might require additional measures to be able to evacuate everyone in case of an emergency.
	Ventilation	Most ventilation systems were functioning poorly. Occupants proved not to be aware of the related health risks. In practice, it was very difficult to convince residents that measures were necessary.
	Multi-year maintenance planning	Owners' associations are obliged to draw up a multi-year maintenance plan. These must be renewed every five years. Energy-saving measures are not a standard part of this planning.

satisfiers, criticals, and neutrals. The outcomes of the different case studies are displayed in Table 5.

### 7.1. Dissatisfiers

Four specific factors appeared in the category of dissatisfiers: communication, low quality of work, demolition of recent home improvement, and lack of choice. The factor of communication does not come as a surprise. This matches with findings in other sectors. Another dissatisfier was the suggestion to take out a rather new tile or wooden floor to improve the energy performance of the ground floor. In these cases, floor insulation was simply skipped. The quality of maintenance work or how architectural details were dealt with was another factor that appeared in this category. The ornaments in woodwork, additional corners, and stained-glass windows, all part of the authentic look and feel of dwellings, can be devalued during a retrofit (DTT). Finally, owner-occupants seem to expect to have a choice between several alternatives. Within #ENEXAP, several owner-occupants made explicit that one proposition only led to disappointment.

### 7.2. Satisfiers

In the category of satisfiers, the following factors emerged: adding an extension, future-proofing, receiv-

ing an unexpected subsidy, direct feedback, and beautification. The residents considered the appearance of their property to be very important. A makeover with a new energy-efficient façade in combination with an expected increase of resale value proved to be an interesting offer for most apartment owners (VvEs). Some households responded very enthusiastically concerning the possibility of an energy-efficient retrofit in combination with an extension (conservatory or kitchen), or energy reduction as a package deal with future-proofing. These households were strong advocates of these ideas to convince the consortia to prepare this interesting proposition. The moment it became clear the consortia would not come with such an offer, these households lost interest. Direct feedback helped to raise awareness but turned out not to be a guarantee for action (DTT).

### 7.3. Criticals

Financial loans and a performance guarantee appeared in the category of criticals, as well as possible advice from energy coaches, the possibility to generate additional funding for the retrofit, comfort improvement, and reduction of the energy bill. The reason for requesting a performance guarantee might be that, generally, expectations of the construction sector are not very high. The factors of comfort improvement and reduction of the



**Table 5.** Dissatisfiers, satisfiers, criticals, and neutrals in the perception of owner-occupants.

Category of Assignment	Factors in #ENEXAP	Factors in DTT	Factors in Owner Associations
Dissatisfiers	Communication Lack of choice Demolition of recent home improvement	Communication Low quality of work	Low quality of work
Satisfiers	Home extension Future-proofing Direct feedback	Future-proofing Home extension Subsidy Direct feedback	Beautification
Criticals	Comfort improvement Reduction of the energy bill Financial loan Performance guarantee	Comfort improvement Reduction of the energy bill Energy coaches	Generation of funding for retrofitting
Neutrals	Advice report Coaching and training of the firms		Ventilation Fire-safety Multi-year maintenance planning

energy bill are directly related to the arguments often used to convince people to invest in energy-efficiency measures. These promises probably led to a rise of the expectations owner-occupants had concerning the performance level, hence the fact they are considered criticals. Without presenting them as a benefit, these factors likely belonged to the category of dissatisfiers. In that situation, they would only lead to complaints in case of malfunction. The possibility to generate funding for the required retrofit with the creation of extra apartments left the owner-occupants with many unanswered questions. This caused people to have both feelings of satisfaction and dissatisfaction.

#### 7.4. Neutrals

Easily overlooked by owner-occupants are the importance of ventilation, fire safety, the possibility to combine the implementation of energy-efficiency measures with maintenance, and the importance of the condition of the foundation, all in the category of neutrals. Also, the training and coaching of the firms are part of this category. In the eyes of customers, these factors are irrelevant and, therefore, part of the neutrals section. This neutral category, part of the theoretical framework, was deliberately framed to contain factors that are relevant for professionals, but not to owner-occupants. In practice, these factors sometimes led to friction. This manifested itself most clearly concerning ventilation. Most residents did not consider this as problematic. The residents in the VvE case presumed they could solve a lack of ventilation by opening a window. The pressing question that arises from this category of neutrals is how to

create a context in energy retrofits in which professionals can address important technical issues without bothering the owner-occupants.

## 8. Discussion and Conclusions

The hypotheses were that the framework of dissatisfiers, satisfiers, criticals, and neutrals would make it possible to identify and structure the different factors in the case studies relevant from the perspective of owner-occupants, to visualise gaps between the owner-occupants' perspective and the take professionals have on specific factors, and hopefully also provide insight on how current propositions can be improved.

### 8.1. Value of Using the Customer Satisfaction Framework

The framework of satisfiers, dissatisfiers, criticals, and neutrals was used in this article to analyse, identify, and structure factors in the response of owner-occupants to concrete propositions in three energy efficiency case studies: #ENEXAP, DTT, and the VvE case. The framework helped to think about the propositions in a new way, because it makes the factors that are important to the owner-occupier visible. The underlying logic of the framework helped to structure the different factors into the categories of dissatisfiers, satisfiers, criticals, and neutrals with their own specific characteristics. The framework helped to structure what should have priority while improving a proposition. The current aim to weed out dissatisfiers is congruent with the insights from the literature. Additionally, it can be concluded that until

now, there has been only limited attention for satisfiers, criticals, or neutrals in energy retrofitting. The evaluation, therefore, showed that the framework can help to identify and structure factors relevant for specific retrofit propositions in general.

Additionally, another hypothesis emerged. The framework might also help to clarify the motivations and drawbacks of a specific owner-occupant as to customise a proposition. The categories would in that case be used to analyse the following:

- Dissatisfiers: What problems and fears the owner-occupant has need to be addressed?
- Satisfiers: What is considered of value by the owner-occupant? What are their needs, desires, and expectations?
- Criticals: What are opportunities, drawbacks, and risks, as perceived by the owner-occupant?
- Neutrals: What relevant blind spots of the owner-occupant need addressing?

By generating insights on the different factors, an understanding of the viewpoint of the client is created. This, in turn, allows translating a proposition into an appealing offer and determining how specific factors that are often overlooked by owner-occupants can be addressed. These consist not only of physical factors but also of, e.g., behavioural aspects. Outcomes of two case studies (#ENEXAP and DTT) showed that tips concerning behavioural aspects can leverage the performance of the applied energy measures. The effects were often of an unexpected magnitude for owner-occupants.

### *8.2. Gaps in the Perspective of Professionals*

Professionals are very focused on getting the technical aspects right. They want to make sure owner-occupants understand the relevance of specific factors that are of no interest to the average resident. Additionally, they may not know how to address these matters. In case of required additional ventilation, it seems impossible to first measure if there is a problem, and second, if there is, to convince the owner-occupant to install the equipment. From the #ENEXAP and DTT case studies, it became clear that professionals do not always register what has value to owner-occupants. Factors that cause satisfaction, like beautification, future-proofing, or additional space are not always evident to an executing party. Having a conversation about what is valuable can help to bypass blind spots. There seems to be a tendency among most professionals to focus on the factors relevant in a rather narrow technical perspective only.

Finally, a new hypothesis also emerged here. The framework might be of help when developing or rewriting norms or standards. The quality of norms and standards would improve if experience and knowledge from the user perspective were included in these trajectories. When new technology is being implemented new

insights will emerge during implementation and use. If and how the framework could be of help here would however need further research.

### *8.3. Improving Propositions*

The framework helped answer the following question: Can and should the proposition service different factors to extend the appeal of the proposition to a wider audience? Standardisation is on the wish list for both owner-occupants and businesses. For clients, it is perceived as a means to improve quality. Companies are looking for standard solutions as a way to upscale their approach and tap into a market large enough to retrieve a profit. Now the interest in offering standardised retrofit solutions is receiving more and more attention among companies, insights, and experiences, and knowledge from customer satisfaction is becoming increasingly important.

Giese and Cote (2000) noted that customer feedback concerning dissatisfiers is stronger than that concerning satisfiers, especially when it provokes negative feelings about fairness and the accuracy of information provided. Dissatisfiers need to be solved urgently. Complaints from clients can therefore be seen as a valuable source of inspiration for the improvement of the product and/or service. One should realise that only 4% of dissatisfied customers will take the effort to file a complaint (Kolsky, 2015). Therefore, it might be useful to organise a periodical evaluation study. Solving a dissatisfier is relatively easy, as it is usually clear what needs to be addressed. That is not to say the question is easy to answer, as became clear in #ENEXAP. Predicting the final reduction on the energy bill, for example, remains tricky.

Lack of information, the time it takes to get certain information, and/or the way information is structured are factors that keep reappearing in the category of dissatisfiers in different sectors and also emerged in two of the energy efficiency case studies. It is, however, not new to point out that the exchange of information during the customer journey is an important and difficult factor in customer relation management (Dowling, 2002). Through differences in perspective of owner-occupants and professionals, not well-managed customer journeys, the required information is not always at the disposal of the owner-occupant when needed. It is a factor that still needs improvement, while it is not always clear what information is relevant. Information management is a balancing act, and information overload of the owner-occupants should also be prevented.

Service providers need to develop product-market combinations that fit the expectations of owner-occupants on the topic of energy efficiency. Insights derived from an analysis of dissatisfiers, satisfiers, criticals, and neutrals can provide interesting clues to improve propositions. Most people consider global warming to be an important problem (de Kluizenaar et al., 2020). However, this does not imply they will actually

invest in energy-efficiency measures. If we look at the satisfiers, one may conclude that the scope of solutions that are of interest to owner-occupants could be broadened, but only if dissatisfiers are dealt with properly. This is compatible with research conclusions from the UK. Wilson et al. (2015) advocate that the “bundling” of efficiency measures into other types of home renovations should be encouraged, rather than stimulating retrofits focused on energy efficiency only. They show that in the UK, energy-efficiency measures are three times more likely to be included as part of broader retrofitting projects that have appeal to the owner-occupant than when considered alone. Only one out of 10 owner-occupants planning a retrofit considers energy-efficiency measures only (Wilson et al., 2013). Hereto specific conditions of domestic life associated with renovation activity, both DIY and contractor-led, should be identified (Wilson et al., 2015). Other research also supports the importance of building aesthetics or home appearance in renovation decisions (Novikova et al., 2011; Whitmarsh et al., 2011). The recent increases in fossil energy prices (Khan, 2021) will most likely stimulate the demand for energy-efficiency measures. With the expected rise in demand, the urgency for appealing market propositions increases.

The question is whether enough energy-efficient retrofits can be sold to owner-occupants while we know that only 13% (van der Werf & van Duist, 2020) of the population feels obliged to contribute with a green lifestyle. Focusing on secondary benefits of energy-efficiency measures, like what is being done with comfort improvement and reduction of the energy bill, could help. But then still the focus remains on energy. In the meantime, a very fragmented and technically oriented supply chain is re-organising itself, allowing the delivery of mass customised energy-efficient retrofit solutions for most dwellings. Additional energy services have been developed, such as financial arrangements, loans, subsidies, energy coaches, and local information desks. The retrofit packages available still require considerable investments from owner-occupants. Will energy prices rise to the extent these investments become appealing? Or should we develop additional strategies? Would it be better to find out what the most appealing renovation propositions are, like Wilson et al. (2015) are suggesting, market those with additional energy-efficiency measures, and, if possible, make sure that these propositions must contribute to energy efficiency? This would mean that energy efficiency becomes one of the neutrals in the customer satisfaction framework of other retrofitting propositions. To assess whether this will be a more efficient strategy, additional research is required into how efficiency measures could be “bundled” into other types of home renovations.

### Acknowledgments

This article is based on the findings of research executed as part of the Integrale Energietransitie

Bestaande Bouw (IEBB) project funded by the Meerjarig Missiegedreven Innovatie Programma 3 (MMIP3) programme of Rijksdienst voor Ondernemend Nederland (RVO), aiming at advancing the upscaling of industrialised retrofitting in the Netherlands. The authors wish to thank everyone involved in the case studies and IEBB 7.3. Finally, we want to express our gratitude to the reviewers of this article for their valuable comments and remarks. All errors and omissions remain the authors’ responsibility.

### Conflict of Interests

The authors declare no conflict of interests.

### Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

### References

- Bader, E. M. L., Grooten, K., & Oostra, M. A. R. (in press). *State-of-the-art en geleerde lessen in Nederland: De individuele of collectieve reis door de energietransitie van eigenaar-bewoners* [State-of-the-art and learned lessons in the Netherlands: The individual and collective journey through the energy transition of owner-occupants]. IEBB.
- Bergman, N., & Foxon, T. J. (2020). Reframing policy for the energy efficiency challenge: Insights from housing retrofits in the United Kingdom. *Energy Research & Social Science*, 63, Article 101386.
- Brandt, R. D. (1988). How service marketers can identify value-enhancing service elements. *Journal of Service Marketing*, 2, 35–41.
- Brouwer, E.-J. (2019). *Climate and energy exploration 2019: Ambitious goals give energy transition momentum, implementation appears unmanageable*. PBL Netherlands Environmental Assessment Agency.
- Cadotte, E. R., & Turgeon, N. (1988). Dissatisfiers and satisfiers: Suggestions from consumer complaints and compliments. *Journal of Consumer Satisfaction, Dissatisfaction, and Complaining Behavior*, 1, 74–79.
- de Kluizenaar, Y., Carabain, C., & Steenbekkers, A. (2020). *Klimaatbeleid en de samenleving: Een korte samenvatting van inzichten uit het SCP-onderzoek op het vlak van duurzame samenleving* [Climate policy and society: A short summary of insights from SCP-research in the field of sustainable society]. Sociaal en Cultureel Planbureau. <https://www.scp.nl/publicaties/publicaties/2020/10/12/klimaatbeleid-en-de-samenleving>
- Dowling, G. R. (2002). Customer relationship management: In B2C markets, often less is more. *California Management Review*, 44, 87–104.
- Duurzaam Thuis Twente. (2020). *Gebruik diensten Duurzaam Thuis Twente: Beknopt jaarverslag 2019*

- [Use of Duurzaam Thuis Twente's services: Concise annual report 2019].
- Giese, J. L., & Cote, J. A. (2000). *Defining consumer satisfaction*. Academy of Marketing Science Review. [https://www.ams-web.org/resource/resmgr/original\\_amsr/giese01-2000.pdf](https://www.ams-web.org/resource/resmgr/original_amsr/giese01-2000.pdf)
- Haase, M., Skeiea, K. S., & Woods, R. (2015). The key drivers for energy retrofitting of European shopping centres. *Energy Procedia*, 78, 2298–2303.
- Heitmann, M., Lehmann, D. R., & Herrmann, A. (2007). Choice goal attainment and decision and consumption satisfaction. *Journal of Marketing Research*, 44(2), 234–250.
- Herzberg, F., Mausner, B., & Snyderman, B. (1959). *The motivation to work*. Wiley.
- Holloway, B. B., & Beatty, S. E. (2008). Satisfiers and dissatisfiers in the online environment: A critical incident assessment. *Journal of Service Research*, 10(4), 347–364. <https://doi.org/10.1177/1094670508314266>
- House of Representatives of the States General. (2019). *Kamerstuk 32813, nr. 406. Kabinetsaanpak Klimaat-beleid: Brief van de Minister van Economische Zaken en Klimaat aan de Voorzitter van de Tweede Kamer der Staten-Generaal* [Parliamentary paper 32813, No. 406. Cabinet approach to climate policy: Letter from the Minister of Economic Affairs and Climate to the President of the House of Representatives of the States General]. <https://zoek.officielebekendmakingen.nl/kst-32813-406>
- Housing Europe. (2021). *The state of housing in Europe in 2021*.
- International Energy Agency. (2017). *Energy technology perspectives 2017*. <https://www.iea.org/reports/energy-technology-perspectives-2017>
- J. D. Power. (2020). *Home improvement retailer satisfaction study*. <https://www.jdpower.com/sites/default/files/file/2020-04/HomeImprovementRetailer20.pdf>
- Joint Centre for Housing Studies. (2009). *The remodelling market in transition: Improving America's housing 2009*. Harvard University. <https://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/r09-1.pdf>
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263–291.
- Kano, N., Seraku, N., Takahashi, F., & Tsuji, S. (1984). Attractive quality and must-be quality. *Hinshitsu (Quality, The Journal of Japanese Society for Quality Control)*, 14, 39–48.
- Khan, M. (2021, October 14). The EU's electricity market and why soaring gas prices are driving bills higher. *Financial Times*. <https://www.ft.com/content/f37d2a36-4609-4b3e-9795-064b6d459676>
- Klantgericht Bouwen. (2021). *SKB Kopersonderzoek* [SKB buyers report].
- Klasens, E., & Oostra, M. (2016). Uncovering the real needs of customers. In N. Achour (Ed.), *Proceedings of the CIB World Building Congress 2016: Volume V—Advancing products and services* (pp. 620–794). Tampere University of Technology.
- Kolsky, E. (2015, April). *Customer experience for executives: Issues and ideas on how to do customer experiences better* [Paper presentation]. Callidus Customer Conference, Las Vegas, NV, USA.
- Kotler, P., & Armstrong, G. (2017). *Principles of marketing* (17th ed.). Pearson Prentice Hall.
- Lucon, O., Ürges-Vorsatz, D., Akbari, H., Bertoldi, P., Cabeza, L. F., Eyre, N., Gadgil, A., Harvey, L. D. D., Jiang, Y., Liphoto, E., Mirasgedis, S., Murakami, S., Parikh, J., Pyke, C., Vilarinho, M. V., Zain Ahmed, A., Brown, M. A., & Pálvölgyi, T. (2014). Buildings. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, J. C. Minx, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, & T. Zwickel (Eds.), *AR5 climate change 2014: Mitigation of climate change* (pp. 671–738). IPCC. [https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc\\_wg3\\_ar5\\_full.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf)
- Maddox, R. N. (1981). Two-factor theory and consumer satisfaction: Replication and extension. *Journal of Consumer Research*, 8(1), 97–102. <https://www.jstor.org/stable/2488847>
- Matzler, K., & Hinterhuber, H. H. (1998). How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment. *Technovation*, 18(1), 25–38. [https://doi.org/10.1016/s0166-4972\(97\)00072-2](https://doi.org/10.1016/s0166-4972(97)00072-2)
- Mittal, V., Anderson, E. W., Sayrak, A., & Tadikamalla, P. (2005). Dual emphasis and the long-term financial impact of customer satisfaction. *Marketing Science*, 24(4), 544–555. <https://doi.org/10.1287/mksc.1050.0142>
- Netherlands Environmental Agency. (2019). *The climate agreement: Effects and points of attention* (Technical report).
- Novikova, A., Vieider, F., Neuhoﬀ, K., & Amecke, H. (2011). *Drivers of thermal retrofit decisions: A survey of German single- and two-family houses*. Climate Policy Initiative.
- Oliver, R. L. (1995). Attribute need fulfillment in product usage satisfaction. *Psychology and Marketing*, 12, 1–17.
- Oliver, R. L. (2015). *Satisfaction: A behavioral perspective on the consumer* (2nd ed.). Routledge.
- Oostra, M., & Bader, L. L. (2021). Towards energy neutral neighbourhoods. In M. Rietbergen, E. J. Velzing, & R. van Stigt (Eds.), *Smart sustainable cities: A handbook for applied research* (pp. 187–214). Hogeschool Utrecht.
- Oostra, M., & Been, L. (2016). An energy expedition: Experiences of a Dutch Collective of house owners aiming for energy neutrality. In S. Nenonen & J.-M. Junnonen (Eds.), *Proceedings of the CIB World Building Congress 2016: Volume IV—Understanding*

- impacts and functioning of different solutions* (pp. 475–616). Tampere University of Technology.
- Sandberg, N. H., Næss, J. S., Brattem, H., Andresen, I., & Gustavsen, A. (2021). Large potentials for energy saving and greenhouse gas emission reductions from large-scale deployment of zero emission building technologies in a national building stock. *Energy Policy*, 152, Article 112114.
- Silvestro, R. M., & Johnston, R. (1990). *The determinants of service quality: Hygiene and enhancing factors*. Warwick Business School.
- Soliman, H. M. (1970). Motivation-hygiene theory of job attitudes: An empirical investigation and an attempt to reconcile both the one- and two-factor theories of job attitudes. *Journal of Applied Psychology*, 54(5), 452–461.
- Souca, M. L. (2014). Customer dissatisfaction and delight: Completely different concepts, or part of a satisfaction continuum? *Management & Marketing: Challenges for the Knowledge Society*, 9(1), 75–90.
- Swan, J. E., & Combs, L. J. (1976). Product performance and consumer satisfaction: A new concept. *Journal of Marketing*, 40(2), 25–33.
- van der Werf, G., & van Duist, L. (2020). *Vijf tinten groener: Nederlanders op weg naar een groene samenleving* [Five shades of green: The Dutch on the road to a greener society]. Motivaction.
- Vargo, S. L., Nagao, K., He, Y., & Morgan, F. W. (2007). Satisfiers, dissatisfiers, citicals, and neutrals: A review of their relative effects on customer (dis)satisfaction. *Academy of Marketing Science Review*, 11(2).
- Whitmarsh, L., Upham, P., Poortinga, W., McLachlan, C., Darnton, A., Devine-Wright, P., & Demski, C. C. (2011). *Public attitudes, understanding, and engagement in relation to low-carbon energy: A selective review of academic and non-academic literatures*. Research Councils UK. <http://www.rcuk.ac.uk/RCUK-prod/assets/documents/energy/EnergySynthesisFINAL20110124.pdf>
- Wilson, C., Chryssochoidis, G., & Pettifor, H. (2013). *Understanding homeowners' renovation decisions: Findings of the VERD project*. UK Energy Research Centre.
- Wilson, C., Crane, L., & Chryssochoidis, G. (2015). Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy. *Energy Research & Social Science*, 7, 12–22. <https://doi.org/10.1016/j.erss.2015.03.002>
- Wolf, M. G. (1970). Nedd gratification theory: A theoretical reformulation of job satisfaction/dissatisfaction and job motivation. *Journal of Applied Psychology*, 54(1), 87–94. <https://doi.org/10.1037/h0028664>
- Zhang, P., & von Dran, G. M. (2000). Satisfiers and dissatisfiers: A two-factor model for website design and evaluation. *Journal of the American Society for Information Science*, 51(14), 1253–1268.

## About the Authors



**Mieke Oostra** is a professor of applied urban energy transition at the University of Applied Sciences (UAS) Utrecht. She is chairing the theme Circular and Energy Neutral Area Development of the Centre of Expertise Smart Sustainable Cities. She has expertise and vast experience in futureproofing both buildings and districts, with a special interest in addressing societal issues while meeting the needs of clients and end-users. As the chair of the platform Urban Energy (an organisation representing Dutch UAS professorships focused on the energy transition in the built environment), she is a member of the working committee of the Dutch Centre for Building Technology Innovation (BTIC).



**Nelleke Nelis**, the owner of Making Space, is a construction engineer who switches between the construction world and the world of the residential consumer. She has many years of experience in informing, involving, and convincing residents (groups) at every moment in the customer journey. With her background in construction and housing technology, she can “translate” information and have insight into the wishes of residents and how these can be connected to an energy-saving plan.