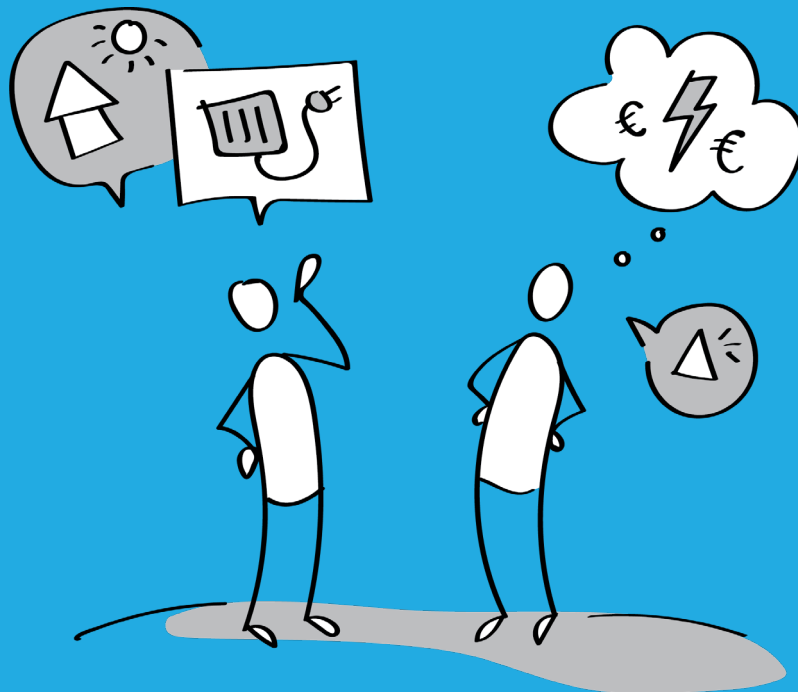


# FACILITATING THE MARKET INTRODUCTION OF DANTE

## INTRODUCTION ROADMAP



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Graduation report  
Technical University of Delft  
MSc. Strategic Product Design

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## PREFACE

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This is the final deliverable of the graduation project of the MSc. Strategic Product Design at the Delft University of Technology. This project enabled me to implement my knowledge and experience in practice, to learn and to have fun.

Thank you Wisse, for granting me the opportunity to do this project. Thank you for the trust and enthusiasm, for introducing me to telephone meetings and for checking your own network to find pioneering homeowners. Your challenging, yet always positive feedback pushed me to make most out of it and to be confident about my own abilities and the choices I made. It was great having such an engaged company mentor.

Thank you Sylvia and Lise, for the freedom and the support throughout the process. Thank you for thinking along and providing honest and sharp feedback. I am sure this result improved because of your genuine interest and recommendations.

Thank you Hannah and Tessa, my graduation buddies. Thank you for the insightful and enjoyable tea and coffee breaks and for the advise on difficult, graduation related matters. And thank you to Rebekka, who took the time to help me structuring the numerous insights of the expert analysis and offered a fresh perspective.

Thank you to all the experts and homeowners which invested time and effort to show and tell me about their knowledge and experiences. Thank you for the hospitality and the new insights.

And last but not least, Thank you mom, dad, Nadine and Hero, for the endless support and patience. And of course, thank you to all my friends and family that provided the perfect distraction from the project. Thank you for keeping life outside of graduation fun and for making me happy.

Enjoy the read!

A handwritten signature in black ink, consisting of stylized, overlapping loops and a long horizontal stroke extending to the right.

Sanne Kirsten Jongeling

# EXECUTIVE SUMMARY

## Market introduction of new products

To successfully introduce a new product to the market it is key to respond to consumer needs and values. In the dynamic marketplace of today, it is thus increasingly important to target the right market segment and to understand consumers in order to offer the right product or service at the right time.

## The assignment

ENGIE is a multinational services and energy company, aiming to become a leader in the energy transition. In order to do so, they offer services to clients in both the B2B and the B2C market. At this moment, the company develops a new product named Dante. This product is based on an emerging nano technology which allows the material of Dante to function as infrared heater and energy storage. While the technical functioning of the product is proven, the company struggles to define the market segment and corresponding value offered to consumers. Therefore, the main objective of this project is to define the best market segment for the introduction of Dante and to develop an introduction plan to support ENGIE in the commercialization process.

## Defining the competitive landscape and market segmenting

Three possible market segments are defined on the basis of exploratory research into market segments, analysis of the competitive landscape and examination of previous market potential reports. These three market segments are: the private housing segment, the social housing segment and the utility buildings segment. Extensive research is done to identify in what way Dante could be introduced in these three specific segments and what value the product can deliver. Nine experts were interviewed, which provided the basis for a deep understanding of the market segments. Insights gained in the expert interviews are integrated into

strategies for the introduction of Dante per segment. To realize a successful short term market entry, Dante should target the private housing segment and especially focus on pioneering homeowners which apply sustainable measures in, on or at home. These consumers are willing to adopt an innovative product and can help to build example cases to stimulate the acceptance of Dante in other market segments. Later on, when the product is proven and energy regulations in The Netherlands are more beneficial, other market segments will grow an interest in the application of Dante.

## Introduction among sustainable, pioneering homeowners

To truly understand the values, needs and behavior of pioneering homeowners, eight consumers were interviewed. The context mapping interviews generated insights about deciding and applying sustainable measures in, on or at home. Additionally, the current design of Dante and its functionalities were examined. As a result, consumer profiles as well as recommendations for the product design and functioning of Dante were developed. The consumer profiles describe how to support pioneering homeowners during the process of applying a sustainable measure and what this means for the proposition of Dante, see figure 1. The recommendations for Dante provide clear guidelines for a redesign of the product to better respond to the values, needs and behavior of homeowners. Both deliverables help ENGIE to introduce Dante in the market and to make the product attractive for early adopters.

## Towards participation in a Virtual Power Plant

Over time, Dante could increase its value by changing its proposition. The three horizon framework is used to maximize the future opportunities. In the first horizon, in which Dante is introduced to

pioneering homeowners, the function of Dante is to maximize the energy usage from self-generated energy. In the second horizon, starting when the netting arrangement changes into a return subsidy, Dante could target the majority of consumers and offer home energy management. In the third and last horizon, starting when flexible energy tariffs are applied, Dante panels could be part of a Virtual Power Plant. In this Virtual Power Plant, a large amount of individual Dante panels can together support the stabilization of the public power grid. This can be financially attractive for both consumers and ENGIE.

## Introduction plan

This project resulted in the introduction plan for the product Dante. The introduction plan supports the market entry and scale-up of Dante by indicating how the introduction and product should respond to regulations, market trends and new technologies. The plan consists of two roadmaps: the introduction roadmap and the product roadmap, see figure 1. The introduction roadmap explains which market segments ENGIE can target and how to position Dante in these markets. The product roadmap discusses how the product should develop over time and how to respond to future consumer needs and values. Together, they form the basis of future decision making for the Dante.

To conclude, estimating whether Dante can be successfully introduced in the Netherlands is hard. At the moment, the application in the market is limited but by responding to changing regulations and consumer needs, opportunities for Dante will arise in the future. On the short term, Dante could be introduced in another country.

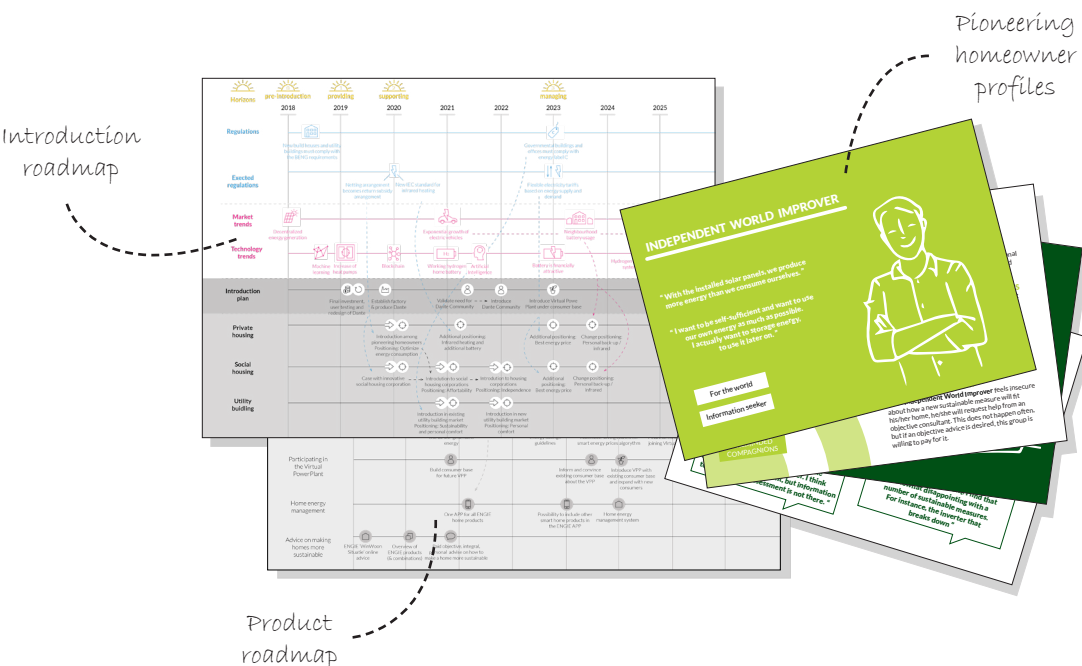


Figure 1. Deliverables: Introduction roadmap, product roadmap and pioneering homeowner profiles



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# 1 PROJECT INTRODUCTION

In this chapter  
1.1 Project introduction  
1.2 Project approach

This chapter presents the project objectives and approach. It gives insight into the assignment and the process used to tackle the project. Additionally, it provides guidelines on how to read this report.



## 1.1 ASSIGNMENT

This project is commissioned by the 'EVIS Innovation & Incubation' department of ENGIE Netherlands, located in Bunnik. This department develops an innovative energy product named 'Dante'. Dante is based on a new energy nano technology, allowing a material to function as a solar panel, light, heater and battery. The first functioning product in which this technology is applied, is a combination of a heater and energy storage. Currently, the first Minimal Viable Product (MVP) of Dante is tested and there is a proven production method.

### Challenge

Dante has great potential as an innovative product and potential market segments exist in both the B2B and the B2C markets (Engie & Navigant, 2018). However, the most suitable market segment, the best way to introduce the product and the design of the product-service system are still unknown, see figure 1.1. This is due to the fact that it is not yet clear what value the product could offer to different market segments and how the product will relate to the ENGIE brand.

The research question therefore is:

**How to introduce Dante in order to add value to both ENGIE and the consumer?**

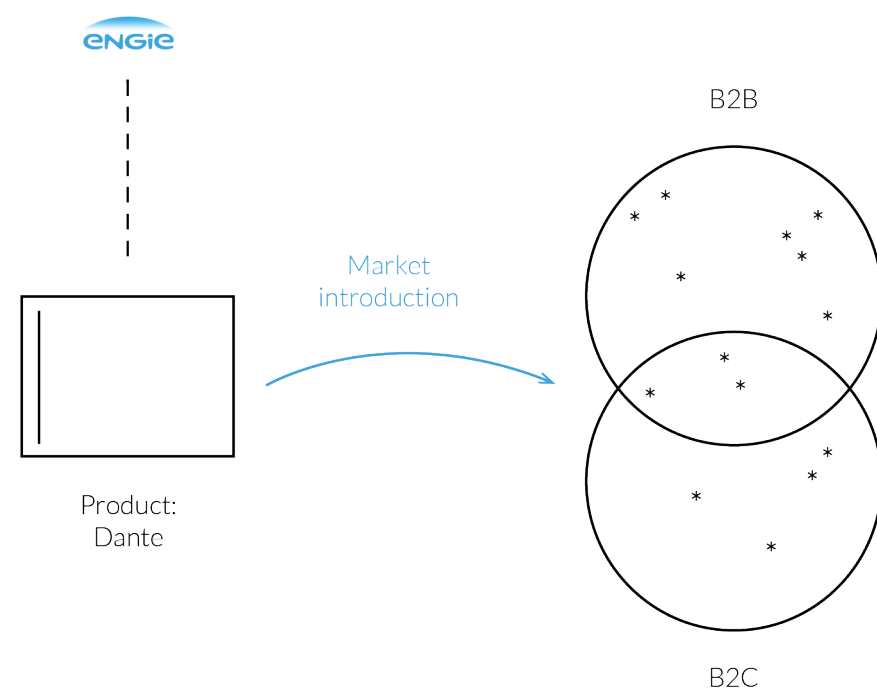


Figure 1.1. Market entry of Dante

### Project aim

The aim of this project is to define the possible market segments for Dante (segmentation), to select the most promising one (targeting) and to develop an introduction plan for this segment (design). Special attention is paid to the further development of the product Dante.

## 1.2 APPROACH

The approach used for this design project is the 'Brand Driven Innovation Process' (Roscam Abbing, 2010). This method includes both a company and consumer focus throughout the design process. It therefore fits with the aim to create a product introduction that provides value for both of these parties.

The method includes four phases: understand, focus, design and implement, see figure 1.2. The different phases all provide input for the next phase and have an iterative character. Nevertheless, the phases can vary in length and intensity. The phases served as the structure for the project itself as well as this report. Underneath a short description of what the phases entail for this project:

### Phase 1 - Understand

In this phase, an understanding of the current market place and the possible consumers is created. Different opportunities and innovation domains for Dante are pinpointed based on current competitors, future trends and insights from expert interviews.

### Phase 2 - Focus

One market segment is chosen for the introduction of Dante. Consumer research built an understanding of this market segment, both in terms of the consumers

itself as well as their values, needs and current opinions about the product.

### Phase 3 - Design

Based on the chosen market segment recommendations for Dante are formulated and an introduction plan is designed. The introduction plan defines an introduction roadmap and product roadmap, which offer advice for the expansion of Dante in other market segments and the development of the product itself.

### Phase 4 - Implement

To reach the market quickly and prepare the organization for delivering the new product, recommendations regarding the business model, introduction abroad and challenges for ENGIE are formulated.

### How to read this report

This report is divided into seven main chapters. The four phases of the Brand Driven Innovation Process form the basis of the report, chapter 2 until 6. Each chapter finishes with a conclusion, which presents the main findings and key take-aways. For a short read, look at the images and read the conclusion after each chapter.

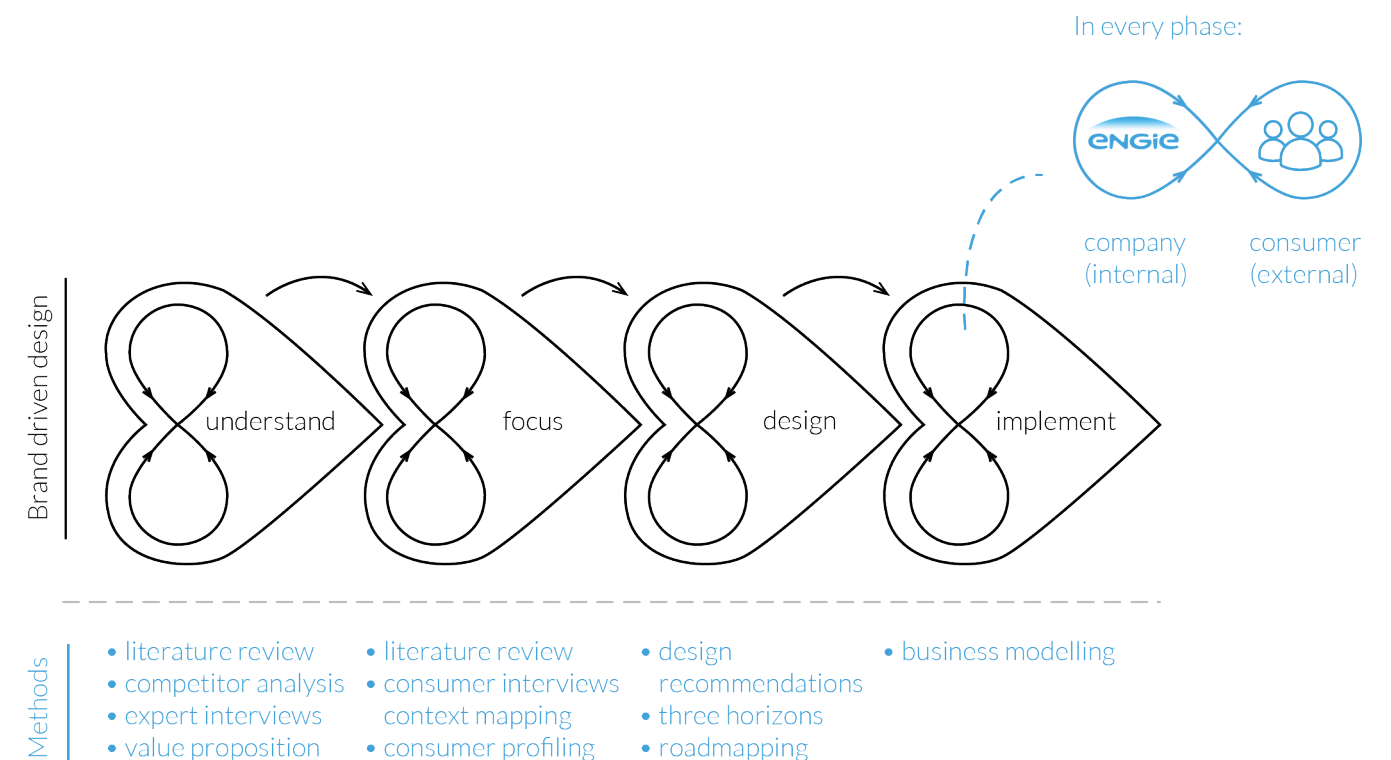


Figure 1.2. Brand Driven Innovation Process (based on Roscam Abbing, 2010) and methods used





## 2 BACKGROUND

In this chapter  
2.1 ENGIE  
2.2 Dante  
2.3 Context  
2.4 Conclusion

In this section an overview of the company, the product and the context is provided. To gain an understanding of ENGIE, a company analysis is performed. The current product, named 'Dante' is explained when it comes to its features and current appearance. Lastly, the context in which the company and product operate is clarified with emphasis on the energy transition.



Dante is developed and owned by ENGIE. Therefore, the company and its context are important for the commercialization of the product. This chapter gives an introduction to ENGIE and discusses their positioning as well as their activities.

ENGIE

ENGIE is a services and electric utility company, often referred to as 'The Engie Group' since it contains multiple financially independent business units. In 2008, the French multinational was born as Gaz de France and SUEZ, two French firms focusing on electricity and gas, merged. The company was named 'GDF Suez' and later, in 2015, changed its name to ENGIE (ENGIE, n.d.). Currently, ENGIE operates in 70 countries around the world and provides solutions to a big variety of clients, including individual consumers, commercial companies and urban authorities, see figure 2.1. The offered energy solutions concern the core business of electricity, natural gas and technical services and are based on expertise in renewables, energy efficiency, liquefied natural gas and digital technologies (ENGIE, n.d.).

Strategy

ENGIE aims to become a leader in the global energy transition, and make sustainable energy available to everyone. In recent and upcoming years, the company itself thus transforms and adopts an agile strategy that aligns with the industrial activities regarding the energy transition. This strategy focuses on realizing possibilities to become more sustainable (ENGIE, n.d.). Hereby, it is important to not only think in a different way but also to do things differently. The way of working, usage of processes and making decisions are changing. Aligned with the strategy, ENGIE focuses efforts on energy efficiency, renewables, digital technology and new business (ENGIE, n.d.).

ENGIE NL

ENGIE NL is part of ENGIE BeNeLux. In the Netherlands, ENGIE consists of two departments: ENGIE Services and ENGIE Energy.

ENGIE Services is market leader and provides sustainable, technical services to industry, infrastructure and utility market players (ENGIE Services, n.d.). Services ranging from design, realization, maintenance and management are offered as well as total trajectories. The services include safety and security solutions, water solutions,

asset management and ground coupled heat installations etc.

ENGIE Energy is, together with about 35 other companies, active in the Dutch energy industry (ENGIE MyConnect, 2018). ENGIE Energy produces and provides energy to commercial and individual consumers. Currently, ENGIE Energy mainly serves commercial consumer and about 250.00 residential consumers (Hummel, 2018) in the Netherlands. However, in Belgium and France, ENGIE is one of the biggest players in the consumer electricity market. At the moment, it seems that the Dutch ENGIE Energy branche wants to grow in this sector of individual consumers as they increase their marketing efforts and expand the offerings for this segment.

EVIS

EVIS is a new department of ENGIE NL, established in early 2017 and currently has 130 employees. EVIS focuses on accelerating integral solutions to become more sustainable (Frenken, 2018). It can therefore not be placed under the current ENGIE branches and is a new department, see figure 2.2. By combining different disciplines, innovations and techniques, EVIS provides clients with a final solution and thus creates a bigger impact and stimulates the energy transition (Frenken, 2017). In collaboration with ENGIE firms, clients and partners, integrated solutions can be developed to make areas, buildings and factories sustainable. EVIS can therefore also provide structure and methodology for business development and innovation processes (Frenken, 2018). The strategy diamond, presented in figure 2.3, gives insight into the differentiation, staging and economic logic of EVIS.

As working in an integrated way is not the standard within ENGIE, an organization which is traditionally divided into different silo's (Frenken, 2017), the EVIS department has a different culture. Agile ways of working, like Scrum and Lean, are applied within project teams.

Matrix organization

EVIS is set up as a matrix organization (EVIS, 2018), see figure 2.2. The focus of EVIS lies in three fields: smart areas, smart buildings and smart industry. These fields can all benefit from the knowledge, skills and competences of centers named innovation and incubation, smart digital solutions and energy solutions.



154.950 employees



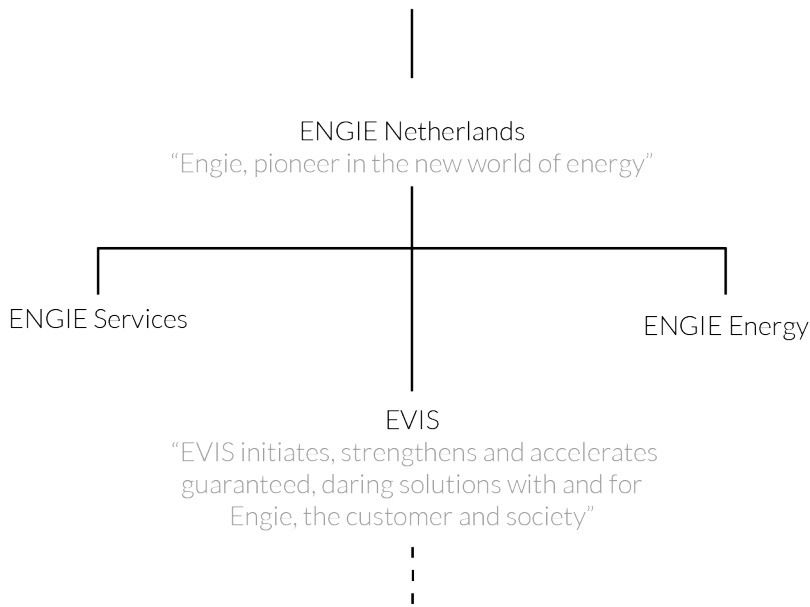
70 countries every continent



65 billion of revenues



#1 independent power producer



	Innovation and Incubation "Turning innovation into business"	Smart Digital Solutions	Energy Solutions
Smart Area			
Smart Building			
Smart Industry			

Figure 2.1. ENGIE in numbers

Figure 2.2. ENGIE - EVIS' organizational structure

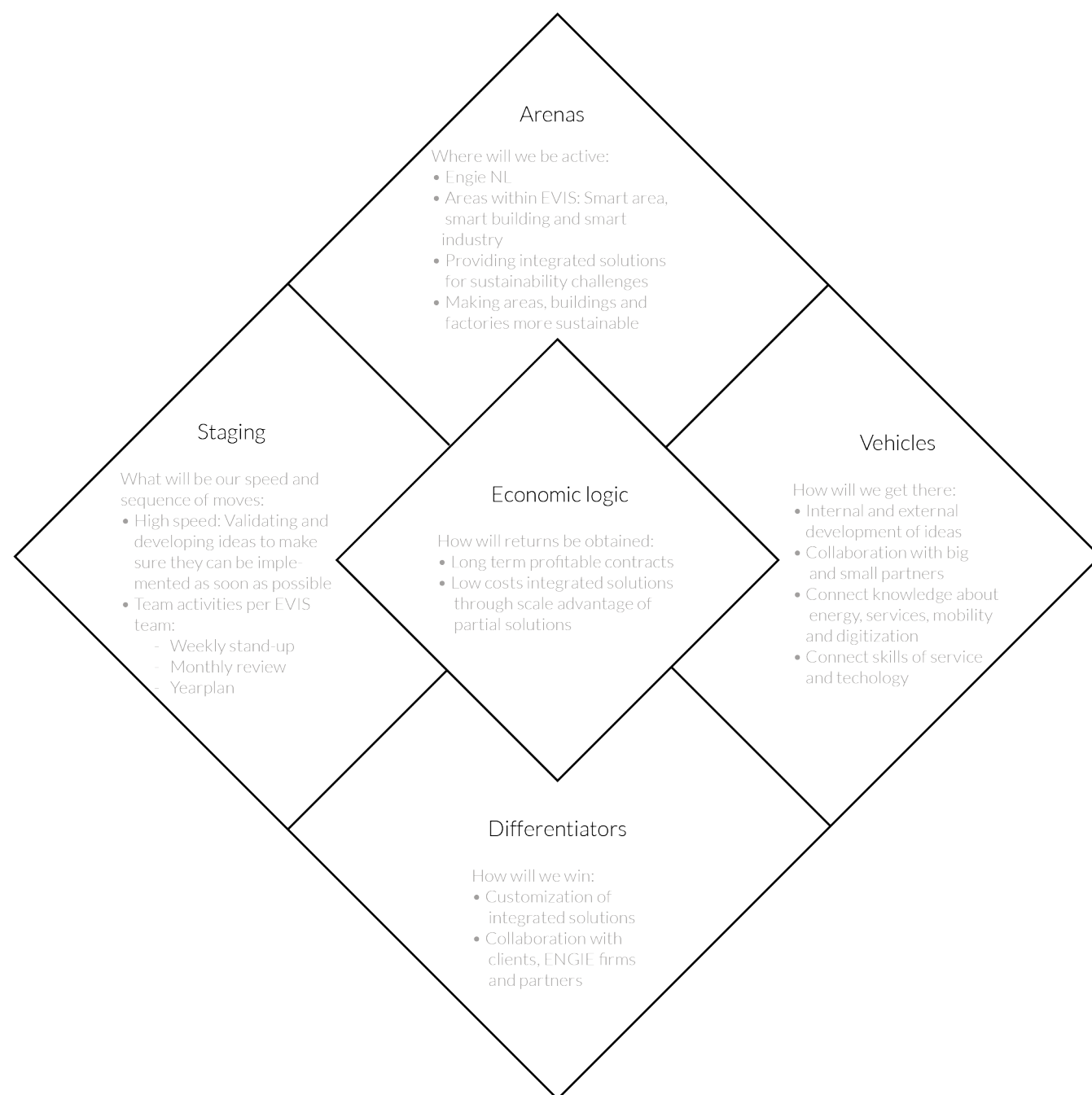


Figure 2.3. Strategy diamond of ENGIE - EVIS

When the organizational structure of a company or division changes, this is often due to a simultaneous change of the strategy (van Trappen & Wirtz, 2016). This was also the case for ENGIE in 2016, when shifting their primary dimension from products, like power services and infrastructure, to regions in order to better serve their clients. However, EVIS is a new division and started as a matrix organization. This is advantageous as it is best to start small when applying this kind of organizational structure. The matrix structure fits with the aim of EVIS to be responsive in two sectors simultaneously (Stanley & Lawrence, 1978), in this case the market sector and the technology and innovation sector. A matrix organization can be seen as complex as it has a dual control and evaluation system and a needs a balance of power (Stanley & Lawrence, 1978). It tries to break and coordinate across different organizational silos. Middle managers are important, as coordination asks for a somewhat formal set-up. A recognized problem with matrix structures is that it asks for reporting and slows decision making, yet the opposite should be true. In a successful matrix organization, operational decision making is controlled and intra-organizational conflict is not common as the roles and accountabilities of the different matrix dimensions are clearly defined (Trappen & Wirtz, 2016).

### Innovation and Incubation

The Innovation and Incubation team within EVIS is specialized in developing innovations from a market perspective and acts like an incubator for internal and external ideas. The team develops ideas into business propositions. To create new ideas, the team uses brainstorm sessions and hackatons but also works in close collaboration with the startup ecosystem and different ENGIE departments. New innovations are therefore attracted from inside and outside the company.

When developing an idea, the technology, business model and organizational support are considered. Promising innovation projects are eventually introduced to the market as a new business department within ENGIE, a new brand endorsed by ENGIE or as a stand-alone spin-off.

Dante is the product which formed the starting point of this project. Dante is an innovative product, based on a new energy nano technology. This technology allows a material to act like a battery, solar panel, light and heater. It is possible to have these different functions within one product since the functions are -so to say- printed as different layers on top of a glass panel. This allows for multiple applications of the technique and different possible products. ENGIE aims to apply this new technology for the first time in the form of Dante; A combination of the battery and heater, see figure 2.4.

### Combination of electric heating and energy storage

The choice of ENGIE to combine the functions as battery and heater is based on market trends, logical thinking and gut feeling. In the current market, the price and value of solar cells decreases rapidly and energy storage is promised to be 'the next big thing'.

Additionally, the heating function is proven and tested and can therefore be introduced to the market quickly. Combining the energy storage with the heating function would mean that a battery is not only a loss of space, but could actually be used and have a function within a building. Combining these two functions is expected to result in a successful product.

The external consultancy Navigant performed a first market analysis for Dante and validated that a combination of the energy storage and heater would be valuable for the short-term future market (ENGIE & Navigant. 2018). At this moment, ENGIE thus continues the development of the product.

### Dante as an infrared panel

Dante can function as an infrared panel, which is a form of electric heating. Infrared heats objects rather than the surrounding air and feels similar to the warmth of the sun. Infrared panels can be controlled

separately and have a fast reaction time. The infrared heating could be used as additional heating in current buildings with a moderate insulation. In buildings with a great insulation, infrared heating could also function as the main heating system.

The infrared panel has a capacity of 1 kWh. Using the energy stored in Dante, the heater can thus be used for 1,5 hours on full power. However, the heater can also function on electricity from the grid, ensuring consumers can always use the heater. How much kWh a specific home needs to meet the heat demand greatly depends on the insulation of the home. To gain insight into the heating system of a home, a heating system map developed, see Appendix A.

### Dante as a battery

The battery of Dante can store electricity obtained from self-generation, for instance solar panels, or from the grid. The stored energy can be used later on, when electricity is needed. In this case, the consumer

can use more of the self-generated energy rather than feeding this energy back to the grid (mostly for a lower price) and the mismatch between energy generation and energy demand is covered. Figure 2.5 presents the energy system of Dante in which Dante as energy storage can charge by means of self-generated electricity or electricity from the grid, and can discharge when supplying energy to the home or grid.

Having an energy storage will make consumers, both in the B2B and the B2C market, more autonomous. To illustrate this; an average Dutch family household with solar panels would be self-sufficient during eight months of the year, by having seven Dante panels. The energy storage can also be used for public services. The battery could provide energy to the public grid. This provides opportunities to make (a group of) batteries function as a Virtual Power Plant to stabilize the grid or to provide other consumers with local, clean electricity.

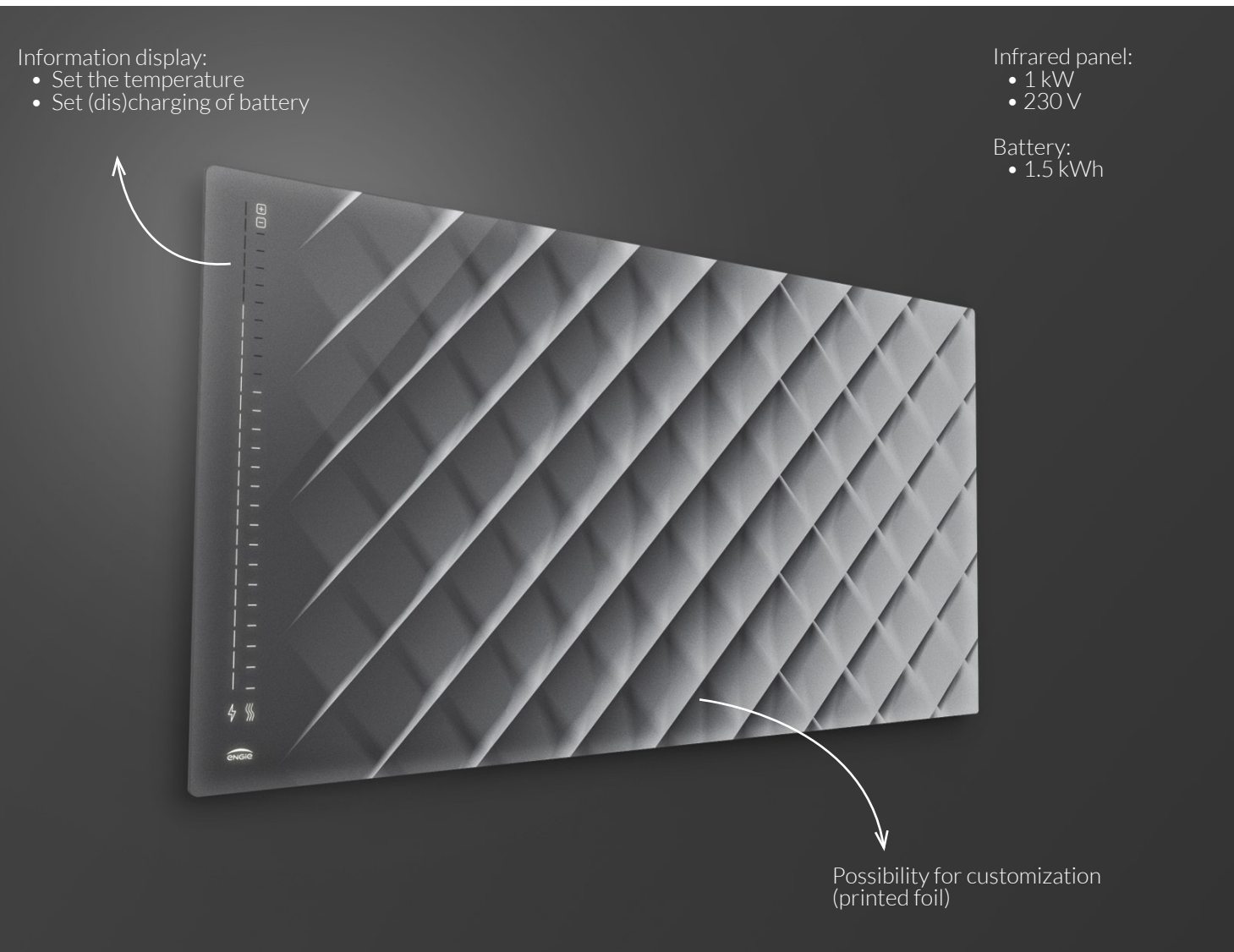


Figure 2.4. Prototype Dante (based on Spark, 2018)

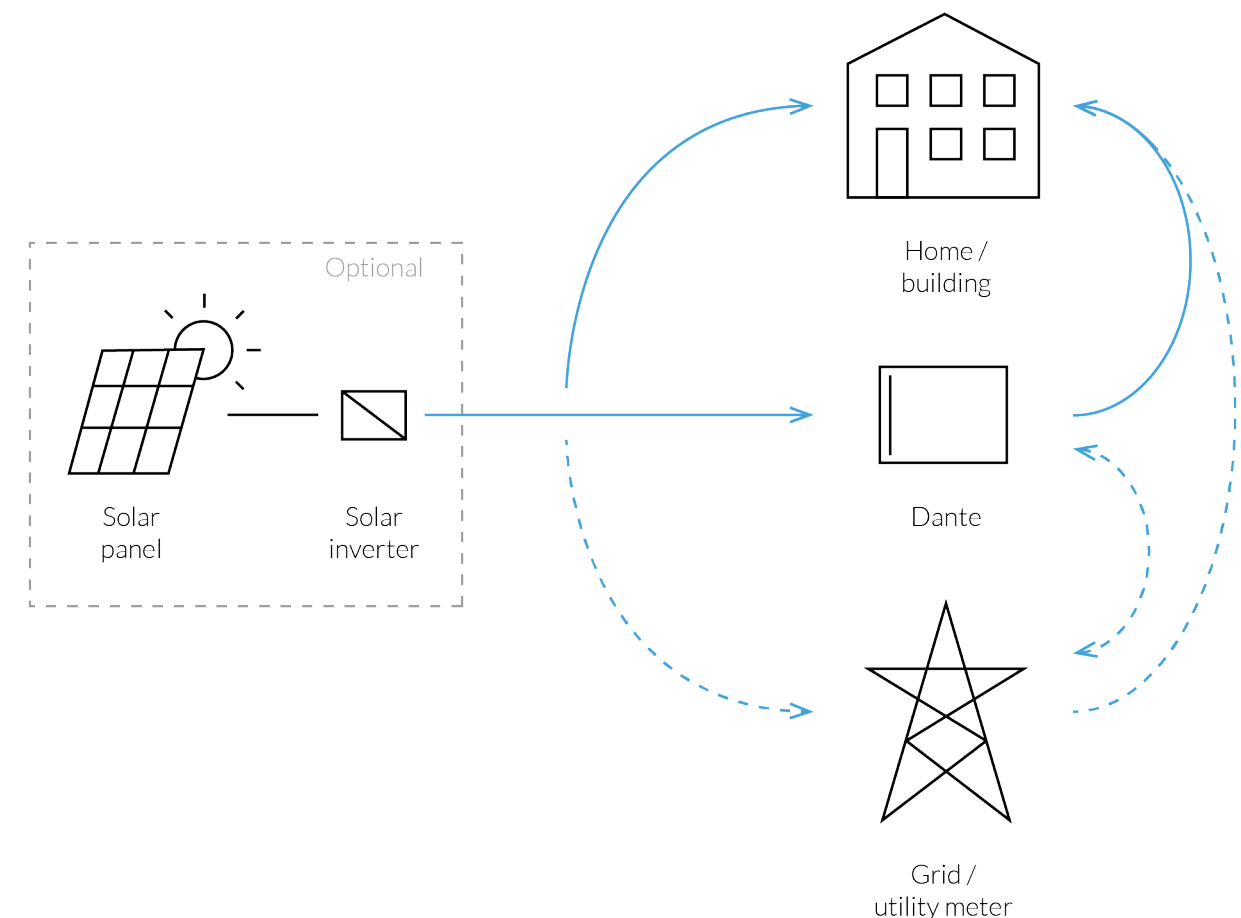


Figure 2.5. Energy system of Dante

2.3 CONTEXT

The Dante battery has a capacity of 1.5 kWh. To illustrate this amount of electricity and how this could be used, see figure 2.6.

Minimum Viable Product

Currently the Minimum Viable Product (MVP) of Dante is produced and tested. Also, a proven production method is found, which means that the Dante panel could actually be produced in a factory.

The MVP looks like the illustration presented in figure 2.4. However, the product design is not yet fixed and for consumers, there are many options to customize the product, as there is the possibility to print a photo on the panel or to have it as a mirror. The product can therefore be offered as a low-end product as well as a high-end product.

Dante functions as an integrated infrared heater and an energy storage. Dante thus has to do with two different contexts; electric heating and energy storage. In this chapter, an introduction to both of these contexts is given with the emphasis on the ongoing energy transition.

The energy transition

The energy transition is defined as the shift from old, depletable energy production and usage towards producing and using new, sustainable energy. Energy used to be fossil-based, made from oil, coal and gas. Sustainable energy is based on renewable sources, like the sun and wind. By using electricity intelligently, systems can be optimized and energy consumption can be reduced.

The energy transition is a sustainability transition, described by Markard et al. (2012) as: *“Sustainability transitions are long-term, multidimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption. One particularity is often that guidance and governance play a particular role”*. This description indicates that the transition takes place at multiple aspects at once and that the government can play a key role within this process. This means that a single company, even a multinational like ENGIE, or a single product, like Dante, is just one of the many important actors and influencers in such a big, complex transition.

Decentralized energy production

An important change that is already seen today is that the generation of energy gets decentralized. Firms, civilian collectives and individuals invest in clean energy production and can function as power plants. Rather than obtaining the energy from the large production companies, energy is produced and

consumed on a local scale. The socio-technical system that is in place and the management of the public power grid is thus exposed to new challenges. For instance, managing the distribution network, keeping energy policies up-to-date, improving organizational structures and adjusting activities of companies active in the energy sector. Dante could possibly offer a solution to one or more of these challenges and upcoming needs by responding to decentralized energy production.

Stabilizing the grid

The amount of energy obtained by renewable resources is increasing. Renewable resources are variable and do not produce a certain amount of electricity at all times. The sun is not always shining and the wind does not always blow. Accordingly, sustainable resources place a heavy load on the public power grid and therefore stabilizing the power grid becomes a challenge. Batteries, like Dante, could help to stabilize the grid by the subtraction or supply energy when required.

Balancing sustainable energy generation and demand

Another challenge is covering the mismatch between energy supply and demand. Sustainable energy is mostly provided when the demand is rather low, see figure 2.7. During the day, the electricity demand for households is low, as adults are at work and children are at school, but this is the moment that the solar panels produce most energy. This self-generated energy can thus not be used directly. On the other hand, during the early morning or evening, when the demand for energy is high, less or none energy is generated.

On average, a maximum of 20-30% of self-generated energy can be used directly (xx) and the remaining energy is provided to the grid or stored in a battery. A battery can store self-generated energy, so that it can be used at a later moment in time.

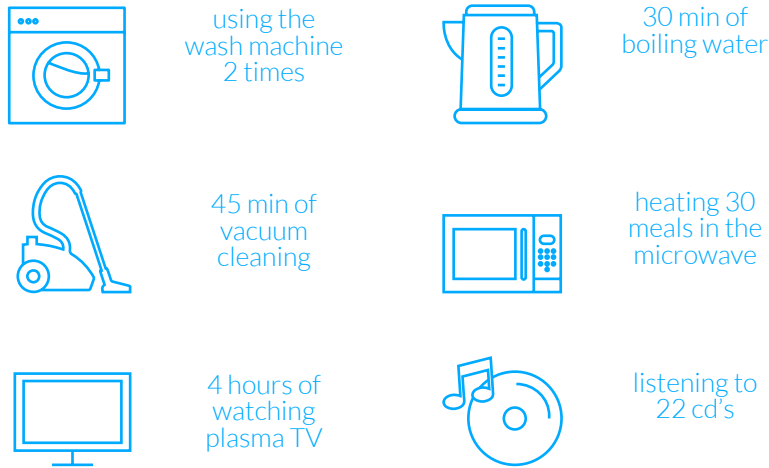


Figure 2.6. Capacity of 1,5 kWh

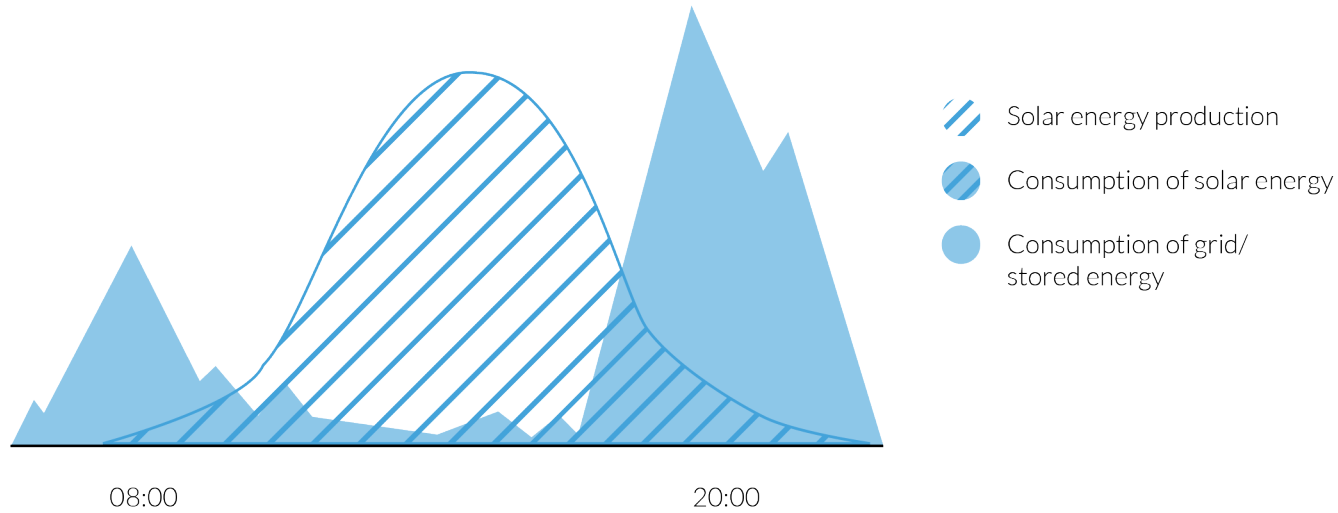


Figure 2.7. The non-alignment of sustainable energy generation and demand



### The electric heating landscape

Heating can play an important role in making existing and new building more sustainable. The majority of Europe's heating appliances uses gas. However, the market share of electric heating is rising. Currently, this market experiences a boost from the rise in decentral energy production and the growing clean energy demand.

#### Dutch context: Free of natural gas

Like in Europe, heating in The Netherlands is based on gas. Remarkable is the fact that Dutch consumers relatively use a high amount of gas. About 95% of the Dutch households has a gas connection (Hier, 2018) and The Netherlands is one of Europe's largest producers of gas. Gas is thus easily available and also used for warm water and cooking. Nonetheless, the electric heating market is growing. The Dutch government aims to be free of natural gas in 2050 (Ministerie van Economische Zaken, 2016). This means that buildings should be heated by geothermal heat, electricity or other alternatives. The abolition of gas proposes a good prospect for Dante as the electric heating market will increase for both new constructions as well as renovations.

### The energy storage landscape

Energy storage is seen as a means to achieve goals of the energy transition and to overcome challenge related to decentralized energy production, stabilizing the grid and matching the energy supply and demand. Globally, the energy storage market is growing exponentially. Australia, The U.S., Japan, Germany and the United Kingdom are considered as leading countries in the energy storage market (ESA, 2018). In these countries, the energy storage solutions are in an early adoption and majority state.

#### Dutch context: Changing netting regulations

In the Netherlands, the market for energy storage is still very small. This is due to the current netting regulations. Net metering currently allows to feed self-generated energy to the public grid. Doing this, a specified feed-in tariff for the provided electricity is gained and the energy bill settles the balance between the consumed electricity and the returned electricity. As the feed-in tariff is quite high, the electricity bill of the consumer or firm will decrease and investing in an energy storage solution is not profitable. However, in 2020 the Dutch government will replace the netting arrangement (salderingsregeling) with a return subsidy (terugleversubsidie) (Wiebes, 2018). This return subsidy splits the electricity compensation into the bare electricity price and the energy taxes. When self-generated energy is supplied to the grid, the supplier will just receive the bare electricity price (7 eurocents/kWh) instead of the former overall price (22 eurocents/kWh). This means that providing self-generated energy to the grid will become less attractive and using own self-generated electricity is desired. To cover the mismatch between self-generated energy supply and energy demand, an energy storage could provide a solution.

## CONCLUSION

### ENGIE

ENGIE is a multinational services and energy company that aims to take the lead in the energy transition. In the Netherlands, ENGIE has two main departments: ENGIE Services and ENGIE Energy. However, the team that focuses on innovation and integrated solutions does not fit within those two main departments. EVIS, ENGIE Ventures and Integrated Solutions, focuses on combining different disciplines, innovations and techniques of the large company. It provides clients with a final, integrated solution and works together with and for clients, partners, society and ENGIE itself. As this innovative, integrated and multidisciplinary way of working is not standard, EVIS is still developing itself.

In the specific 'Innovation and Incubation' team, efforts are focused on turning innovation into business by collaboratively developing both internal and external ideas. One of those ideas is the technology and eponymous product Dante.

### Dante

Dante is a new product, which is currently in the development phase. It is a thin panel which can function as a battery, storing energy, and as an infrared heater, providing radiant heat. At this moment, ENGIE is testing the technology to check whether the first prototype works. Depending on the developments in the market, Dante could become a successful product when introduced in the right way.

### Context

ENGIE as well as the product Dante operate in the energy market. In this market, the energy transition plays a major role and will determine the future industry. The energy transition is defined as the shift from old, depletable energy production and usage towards producing and using new, sustainable energy. This transition entails lots of trends and challenges, like decentralizing energy production, stabilization of the electricity grid and covering the mismatch between sustainable energy production and demand.

As a battery and heater, Dante has to deal with both the energy storage and the electric heating market. Most heating appliances in Europe, including the Netherlands, use gas but in recent years, the market experiences a growth of electric heating. Energy storage is supposed to be 'the next big thing' as it can especially help by optimizing the use of sustainable energy. However, in The Netherlands the netting regulations ensure that storing energy, both for businesses and consumers, is not yet financially attractive.



# 3 UNDERSTAND

In this chapter  
3.1 Literature review  
3.2 Competitive landscape  
3.3 Market segments  
3.4 Target group: Pioneering home owners  
3.5 Conclusion

To understand the current market and the possible target groups, various analyses are performed. A short literature review introduces the discipline of innovation and market introduction of new products. A competitor analysis provides insight into the competitive landscape and expert interviews are conducted to gain insight into the possible market segments. The analyses are used to indicate the best opportunities for the introduction of Dante and led to the selection of one market segment for the introduction.



In today's dynamic marketplace, creating and understanding about innovation and market introduction is important for everyone who aims to launch a new product. This chapter presents a brief literature review providing support for the introduction of Dante.

### Disruptive innovation

The new nano technology as well as the Dante product are often put away as disruptive innovations. Apart from the great impact on the market, the technology and product might not be actual disruptive innovations.

Disruptive innovation is a buzz word which lost its true meaning. It is currently used to evoke the idea of innovation. Therefore, the term is misunderstood and applied in the wrong cases (Christensen et al., 2015). In literature disruptive innovation is seen as a process in which a small company with few resources challenges the market (Christensen et al., 2015). Leading firms are not directly threatened, as the disrupter focuses on unmet needs of smaller consumer segments and low-margin business (Tarakci, 2017). However, the disrupter can grow unnoticed and can take over the market due to the high improvement potential of the product or service (Tarakci, 2017). A disruptive innovation can start in two ways; (1) by a low-end foothold, in which the disrupter attends to the needs of low-end consumers, or (2) by a new market foothold, in which the disrupter creates a market where previously none existed (Christensen et al., 2015).

### Dante as disruptive innovation

For big companies, like ENGIE. It is important to launch own disruptive innovations (Christensen et al., 2015). Dante could be such a disruptive innovation which arises from targeting a niche or emerging market. When introducing the product in a small consumer segment, it is important to treat Dante as a different unit with an independent business model and specific market growth expectations (Christensen et al., 2015). Next to this, it is key to define the job-to-be-done (Christensen et al., 2015) in order to create value for the consumer and the company.

However, if Dante is introduced in a different manner, it will not be marked as a disruptive innovation but rather as a radical innovation (Pisano, 2015). Radical innovations target the main market and challenge the technology (Pisano, 2015). The new nano technology applied in Dante can be seen as the technological breakthrough.

### Defining the 'job-to-be-done'

Traditional market segmenting is done on the basis of product and customer categories. However, it is increasingly important to understand dynamic consumer behaviour and to define the 'job' that arises in consumer lives which can be accomplished by

the product (Christensen et al., 2007). Job-defined markets are usually larger and provide a better basis for defining real competitors (Christensen et al., 2017). Consequently, segmenting based on the to resolve problem will help companies to create products and services that are truly valued by consumers and hard to copy by competitors.

### Creating the right value proposition

In the current marketing environment, companies have to ensure customer value (McFarlane, 2013). This is done by using value proposition design; the design or renewal of a product, service or innovation to make it attractive to consumers, both in terms of design and delivery (Osterwalder et al., 2014; Johnson & Weinstein, 2004). It is a customer focused methodology, performed to define and meet consumer profiles and values. The value proposition thus defines what consumers really want (McFarlane, 2013) and the 'jobs-to-be-done'. These are not just functional jobs, but can also be social or emotional jobs (Osterwalder et al., 2014). Defining the value proposition in the early stages of product development is key as working on products, services and innovations that are not valued by consumers is a waste of time, energy and money (Osterwalder et al., 2014). Contrary, having deep consumer insights and an associated value proposition provides a foundation for market success (Price et al., 2015).

### Defining the right competitors

Competitors help to define and compare strengths and weaknesses and formulate opportunities and threats for the product, service, innovation and its positioning and strategy (Christensen et al. 2007; Bergen & Peteraf, 2002). Defining competitors based on the consumer job rather than the category or products gives a different perspective and ensures that other products and companies are seen as competitors. In order to prevent a surprise by competitors or the inability to spot an opportunity, both the demand and the supply side should be analyzed (Bergen & Peteraf, 2002). This means that products with similar functions and 'jobs' as well as similar firms should be examined.

In the development and introduction of a new product like Dante, clarifying the 'job to be done' and defining the real competitors is a first step in the business planning for creating the introduction of a new product.

### Timing of new technology

When new technologies arise, there is often a fear of responding too late. There is plenty of literature on disruption of business, industries and sectors and the cost of doing nothing and missing a revolution. However, organizations can also act prematurely and exhaust resources before the actual transition begins (Adner & Kapoor, 2016). This can apply both for existing companies as for innovative start-ups (Adner

& Kapoor, 2016). For the introduction of Dante, the timing of the technological change should be a point of attention. Therefore, it is key to not only look at the technology itself, but also to the ecosystem that supports it as well as the competition between the old and the new ecosystems (Adner & Kapoor 2016).

### Complementary ecosystem

The potential for a new technology lies in the ability to satisfy user needs (Adner & Kappor, 2016; McFarlane, 2013; Christensen et al., 2007). If this is the case, it is mostly believed that this technology can take over the market. However, external factors and complementary elements of the ecosystem can slow the application of a technology (Adner & Kappor, 2016). This means that whenever the ecosystem is not ready to apply a new technology, the technology is limited regarding the delivery of its value until the ecosystem is available. For the heating function of Dante, this is not the case, as the product is a plug-and-play substitution and therefore does not require significant developments of the existing ecosystem. For the battery function of Dante, the ecosystem is not sufficient to realize the technology's potential. In The Netherlands, the current netting arrangement makes energy storage financially unattractive and also the battery itself is insufficient for a mainstream adoption with the current capacity. The pace of substitution for Dante is thus partly determined by the rate at which the energy storage function can overcome the ecosystem challenges.

The success of the introduction of Dante depends on the elements of the ecosystem which can stimulate or limit the delivery of the value proposition. The ecosystem elements, like services, standards and

regulations, are crucial for the relevance of old technologies as well as the opportunities and success for a new technology (Adner & Kappor, 2016).

### Market introduction of new products

The introduction or launch phase of a new product or service aims to maximize the chances of achieving acceptance in the market and making profits from innovations (Guiltinan, 1999). For high-technology products, like Dante, success in the launch phase is associated to success in the long-term (Beard & Easingwood, 1996). In this high-tech environment, strategic approaches are often entrepreneurial, proactive and technology-driven. Little attention is paid to planning of the market entry and companies can improve their activities taken to prepare the market, to target a specific market segment and to position the product (Beard & Easingwood, 1996). In order to plan and execute the introduction of an innovation in the right way, an introduction plan is designed. The introduction plan includes strategic as well as tactical decisions. Strategic decisions describe the niche vs. mass targeting and the lead vs. follow entry. Tactical decisions concern the pricing, branding, timing and channels of the new product or service (Guiltinan, 1999).

This literature research served to build an understanding about innovation and market introduction, two important topics for this research. Figure 3.1 provides an overview of the elements discussed. Additionally, this information helped to define the approach on how to do the competitor analysis and market segmentation.

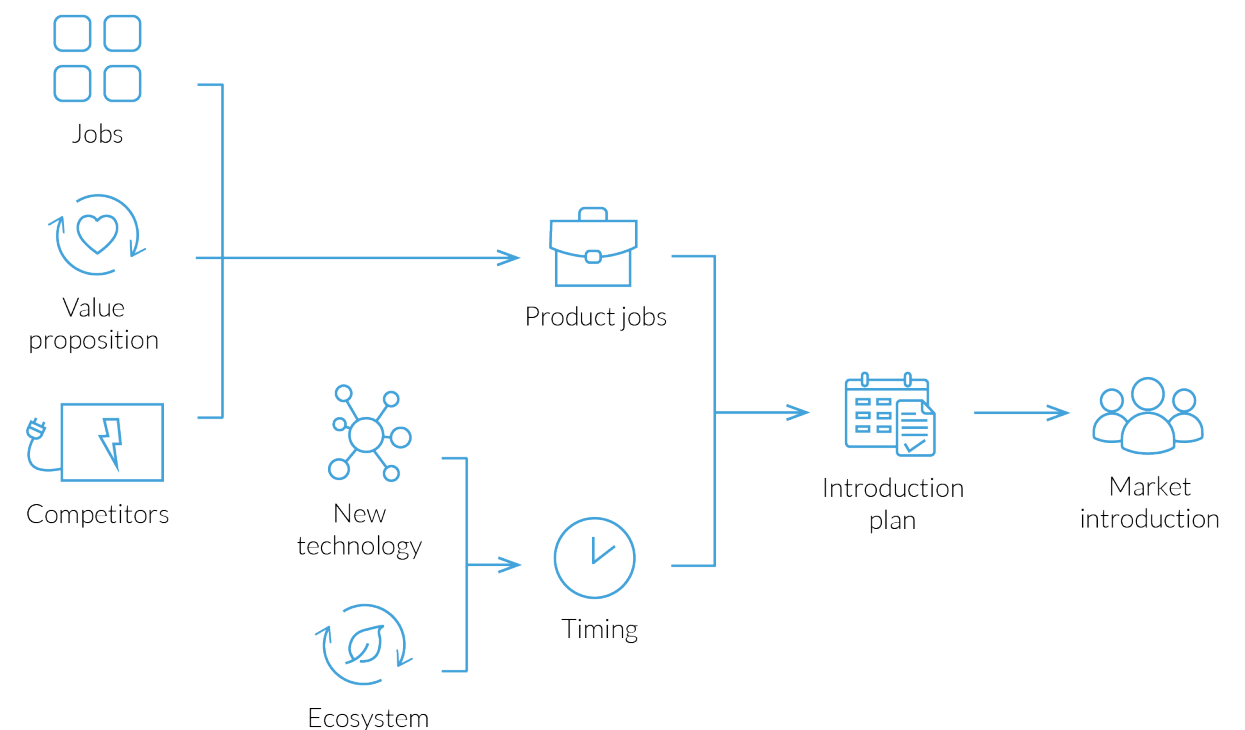


Figure 3.1. Elements for market introduction

## 3.2 COMPETITIVE LANDSCAPE

Dante is defined as 'integrated heater and storage' and therefore competes in two markets; electric heating and energy storage. A former market report by ENGIE and Navigant (2018) indicated the following nine competitors: Sonnen, Tesla, Ikea, LG Chem, Enphase, Viessman, Infrapower, Wellterm and the start-up Lancey. A more extensive competitor analysis is done in order to get a good understanding of both markets. The previously determined competitors are included in this analysis.

### Infrared heating

Dante uses infrared heating. This type of electrical heating is mainly used to make a specific space comfortable instead of managing the overall air temperature. Infrared heating is therefore especially interesting if a building is not connected to gas or if the main heating desires additional heating. In general, infrared is a fast and energy-efficient heating method which does not heat the surrounding air but rather the surrounding mass, like walls, objects and human bodies, see figure 3.2. These objects release warmth to the environment, allowing for a mutual heat transfer and no direct heat lost to air movements (Welltherm, 2017). Infrared heating can be applied in heaters and panels, which can

be stand-alone or installed on the wall or ceiling. Especially the infrared panels are gaining popularity because the sleek design is more aesthetic than the current radiators (Verwarminginfo, n.d.).

### Competitors in the infrared panel market

Ten competitors were identified in the electric heating market based on the European scope and current offerings, see figure 3.3 and Appendix B. Comparing the different companies and their infrared panels, the following conclusions about the current infrared heating market can be drawn:

- There are not much standing infrared panels offered, detached from the wall or ceiling.
- Most manufacturers operate in a big region and sell products via own sales channels and partners.
- Apart from installation (for which extra costs will be charged) and insurance, no services are offered.
- No additional functions are integrated.
- Although the companies have different positionings, the positioning of the company and product is not present in the marketing and communication.
- The price of a 1000 W infrared panel varies a lot among the companies as well as their specific distribution partners.

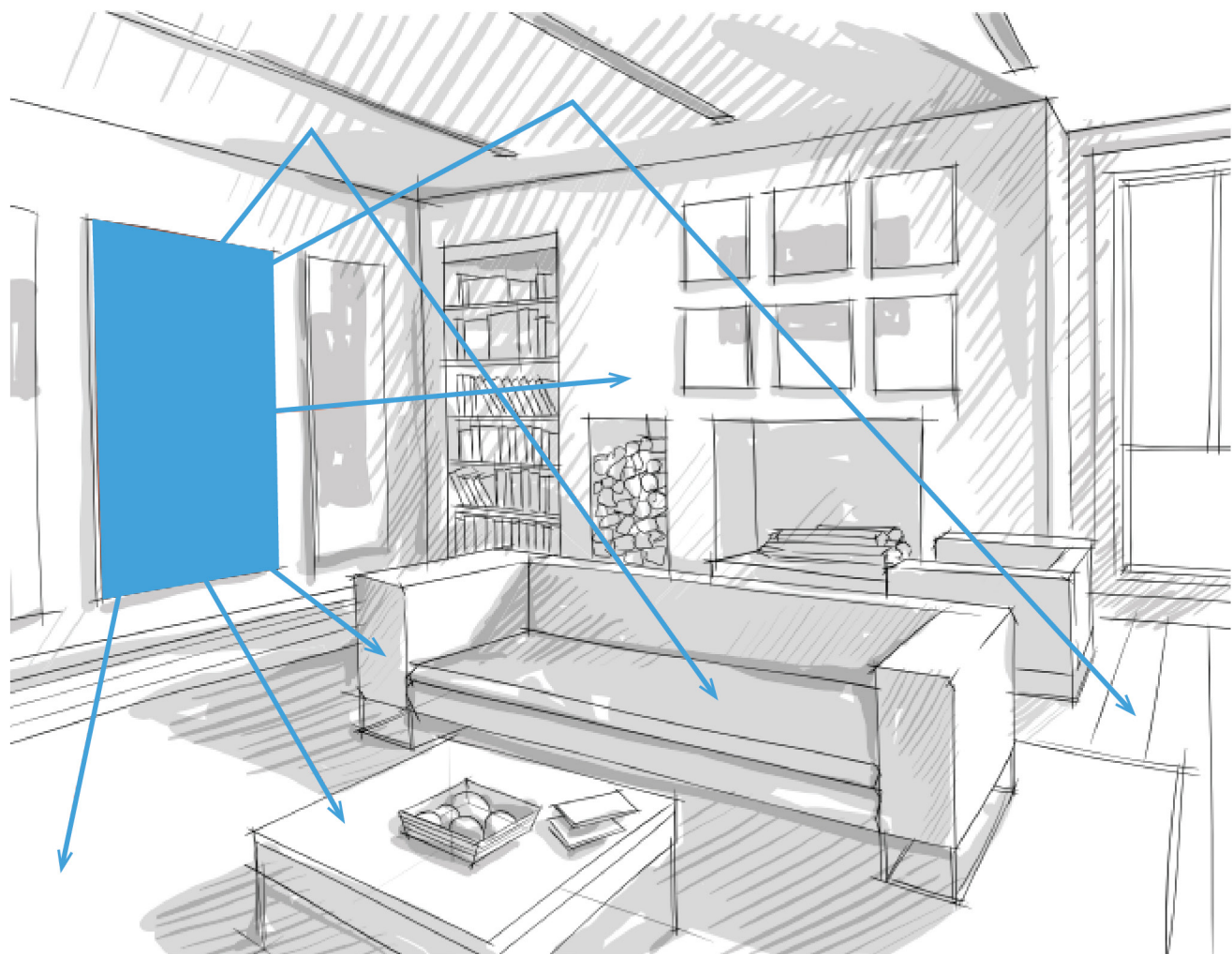


Figure 3.2. Infrared heating

### Energy storage

Dante can function as battery, storing self-generated solar energy or energy obtained from the grid to allow consumers to use this stored energy later on. This is especially interesting considering the fact that sustainable energy is mostly generated when the energy demand is low. As (future) prices of energy might respond to this unequal relation of energy generation and energy demand, efficient storage of excessive energy could be financially attractive for both individual consumers and commercial players.

In the US and Australia, the energy storage market is more developed. Both utility and home energy storage are accepted by the market and there are multiple competing brands and products. The frequent power outages, cost of electricity, government incentives and abundance of sunlight makes energy independence very attractive for both independent power producers and other investors (Energy Information Administration, 2018; Smart Energy Council, 2018). Also the Chinese market is important for the global energy storage policy and market. Although China's battery market is less developed than the markets of the US and Australia, it is likely that the energy storage industry in China will boom (Smart Energy Council, 2018). The country has an ambitious focus on renewables and electric transport.

Within Europe, Germany and the United Kingdom are leading the way in the energy market (ENGIE & Navigant, 2018). In Germany, a low feed-in tariff, financial support from the government (low interest loans, subsidies) and a high amount of solar plants

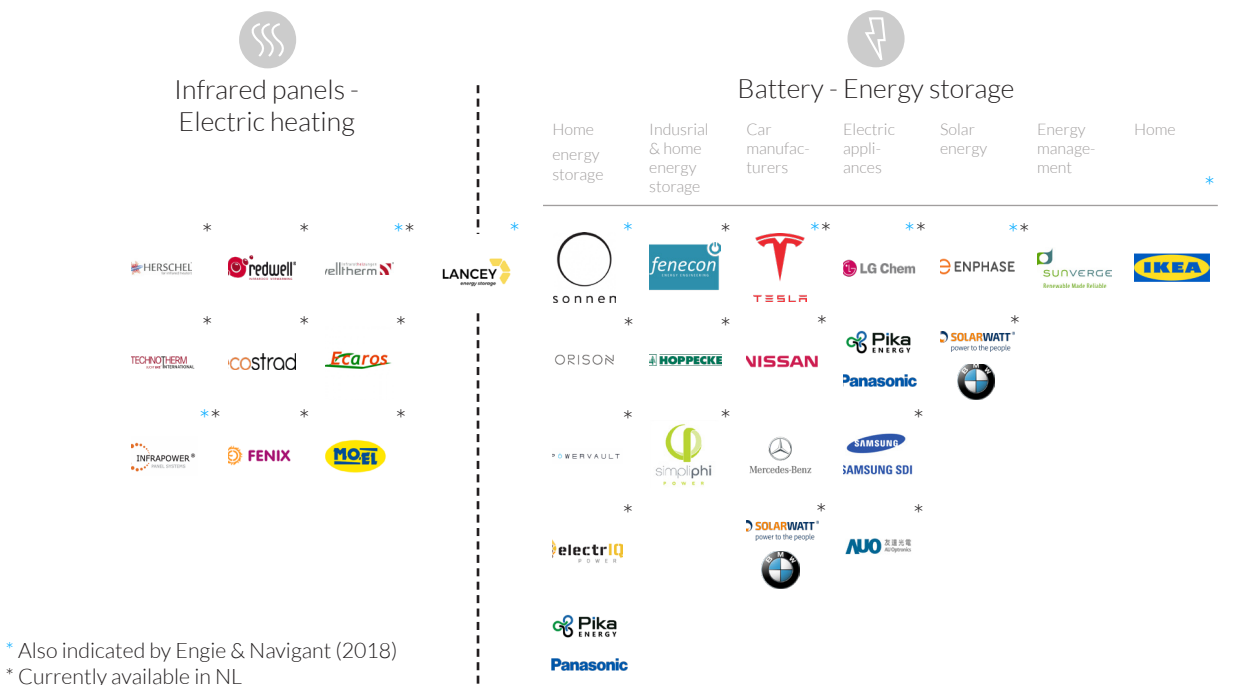
ensures there is a desire for home batteries already today. In the UK, the feed-in tariff is low and energy poverty is considered as an issue. In both countries, the battery is an emerging product adapted by an early market.

Worldwide, it is noticeable that firms with a core business in automotive, electric appliances, solar and home furnishings enter the battery market. This shows the potential and believe in the profit that can be achieved in the growing battery market.

### Competitors in the battery market

Based on the comparison of 19 competitors, see figure 3.3 and Appendix B, the following conclusions about the current battery offerings can be stated:

- Most batteries use lithium-ion or lithium ferro phosphate, which are based on chemicals.
- The capacity generally ranges from 1 till 20 kWh, with the possibility to add up multiple batteries with a low storage size.
- The depth of discharge and round trip efficiency are generally both above 90%.
- Energy storage batteries are heavy and therefore meant to be wall mounted or standing. Only Tesla communicates that their battery can be mounted to the ceiling.
- The warranty standard of batteries is 10 years.
- Products position themselves very technical and rational.
- Extra services often include a platform on which consumers can monitor and adjust energy storage and consumption. This is done by an App.



\* Also indicated by Engie & Navigant (2018)  
\* Currently available in NL

Figure 3.3. Main competitors for Dante in the electric heating and energy storage market



### Price and amount of batteries

Figure 3.4 and 3.5 present 11 main competitors and Dante, exhibited with the ENGIE logo. Figure 3.4 shows the price and amount of batteries needed for a battery system of 9,2 kWh\*, which is sufficient for a day and night rhythm during the winter. The y-axis presents the price of the battery. As the price has a big influence on the payback time and therefore the financial attractiveness of the battery, this is important to consumers. The graph shows that the price, on the basis of a 9,2 kWh battery, does not differ much among competitors. The x-axis, presenting the amount of batteries needed, shows that there is a dichotomy between brands that produce batteries with a large capacity, like Tesla and Sonnen, and brands that offer a modular system based on small capacity batteries, like Enphase, Orison and ENGIE.

### Easy installation and stackable capacity

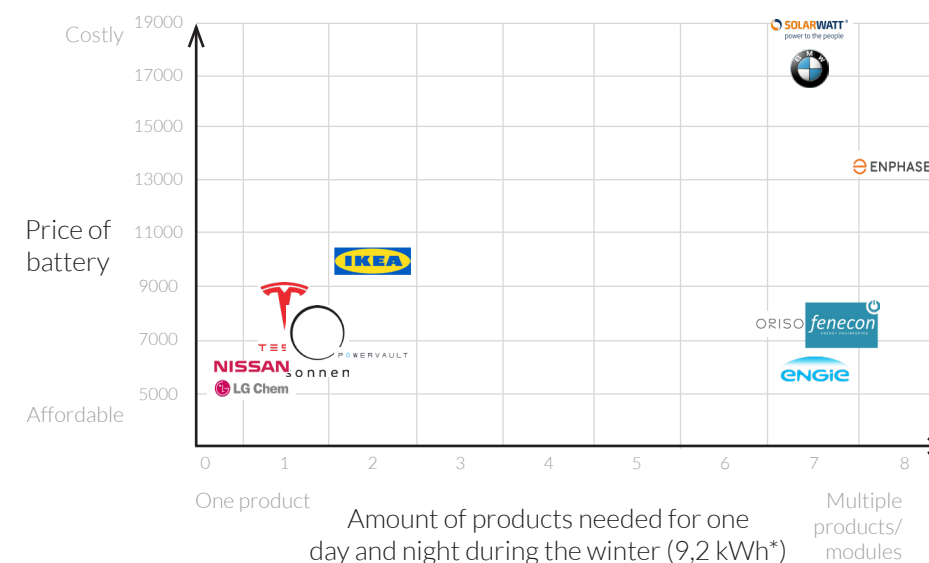
Figure 3.5 provides insight into the user desires of easy installation and stack ability of the battery. The installation of a battery should mostly be done by professional installers and is pricely as well as time consuming. On the basis of installation videos and reviews, the ease of installation is indicated on the y-axis. It is remarkable that Orison, Lancey and Engie (Dante) offer a battery which uses the plug-and-play principle. This battery can be installed by the user itself and does not request any user set up appliances. The x-axis of this graph presents the so called stack ability of battery capacity. Here, it is noticeable that Tesla offers one type of battery with a large storage size (13,5 kWh). Other brands offer a range of batteries, with different capacities, like LG or Nissan, or a modular systems, like Pauwervault, Sonnen and ENGIE. In these modular systems, the capacity can be increased by adding more batteries. Having an expandable capacity of steps of 1 or 2 kWh offers the possibility to connect more accurately to specific wishes of a consumer.

### Main competitors

On a product level, Dante is most similar to the current energy storage products of Lancey and Orison, see figure 3.6. These batteries all look like panels and therefore they are aesthetically very similar. Dante and Lancey offer the same functionalities, namely energy storage and electric heating. Orison combines energy storage with lighting. Also in battery capacity and installation the three products are similar. Dante offers a 1,5 kWh battery and Orison has a capacity of 2,2 kWh. The capacity of Lancey could not be retrieved, but is expected to be about 1 to 2 kWh. Dante, Lancey and Orison can all be installed by the user, having a simple plug-and-play system. Special attention should be paid to Lancey, the start-up and product which also combines energy storage and electric heating. A more detailed description of Lancey as a company and product is provided in Appendix C.

### Business models

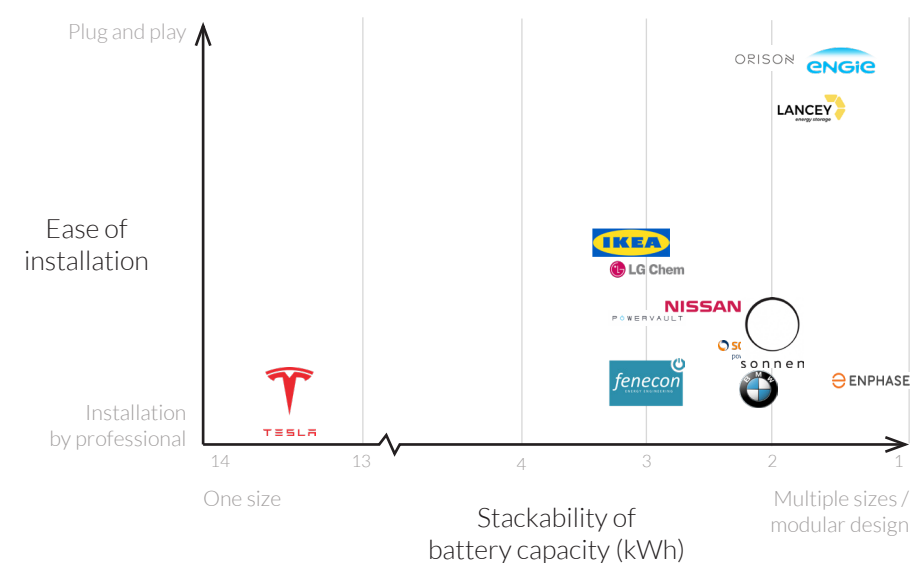
In terms of business, the German company Sonnen en the offer of Eneco including a Tesla Powerwall or LG Chem battery offer a service rather than a single purchase of a battery. In these models, home energy storage to is used to stabilize the public power grid and the provide energy to peers. In Appendix D, the business models of these competitors are elaborated upon.



Firms plotted:

NISSAN 1x 10 kWh € 5600	LG Chem 1x 9.8 kWh € 5200	TESLA 1x 13.5 kWh € 7740
sonnen 1x 10 kWh € 6400	POWERVULT 1x 6 kWh 1x 4 kWh + € 6450	IKEA 1x 3.3 kWh 1x 6.5 kWh + € 8000
ORISON 7x 2.2 kWh € 7440	fenecon 7x 2.2 kWh € 7440	ENGIE 7x 1.5 kWh € 5950
ENPHASE 8x 1.2 kWh € 15200	SOLARWATT 7x 2.2 kWh + € 17500	LANCEY No info € 1000 per piece

Figure 3.4. Plot of competitors on price and amount of products needed



Firms plotted:

NISSAN 2 kWh steps installer	LG Chem 3 kWh steps installer	TESLA 13.5 installer
sonnen 2 kWh steps € 6400	POWERVULT 3 kWh steps installer	IKEA 3.3 & 6.5 installer
ORISON 2.2 kWh plug&play	fenecon 3 kWh steps installer	ENGIE 1.5 plug&play
ENPHASE 1.2 kWh installer	SOLARWATT 2.2 kWh installer	LANCEY No info plug&play

Figure 3.5. Plot of competitors on ease of installation and the stackability of battery capacity

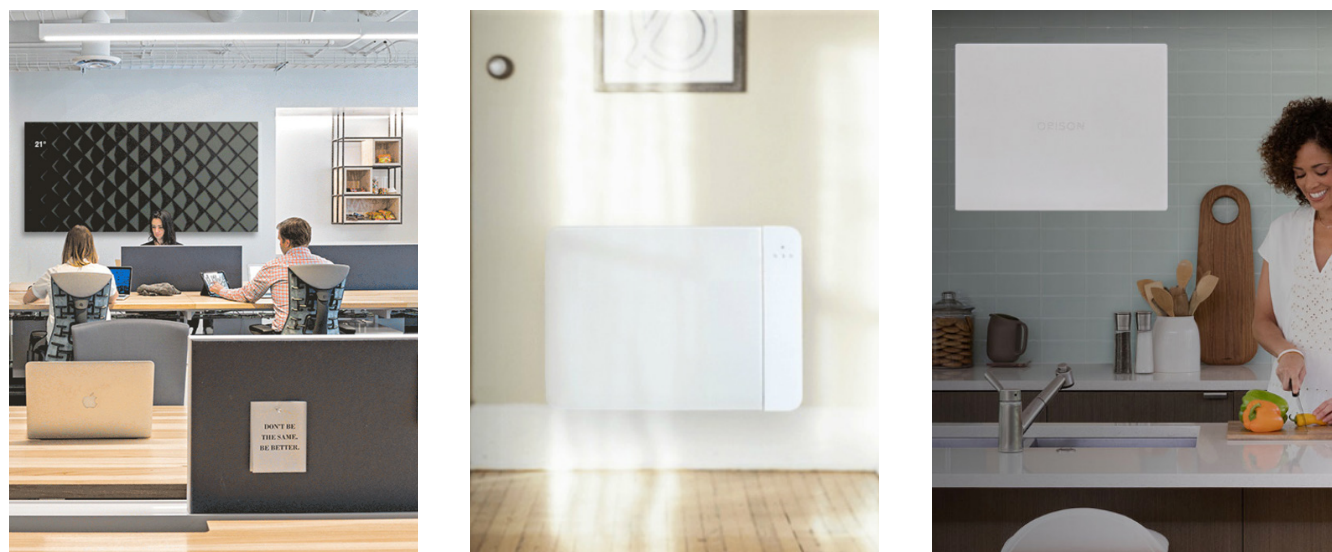


Figure 3.6. Eergy storage competitors: Dante, Lancey and Orison

\* 9, 2 kWh is based on a calculation for a single family home in The Netherlands with 16 solar panels, producing 4000 kWh annually and consuming an average of 3000 kWh annually.

Infrared heating	
<b>Strengths</b> <ul style="list-style-type: none"><li>• Inexpensive purchase</li><li>• Alternative for using gas</li><li>• Easy and quick installation</li><li>• Little maintenance</li><li>• Quick response enables fast heating</li><li>• Additional function: energy storage</li></ul>	<b>Weaknesses</b> <ul style="list-style-type: none"><li>• Contradicting comfort studies and experiences</li><li>• Asymmetry of radiant heat<ul style="list-style-type: none"><li>- Temperature difference when user is inside or outside the radiation beam</li><li>- Temperature difference due to distance (different temperature of head vs. toes)</li></ul></li><li>• No cooling so there is a need for additional air conditioning</li><li>• No hot water maker, so there is a need for an additional boiler</li><li>• Perceived as not energy efficient in terms of usage, which affects the calculation methods (COP/EPC/IEC) and regulations</li><li>• Current regulations (BENG/NOM) require compensation for low COP with solar panels</li><li>• Mismatch of self-generated energy and usage of heating</li></ul>
<b>Opportunities</b> <ul style="list-style-type: none"><li>• Additional heating in existing homes</li><li>• Main heating in new homes with<ul style="list-style-type: none"><li>- Great insulation</li><li>- Great air tightness</li><li>- Self-generation of energy with solar panels</li><li>- Good detailing</li></ul></li><li>• Personal heating in office buildings</li><li>• New regulations</li></ul>	<b>Threats</b> <ul style="list-style-type: none"><li>• Heat pump as alternative<ul style="list-style-type: none"><li>- Awareness among consumers</li><li>- High COP</li><li>- Subsidy</li></ul></li><li>• Calculation methods and regulations</li></ul>

Table 3.1. SWOT of infrared heating in The Netherlands  
Blue statements apply specifically for Dante

Strengths and weaknesses of Dante

Comparing Dante with the current offering of infrared panels and batteries, strengths and weaknesses as well as opportunities and threats of the product can be pinpointed. In this case, the so called SWOT analysis is not used to evaluate the internal and external company aspects, but rather to identify and analyze the elements related to the current offering and market of infrared heating and energy storage. These SWOT analyses are presented in table 3.1 and 3.2. The analysis gives an overview of the factors that are supportive or unfavourable for the introduction of Dante and can help to define strategic planning of Dante.

Infrared heating

In terms of infrared heating, no unique selling points for Dante can be stated. The functions and appearance of Dante is very similar compared to the current infrared panels which are offered at the moment. However, the combination with energy storage makes the product interesting and distinctive.

Energy storage

In terms of energy storage, the capacity of Dante is relatively low. Although the batteries can be stacked, increasing the capacity of a single Dante panel is desired. Three advantages of Dante compared to other batteries are (1) the natural non-chemical and non-toxic production of Dante, (2) the quick and inexpensive plug-and-play installation and (3) the combination with heating, which provides an additional function.

Overall, the strength of Dante would thus be the combination of the two functions and the compatibility in both markets. The weakness is expected to be the communication and integration of the two functions towards the consumers.

Particular strengths, weaknesses, opportunities and threats can be particularly interesting or applicable for a certain target group. The next chapter looks into different market segments and the defines the possibilities for Dante in three specific segments.

Energy storage	
<b>Strengths</b> <ul style="list-style-type: none"><li>• Covers mismatch between own energy generation and consumption</li><li>• Helps consumers to get most out of self-produced electricity</li><li>• Perceived as a cool gadget</li><li>• Non-chemical and non-toxic material and production method</li><li>• Plug-and-play installation</li><li>• Additional function: infrared heating</li></ul>	<b>Weaknesses</b> <ul style="list-style-type: none"><li>• Expensive purchase</li><li>• Financially unattractive due to the current netting arrangement</li><li>• Installation costs and efforts</li><li>• Placement in home<ul style="list-style-type: none"><li>- Weight</li><li>- Space</li><li>- Appearance</li></ul></li></ul>
<b>Opportunities</b> <ul style="list-style-type: none"><li>• Changing regulations of netting arrangement</li><li>• Future subsidy</li><li>• Autonomy of consumers and independence of the utility company</li><li>• Lower carbon footprint of home electricity usage</li><li>• Lower the demand on power plants</li><li>• Application of flexible energy tariffs with peak demand charges</li><li>• Participation in a Virtual Power Plant</li></ul>	<b>Threats</b> <ul style="list-style-type: none"><li>• Electrical vehicles which serve as energy storage</li><li>• Big scale energy storage solutions as neighborhood batteries</li></ul>

Table 3.2. SWOT of private enegry storage in The Netherlands  
Blue statements apply specifically for Dante



This chapter includes an overview of the different market segments that provide a possibility for the introduction of Dante. Based on qualitative research, a brief description of the segments is presented and current as well as future trends are discussed. Introduction strategies for each segment are defined and one of the strategies is chosen for further elaboration for the introduction of Dante.

#### Three market segments

Possible market segments for the introduction of Dante were defined by a creative brainstorm and by examining the former market potential research of ENGIE and Navigant (2018) as well as the current market segments in which competitors operate.

#### The exploration of possible market segments

A first launch of Dante is expected to have a higher success rate in living and working situations. In these situations, the value offered to end-consumers is more meaningful and these situations better fit the current product. Next to this, the opportunity to build an ENGIE Virtual Power Plant, consisting of different individual Dante products, is more likely with a larger consumer base, built up in segments focusing on living and working situations.

The former report by consultancy Navigant (ENGIE & Navigant, 2018) formulated three product-market-combinations, namely:

- **Green and smart comfort in homes of elderly**

This product-market-combination is very interesting for the introduction of Dante. However, the former market potential research (ENGIE & Navigant, 2018) does not state why the green and smart comfort should especially focus on elderly. Therefore, the scope of this segment is enlarged and the private consumer market is stated as a segment for further research.

- **Community storage in new apartment buildings**

The market segment of new apartment buildings is considered as interesting but rather difficult. New apartment buildings have a great insulation and have underfloor heating installed at every

floor. This makes the demand for (additional) heat very small. Therefore, the heating function of Dante is less valuable. The battery function will only be valuable in the future, when electricity prices will fluctuate or when facades can also generate energy. At this moment, the self-generation of energy of apartment buildings is small and therefore energy storage is not yet attractive. This product-market combination is thus not interesting at this moment. For the introduction of Dante, the segment representing community storage in new apartment buildings is thus rejected. However, this segment will be taken into account for the introduction roadmap of Dante and the recommendations for further development of the product.

- **Smart comfort in new office buildings and hospitals**

This product-market-combination is recognized to be promising and is also determined as one of the segments to focus on. As, in The Netherlands, not many new offices and hospitals are being built, the research will also look into existing offices and hospitals. Furthermore, also other utility buildings like schools and public buildings, might be interesting.

Additionally, the main competitor Lancey, which offers an electric heater and energy storage solution, specifically focuses on the renovation of social housing, see Appendix C. As this product is very similar and finds itself in the is in the commercialization phase in the France market, the segment of social housing is chosen for further research. Hereby, not only renovation but also the new construction social housing is considered.

To conclude, three market segments are determined as promising for the first commercialization of Dante: private housing, social housing and utility buildings, see figure 3.7.

#### Private housing

Private housing is the consumer market in which consumers own their house or have a mortgage on their home. Both for renovation and new construction homes, Dante could be interesting. A particular, smaller target group within this segment is the elderly homeowners. As ENGIE and Navigant (2018) defined these consumers as a suitable target group, special attention is paid to these consumers.

#### Social housing

Social housing is the market in which homes are rented to social tenants, with a relatively low income. For this segment, research looks into the possibilities for both renovation and new construction homes. As the application of Dante in apartment buildings is not attractive on the short term, focus is placed on so called land bound social housing.

#### Utility buildings

Utility buildings are big buildings like offices, hospitals and schools. These buildings can have different private or public functions and are usually occupied during the day. The exploration of possibilities for Dante in this segment focuses on both the renovation and new construction buildings.



Private housing



Social housing



Utility buildings

Figure 3.7. The three market segments for further exploration



#### DE WILLEM EN DE ZWIJGER

De Willem en De Zwijger are the first energy neutral (NOM) apartment buildings in The Netherlands. They were built in July 2018 in Best. The apartment building has 48 social housing apartments, a common space and an elevator. The buildings both consists of five floors and were developed by NBArchitecten, BAM and housing association 't Huis. The buildings are all-electric and can be energy neutral as the facade is made up out of solar panels. These buildings are state-of-the-art and provide a glimpse into the future of sustainable construction. But of course, this comes at a high price, in fact the costs were 5.700.000 euro (BAM, 2018).

**Determining the best market segment for introduction**

To define which segment offers the best opportunity for the introduction of Dante, a closer look was taken into the three defined market segments. In order to gain in-depth knowledge about the specific segments, a qualitative research was carried out with experts. These experts were selected based on their specific knowledge and background in one of the segments.

**Research goals**

The research aimed to identify the opportunities in the three market segments and to explore the current and future trends within these segments. The following research question was set up to gain an understanding of the different market segments and to explore the best opportunity to introduce Dante:

What are the possibilities for the introduction of Dante in the different market segments?

To eventually determine:

Which market segment offers the best opportunity for the introduction of Dante?

**Research procedure**

A total of nine experts were interviewed about current and future situations regarding heating, energy consumption and energy storage. The experts provided insight into the orientation behaviour and decision process of a specific target group. Additionally, first reactions to the Dante product were examined. For a more elaborate description of the expert interviews and the data analysis procedure, see Appendix E and F.

**Data analysis**

Based on the audio recordings of the expert interviews, statement cards were created. A cross-interview analysis was done to create insights and to structure (dis)similarities. Per segment, statements were clustered and themes were defined based on heating, energy storage and the Dante product itself. The data analysis procedure is visualized in figure 3.8. The main insights and introduction strategies per market segment are described later in this chapter. The insights per segment are also presented on different posters, which are delivered to ENGIE.

**Findings**

The research provided an understanding of the three market segments: private housing, social housing and utility buildings. The main findings per segment are all described in the following pages of this chapter. Comparisons between the three market segments were made. Opportunities and disadvantages were identified and summarized to choose one segment and one introduction strategy for further research and development.

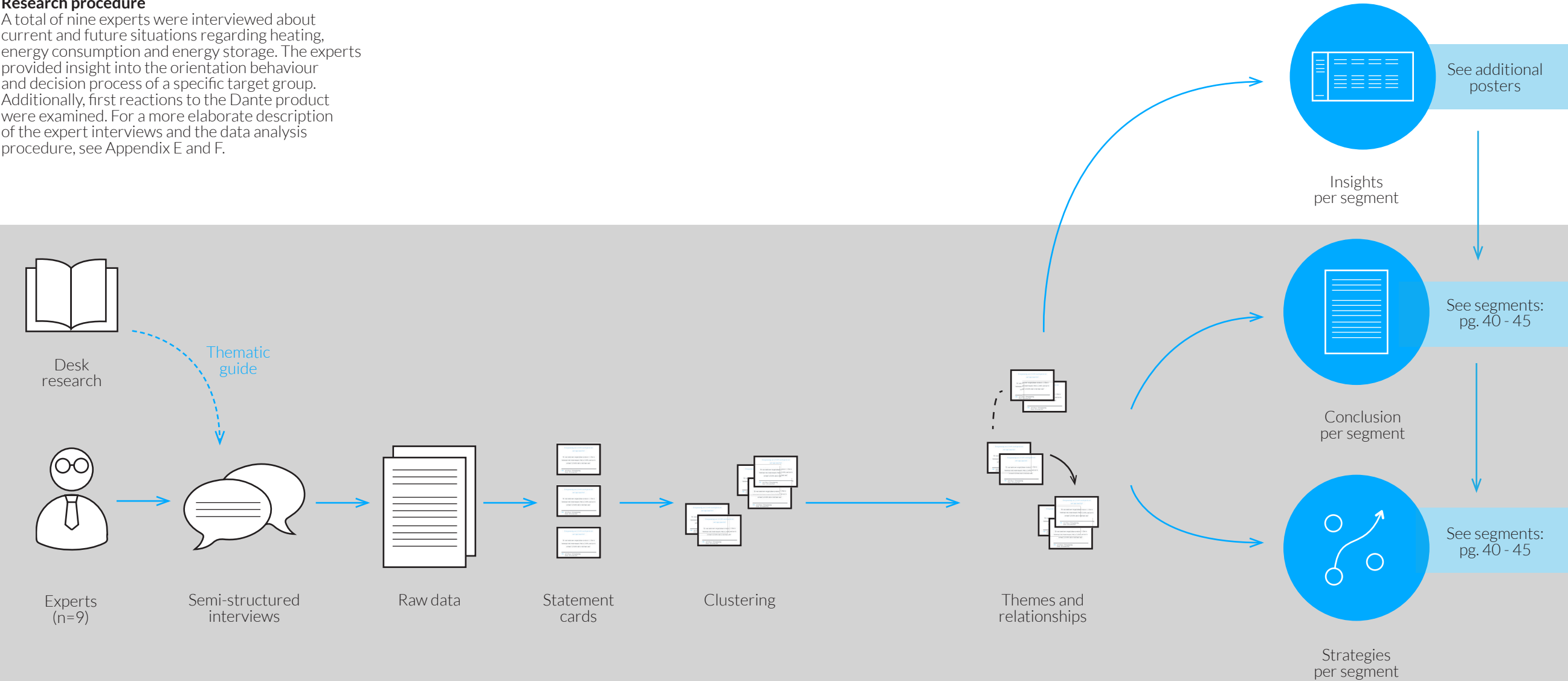


Figure 3.8. Research approach and data analysis procedure



### 3.3.1 PRIVATE HOUSING

The term private housing describes the direct consumer market. These consumers are either homeowners or tenants in the private sector, meaning that their income is average or above average. Within the private housing market, consumers will pay for Dante and the additional service themselves. The consumers thus have the power to make their own decisions.

Dante can respond to the need of consumers to make their home more sustainable and comfortable. This could be done for existing as well as new construction homes. In both cases, it is important to provide consumers with reference cases as the functioning of infrared heating is currently unknown. Both the infrared heating and the energy storage functions require a communication strategy which makes advantages tangible and personal. Within the decision making process for a heating system at home, price, mainly indicated by the purchase price and payback time, plays an important role. This is beneficial for Dante as the purchase price is low considered to other heating systems, as well as disadvantageous as a battery is not yet financially attractive in The Netherlands. In terms of usage, the infrared heating connects to the current user experience of high temperature heating systems: once turned on, the warmth will quickly be released. At the other hand, consumers will have to change their behavior or connect the infrared panels to a thermostat in order to prevent a high energy bill as a result of the panel being switched on while this is not necessary.

#### Regulations

The private housing market is forced to become more sustainable and to be free of gas by 2050 (Ministerie

van Economische Zaken, 2016). Therefore, homeowners of existing homes have a great job to do. Also the new building requirements are stricter, which can either present an opportunity or threat for the future application of Dante in homes. Appendix G explains the current regulations and the expected changes which influence the attractiveness of Dante.

#### Possibilities within the private housing market

There are two suitable opportunities for the introduction of Dante in the private housing market. Like with other consumer goods, it is logical to focus on early adopters (Rogers, 1976; Beard & Easingwood, 1996). Early adopters are typically young and highly educated. They have a relatively high income and recognize the risk of new innovations (Shelly, 2014). The early adopters of Dante are expected to be similar to the adopters of solar panels. The age of these early adopters is usually higher due to the necessary homeownership and financial investment (Shelly, 2014). The first strategy is thus to focus on pioneering homeowners, which have the financial means, decision making power and motivation to apply Dante themselves. The second strategy focuses on applying Dante on the upper floor of new construction homes. Responding to current building standards and the behavior of consumers to rarely use heating upstairs, this application could present an attractive heating system and additional energy storage for comfortable and sustainable living.

Underneath the two strategies are shortly described. In Appendix H, a more detailed explanation and the value proposition of the strategies are presented.

**“When the netting arrangement still stands, or a good return subsidy is in place, the battery is financially not attractive. Energy storage is still a party for the ones who like it.”**

**- Sustainability innovation in construction expert**



#### Pioneering homeowners

In the short term, Dante could be offered to pioneering consumers to optimize their energy consumption from own energy generation and to experiment with new technologies and innovations. At this moment, a battery is not financially attractive for private households. However, pioneering consumers are willing to invest in this new sustainable measure if it can help them to optimize the energy consumption from their own energy generation and can be a cool gadget. These needs can have different sources, like independence, curiosity, the aim and perception of being an early adopter. To apply Dante in private homes, the homeowners should be targeted directly.



#### Upper floor of new construction

In new construction homes, Dante can be installed in the right place with a beautiful finishing. This ensures the aesthetics of the panel to fit the interior or to even be invisible and go unnoticed. The Dante panels will be installed on the upper floor(s) as new construction homes are insulated well and often install underfloor heating on the ground floor. As a result, the heat demand is low and usually additional heating is rarely needed at specific rooms at the upper floor. Dante, which can also function as an energy storage, can thus deliver extra value. To install Dante at the top floor, it is best to target constructors and installers, as those are usually in charge of choosing the heating system of new construction homes.





**“Tenants understand the changes of sustainable measures and are willing to cooperate if there are guaranteed returns. (..) The financial motive is the most important for our tenants.”**

**- Project developer of social housing**



Social housing indicates the inexpensive rental of homes for people that do not have access to the financial resources needed to rent or buy a house in the free sector. Usually, social rental properties are owned by housing corporations. To be eligible for social housing, people must meet certain conditions. These conditions, posed by the housing corporation, often include a minimum or maximum income and family size.

There are different (social) housing corporations in The Netherlands, with different goals and values. Commonly, all social housing corporations provide homes to people with a low income. This means that the affordability of living is an important aim for most social housing corporations. If Dante can provide a solution that makes living comfortable and affordable, both the tenant and the social housing corporation will be satisfied. When it comes to installations, social housing corporations have a complicated decision making process. Sometimes, the social housing corporation can decide on the exact installations. Otherwise, it sets performance standards. In the latter case, the constructors and installers can decide on the installation. When introducing Dante in the social housing market, corporations, contractors as well as installers should thus be targeted. The tenants should learn how to use Dante correctly, switching it on and off according to their heat demand. Additionally, as social tenants might have another lifestyle than the average tenant, Dante should be hufferproof and in need of little service.

**Regulations**  
In general, Dante can respond to the need to make both new and existing homes sustainable. This is increasingly important for housing corporations as

the imposed sustainability requirements for homes are becoming stricter. For example, all new homes must be energy-neutral (BENG) from 2020 on, and all the existing property must be gas-free by 2050 (Ministerie van Economische Zaken, 2016; RVO, 2018-a; RVO 2018-b), also see Appendix G. Housing corporations so take action when it comes to decreasing the energy consumption, increasing the self-generation of energy and installing heating systems free of gas, as this is imposed by regulations.

**Possibilities within the social housing market**  
It can be stated that there are opportunities for Dante in the social housing market. However, before applying a new product, social housing corporations as well as their contractors and installers, want real-life proof of the product. The lack of knowledge and contradicting experiences with infrared heating therefore negatively impact the current demand for Dante. This forms a big barrier for the introduction of Dante in the social housing segment and therefore the two strategies developed for this introduction focus on overcoming this barrier. The first strategy suggests to collaborate with an innovative social housing corporation to share the risks of applying a new product. The second strategy proposes to introduce Dante in another market segment and build example cases to show market proof to the social housing corporations.

Two strategies can be rolled out to successfully introduce Dante as a sustainable measure which provides affordability for tenants. Underneath the two strategies are briefly described. In Appendix H, a more detailed explanation and the value proposition of the strategies are presented.



**Innovative social housing corporation**

By collaborating with a social housing corporation that is not afraid to install a new product, Dante could be applied in new construction or renovation homes as soon as possible. In that case, ENGIE can lower the risk for the corporations by taking responsibility for the functioning of Dante. Especially if there is a lease or maintenance construction, this could be profitable for both parties. The corporation will benefit from an innovative yet lower risk sustainable measure and ENGIE has the opportunity to form long-term and profitable contracts.



**Building market evidence**

To reach the majority of the social housing corporations, contractors and installers desire experience and proof of the infrared panels. It is therefore key to build this experience and proof within another market segment. The strategy for the introduction of Dante can thus focus on other target groups at first, after which the social housing market could be targeted later on with a more convincing and well-founded market introduction. Hereby, it is important to show the similarities and differences of applying Dante in homes for social tenants compared to the application in the other segment.

Next to building evidence in other markets, proof can also be obtained by collaborating with an innovative social housing corporation, see the strategy named 'innovative social housing corporation'. This first application can serve as an example for later projects.



# 3.3.3 Utility Buildings

Utility is an umbrella term including various types of buildings. Utility buildings are used for non-residential purposes and can have the following functions:

- Office
- Education: Schools and universities
- Healthcare: Hospitals and care institutions
- Hospitality: Hotels and restaurants
- Sports: Sport halls, stadiums and swimming pools
- Retail: Supermarkets, department stores and shops

As every utility building is different, based on the building properties and its functionality, Dante could offer a distinctive solution to different buildings with a different function. Choosing a new heating system or energy storage solution for a specific utility building is dependent on among other the insulation, the existing installation and the surroundings. Therefore, Dante should be offered for utility as one of the possibilities, which together can be composed as the perfect solution for a specific, complex building. A big advantage of Dante compared to other heating or energy storage systems for large, complex buildings is the quick and easy installation. This is preferred in utility buildings as it ensures a minimal loss of functionalities and can thus save a lot of nuisance and loss of activity. Accordingly, Dante might also have potential as a temporary solution. A disadvantage of Dante in the utility segment is the fact that there is less of a mismatch between energy generation and energy consumption, as utility mainly consumes energy during the day. Direct usage of generated energy is thus relatively high, making the business case for energy storage less attractive (Korpershoek, 2018). Additionally, utility buildings are often high rises, with limited possibilities for renewable energy generation due to limited roof

space and the presence of installations like ventilation pipes. Regarding heating, utility buildings can often use a relatively large, expensive and complex techniques as cost of usage is more important than the investment costs.

## Regulations

In the near future, the introduction of Dante has more potential in existing office buildings as regulations demand them to comply with energy label C in 2023 (Rijksdienst voor Ondernemend Nederland, 2018). The other utility buildings are not forced to do so. Therefore there is a major sustainability task for the 44% of office buildings that currently do not perform well enough (Eerenbeemt, 2018). Dante could thus be a part of an integrated solution, together with for instance insulation and a low-temperature heating system for making the offices more sustainable.

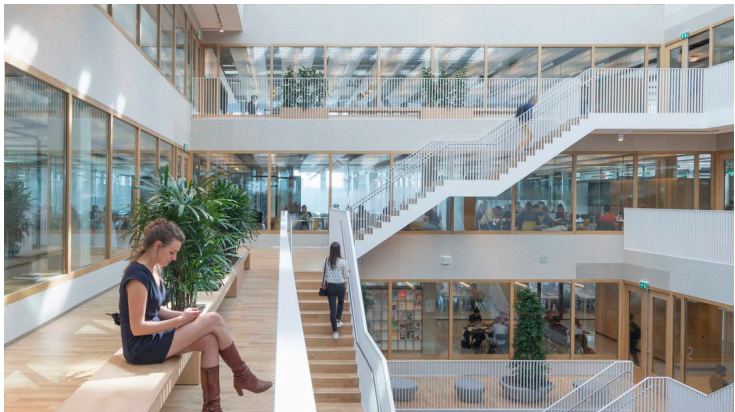
## Possibilities within the utility market

The best opportunity for Dante in the utility market is to respond to the need for personal comfort. A comfortable workplace stimulates productivity and well-being and personal heating can thus contribute to employee performance. Additionally, personal heating can ensure a reduction of overall energy needed for heating, although this needs validation for each building. An introduction strategy could thus focus on offering Dante to office owners and tenants or on offering Dante as a part of an integrated in complete workplaces.

Two strategies can be rolled out to successfully apply Dante in offices. These strategies are shortly described underneath. In Appendix H, a more detailed explanation and the value proposition of the strategies are presented.

***“I can imagine this meeting room can be more pleasant. If you walk in and have a seat, we move a little and Dante turns on to make it extra warm.”***

***- Employee in office building***



## Personal comfort in offices

ENGIE could offer Dante directly to contractors, office owners or office tenants. Dante should be positioned as an additional heater providing personal comfort to employees. This is especially interesting for new built offices as the Dante panels can be built in to the building, ensuring a nice finishing. However, for a short term introduction there is more potential in existing office buildings as regulations demand them to comply with energy label C in 2023.



## Part of a complete workplace

ENGIE could collaborate with firms that offer complete workplaces for in buildings. Doing this, Dante could be a part of an integrated solution offering personal, comfortable workplaces. The integrated solution can be based on a desk with additional features which enable users to set lighting, temperature and ergonomic settings of the workspace. A suitable company to collaborate with is Ahrend. Ahrend is a Dutch, international company offering contemporary, sustainable office interiors. A partnership with Ahrend can be interesting as they could apply Dante in their (future) workspace designs and as the company is an established brand within the office furniture market.



3.3.4 CHOICE OF SEGMENT FOR INTRODUCTION

The defined segments, both in the B2B and in the B2C market, offer good possibilities for the commercialization of Dante. In all segments, it is clear that early adopters already think of future solutions as energy storage and electric heating. However, the most suitable market segment for the introduction of Dante is considered to be the private housing segment. This chapter briefly explains for what reasons private housing is chosen for the introduction of Dante.

Launch in the private housing market

Table 3.3 presents an overview of the main criteria for the choice of the segment for the market introduction. These criteria were discussed with the experts and served as a method to compare the different segments. Eventually, there are three main reasons to go for the private housing segment.

First, the private housing segment acts most innovative and daring. It is the consumer market where products are adopted and proven before acceptance by the majority (Rogers, 2010). At the moment, a group of sustainable pioneers is already willing to invest in these kind of sustainable measures (Thijssen et al., 2018) and therefore there is already a small market demand. Targeting consumers gives ENGIE the opportunity to gain experience and improve the product. Therefore, Dante could be

further developed and become mature, before collaborating with big partners as contractors, installers, (social) housing corporations and utility owners. The later introduction of a proven, improved product in the other markets will decrease the risk of failing big deals and collaborations. Second, starting in the private housing market and growing into other markets, is easier than the other way around. Especially for the social housing market, the product could be simplified and the cost price can become competitive in the long term. Last, the barriers for introducing the product in the private housing market are smaller compared to the other segments. The application of Dante is less specific in homes compared to utility buildings and communication and placement of the panels is thus easier. Also, consumers have the power to make decisions themselves, so there is no hassle of targeting different stakeholders involved in the decision making process.

“Preferably, you don’t target installers, they won’t adopt a new product. The market should be targeted directly. (...) Installers just want to sell gas kettles. They are super traditional.”

“It is always picked up by private individuals. And only later, if the product has proven itself in the market, you will see that corporations introduce it as well.”




	 Private housing	 Social housing	 Utility buildings
Time to market	Medium, as it is difficult to reach the market with a new product and ENGIE is small in the B2C market.	Long as housing corporations desire a proven product and have multiple decision-makers.	Medium, as it is a very new product in this market. Multiple decision-makers and stakeholders.
Time to usage	Short for existing homes. Medium for new construction homes as they need to be built.	Medium for existing homes, a sit is an easy and quick alternative. Long for new built home.	Medium for existing utility buildings as it is simple to install. Long for new buildings.
Market acceptance	Medium as consumers need to recognize the new product features and benefits (Guiltinan, 1999)	Medium as the tenants have to change their behaviour to reduce the energy consumption.	Medium for existing utility buildings, as ENGIE is an established B2B player. Long for new buildings.
Investment opportunities	Little investment power, but therefore competing as affordable heating. Sell small numbers at once.	Big investment power and often possibilities for future scale-up. Sell big numbers at once.	Big investment power, depending on the type of utility building. Sell big numbers at once.
Growth potential	Easy to introduce in both other segments and abroad.	Easy to introduce abroad. Hard to migrate to more high-end segments.	Easy to introduce abroad. Prove or reference cases needed to migrate to housing markets.

Table 3.3. Criteria for comparing the potential for the introduction of Dante in different market segments

CONCLUSION

Competitive landscape

Infrared heating is a fast and energy-efficient heating method which does not heat the surrounding air, but rather the surrounding mass, like objects and human bodies. Recently, the infrared panels increase in popularity because of the sleek design. Infrared panels currently offer one function, namely heating. Theferore, Dante can be easily differentiated in this market by providing heating as well as energy storage.

Energy storage is expected to be the next big thing in the energy transition, as it provides the solution for the mismatch of renewable energy generation and demand. In countries like the US, Australia, the UK and Germany, the energy storage market is more developed and there are multiple competing brands and products. The capacity of home batteries range from 1 till 20 kWh with the possibility to stack kWh. The home batteries often include a system to monitor the energy generation, storage and consumption. On a product level, Dante is most similar to the energy storage products of Lancey and Orison. Both of these competitors differentiate themselves by providing energy storage and an additional function. Next to the energy storage, Lancey offers electric heating and Orison offers lighting.

Market segments

Three market segments are determined as promising for the commercialization of Dante. The importance of these segments is indicated by the former market potential research of ENGIE and Navigant (2018) and the competitive field. Insight into the specific segments was obtained by conducting expert interviews. The three promising segments are:

1) Private housing

Private housing is the consumer market in which consumers own their house or have a mortgage on their home. Both for renovation and new construction homes, Dante could be interesting. Two strategies are formulated for the private housing market:

- Offering Dante to pioneering consumers to optimize their energy consumption from own energy generation.
- Installing Dante in new construction houses in rooms on the upper floor.

2) Social housing

Social housing is the market in which homes are rented to social tenants, with a relatively low income. For this segment, the affordability for the tenant is key. Two strategies are formulated for the social housing market:

- Entering a partnership with an innovative social housing corporation to apply Dante right away.
- Offering Dante to contractors and social housing corporations after providing market evidence in another market segment.

3) Utility buildings

Utility buildings are big buildings like offices, hospitals and schools. These buildings mostly have a big, central heating system. Dante will thus be valuable as additional, sustainable heating and energy storage. Two strategies are formulated for the utility buildings market:

- Offering Dante to contractors and office owners to provide personal comfort.
- Entering partnerships to offer complete workplaces.

Segment for introduction

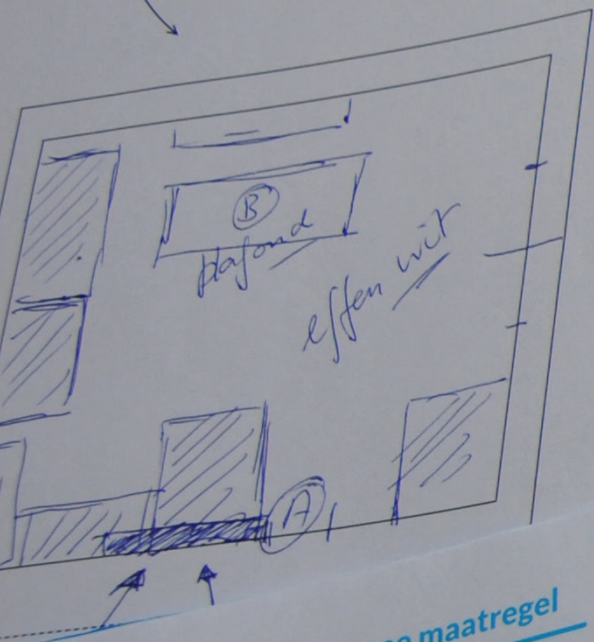
The product launch of Dante should be focused on the private housing segment, and especially the pioneering consumers. These consumers act most innovative and are the first to adopt a new product. Focusing on pioneering consumers is best for short-term introduction of the product and can help to build example cases to later move into the social housing and utility buildings segment.



## Infrarood verwarming en batterij

- Stap 1:**  
Stelt u zich voor dat u gratis een paneel krijgt wat functioneert als infrarood verwarming en batterij.
- Waar zou u dit paneel dan ophangen in huis?
  - In welke ruimte?
  - Aan welke muur of aan het plafond?
  - Waarom kiest u voor deze plek?
  - Waar ligt uw voorkeur, de verwarming of de batterij?

Teken in de polaroid hieronder hoe deze ruimte eruit ziet en waar u het paneel zou ophangen.



## Stap 3: Zo kies ik een duurzame maatregel

U wordt geholpen door mensen die u bij het kiezen van de maatregel voor uw huis helpen.

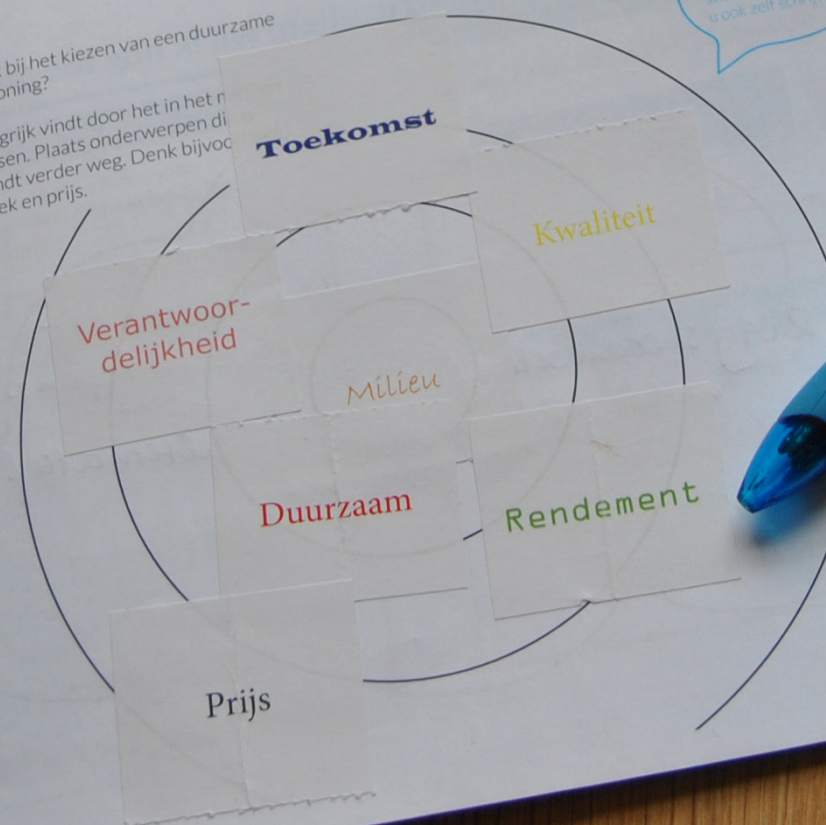
De stickers aan wie er bij hun rol is.

Installateur

Essent

Wat vindt u belangrijk bij het kiezen van een duurzame maatregel voor uw woning?

Geef aan wat u belangrijk vindt door het in het midden van de cirkel te plaatsen. Plaats onderwerpen die u minder belangrijk vindt verder weg. Denk bijvoorbeeld aan comfort, esthetiek en prijs.



Hybride systeem voor verwarming en warm water  
Accu-pakket voor opslaan van zonne-energie  
Ventilatie-warmte-terugnysysteem  
Composthoop  
Regenton

## 4 FOCUS

- In this chapter
- 3.1 Acceptance of new sustainable products
  - 3.2 Pioneering homeowners
  - 3.3 Profiles of pioneering homeowners
  - 3.4 Conclusion

Building on the decision to introduce Dante among pioneering homeowners, this chapter focuses on building a deeper understanding about this specific market segment. It does so by looking into the literature and presenting the results of a context mapping study. Based on the findings, four profiles for pioneering homeowners are developed. These profiles can be used for the development of Dante itself as well as its introduction.



This chapter provides a brief overview of the current findings on acceptance and adoption of sustainable products among consumers. This ensures a basic understanding, supporting the research into the introduction of Dante among pioneering homeowners.

**Adoption model: Diffusion of innovation**

One of the most popular adoption models is Roger's theory 'Diffusion of innovations'. This theory describes how five different groups adopt and accept a new innovation, technology or product (Rogers, 1995; Rogers, 1976), see figure 4.1. The groups differ in some key characteristics (Noppers et al, 2015; Rogers, 1976). The first consumers to adopt a new product are the innovators. They are risk takers which are well informed about the developments of the product category. Second, the early adopters envision benefits of the new product and adopt it to gain admiration. Third, the early majority has to be convinced of the advantages to adopt the new innovation and the late majority is skeptical and adopts the innovation when it has been on the market for quite some time. Finally, the laggards are risk-averse and avoid change. They are the last consumers to adopt a new product.

**Functions of Dante on the adoption curve**

For both the infrared heating and energy storage, one could say that the innovation in The UK and Germany is currently in a stage of adoption among innovators and early adopters (ENGIE & Navigant, 2018), see figure 4.1. This means that it is an emerging market and that the early majority will soon pick up

the innovations, providing opportunities for both functions of Dante. The early majority is however hard to convince. Starting small and simple will help to stimulate the adoption (Rogers, 1995). Simplicity of the product, allowing the consumers to understand it easily is therefore key in this phase. In The Netherlands, both markets are less developed as in the UK and Germany, and are in the innovators phase. This means that risk-taking and well-informed consumers start to invest in the products (Noppers et al., 2015).

**Adoption of sustainable innovations by early and later adopters**

Most sustainable innovations will realize their full potential only if they are adopted by a majority consumers (Noppers et al., 2015). The adoption of the innovation among early adopters is crucial for the initial uptake and further development of a new sustainable product. Therefore, special attention should be paid to the acceptance and adoption among innovators and early adopters. Noppers et al. (2015) state that three types of attributes influence the adoption of sustainable innovations: instrumental, environmental and symbolic attributes. Instrumental attributes concern functionalities and results of the ownership over the sustainable product. Environment attributes concern the consequences for the environment and symbolic attributes concern the benefits for the owner's identity and status. To translate this to the case of Dante; an instrumental attribute can be the capacity of the energy storage, an environmental attribute can be the functioning of the infrared

panel on self-generated energy which reduces the gas consumption and an symbolic attribute can be the signaling of Dante to indicate that the person is sustainable.

For early adopters, the symbolic attribute is most important for the adoption of a sustainable innovation. This is especially the case when instrumental drawbacks, like a high purchase price, are in place. This drawback strengthens the symbolic attribute of expresses the identity of the owner, because a consumer which uses or purchases an costly, sustainable product must be highly motivated (Noppers et al., 2015).

Similar to the consumer adoption described by Noppers et al (2015), the adoption of solar electricity is influenced by the timing of economic events for the consumer (instrumental attributes), environmental values (environmental attributes) and the perception of early adoption (symbolic attribute) (Shelly, 2014).

**Expected consumer acceptance and adoption of Dante**

The adoption of Dante is expected to be comparable to the adoption of solar panels among consumers. This means that Dante will benefit from symbolic attributes, making the owner perceived as sustainable within social networks. Environmental attributes are expected to be important, but will not be enough to motivate purchase (Shelly, 2015). In terms of instrumental attributes, the financial attractiveness, evaluated by the calculation of the payback period, is less crucial than the timing of economic events within a household. (Shelly, 2015).

**Profiling of early adopters**

By understanding different consumers and their adopter needs and values, marketing a new product and targeting consumers can be done more precise, increasing the chances of a successful adoption. On the basis of qualitative research, different consumers can often be defined. Consumer profiles can be created, which are archetypical representations of consumers (van Boeijen et al., 2013)

**Profiling of Dutch consumers based on sustainable motivation**

Motivaction (2018), presents five sustainability groups based on an examination of 1.000 Dutch citizens. Each of these groups have their own motivations to live sustainably. The different groups cover the entire Dutch population and are therefore more abstract than the profiles developed for the pioneering homeowners. The pioneering homeowners are covered by the group named the 'responsible', see figure 4.2. This specific group sees sustainability as a necessity. They are convinced that they can contribute to sustainable goals by changing their behavior and they are willing to pay more and give up some luxury. The responsible show others what needs to be done and they act based on ideals. (Motivaction International B.V., 2018).

**Profiling of pioneering homeowners**

Based on qualitative research into pioneering homeowners, profiles of the early adopters of Dante are created. The profiles of the pioneering homeowners for sustainable measures in, on or at home are presented in chapter 4.3.

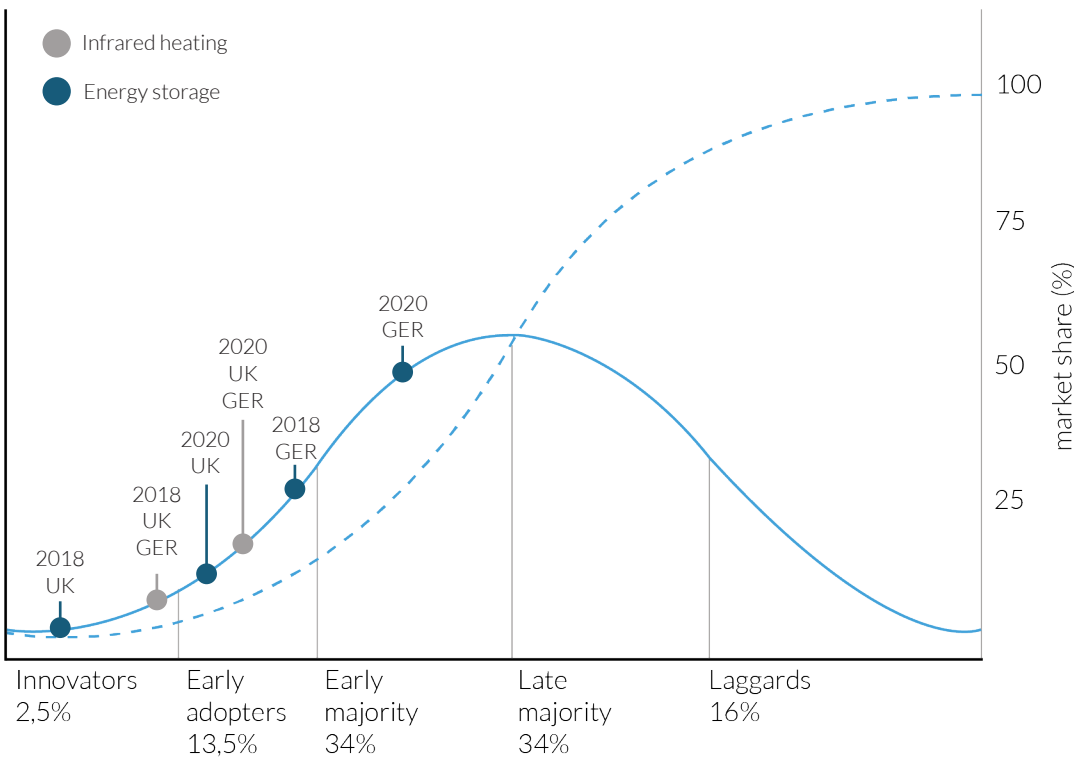


Figure 4.1. Adoption of infrared heating and energy storage (based on ENGIE & Navigant, 2018; Rogers, 1995)

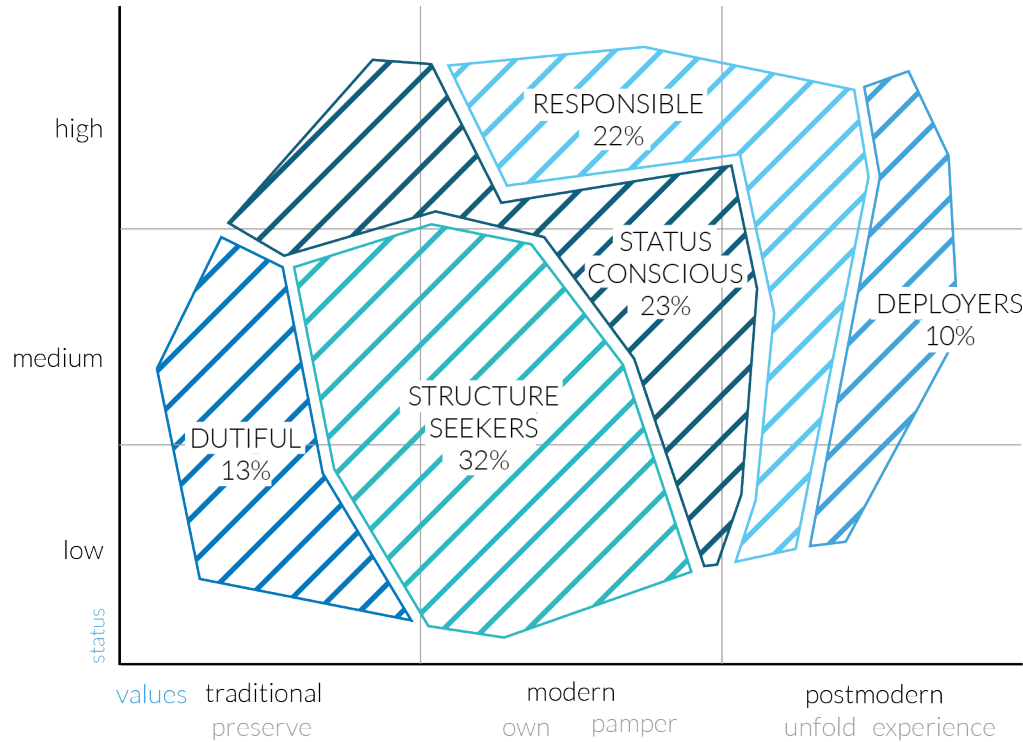


Figure 4.2. Profiling of consumers based on their motivation (based on Motivaction International B.V., 2018)



# 4.2 PIONEERING HOMEOWNERS

In order to validate the formulated strategy targeting homeowners and to detail the matching value proposition of Dante, research is done into this specific target group. In this chapter, qualitative research into pioneering homeowners and their sustainable behaviour is presented.

## Insight into pioneering homeowners and their process of applying sustainable measures

To understand pioneering homeowners and be able to design an introduction plan targeting them, in-depth research was done into this target group. The qualitative research was carried out to get insight into the process of applying sustainable measures at home and the opinion towards Dante.

The homeowners were selected based on the sustainable measures they applied already. The key selection criteria was therefore whether the homeowners have installed solar panels at least 4 years ago, in 2014. This sustainable measure is chosen as key criteria as it is similar to Dante; a sustainable measure which is relatively easy to install, requires an investment and is first accepted and applied by early adopters in the consumer market. Additionally, the consumers which provide energy themselves already have more knowledge and a possible need for a product like Dante. A different perspective was provided by two sustainable homeowners which are currently building and designing a new home.

### Research goals

The research aimed to identify the mentality, behaviour and needs of pioneering, sustainable homeowners. The following research question was set up to gain an understanding of the different homeowners and to gauge opinions about Dante:

How can Dante provide value to homeowners which are pioneering on sustainability?

### Research procedure

A total of eight pioneering homeowners were interviewed about their (future) home, their process of applying measures at home and their opinion about the product Dante. The research followed the method named 'contextmapping'. Using this method, interviewees are sensitized before the actual interview takes place and generative tools are used in the preparation as well as in the interview. This method helps participants to construct and express deeper levels of knowledge, see figure 4.3 (Sleeswijk Visser et al., 2005; Sanders & Stappers, 2012). The photos on the right page show the sensitizing booklet. A detailed description of the method and the tools used, is presented in Appendix I.

### Data analysis

Based on audio recordings, notes and creative results from the generative tasks, the consumer interviews were analyzed. Statement cards were created and a cross-interview analysis was done to . The statement cards were clustered and translated to insights and a profile matrix, which formed the basis of the pioneering homeowner profiles.

### Findings

The research provided an understanding of the market segment defined as 'pioneering homeowners'. The homeowners can be categorized into four different homeowner profiles. These profiles indicate how a specific type of homeowner goes about applying a sustainable measure in or at home and what values, people and support are important. Next to this, recommendations for Dante are formulated. These recommendations mark important considerations and improvements for the development of the product as well as the service and business model.

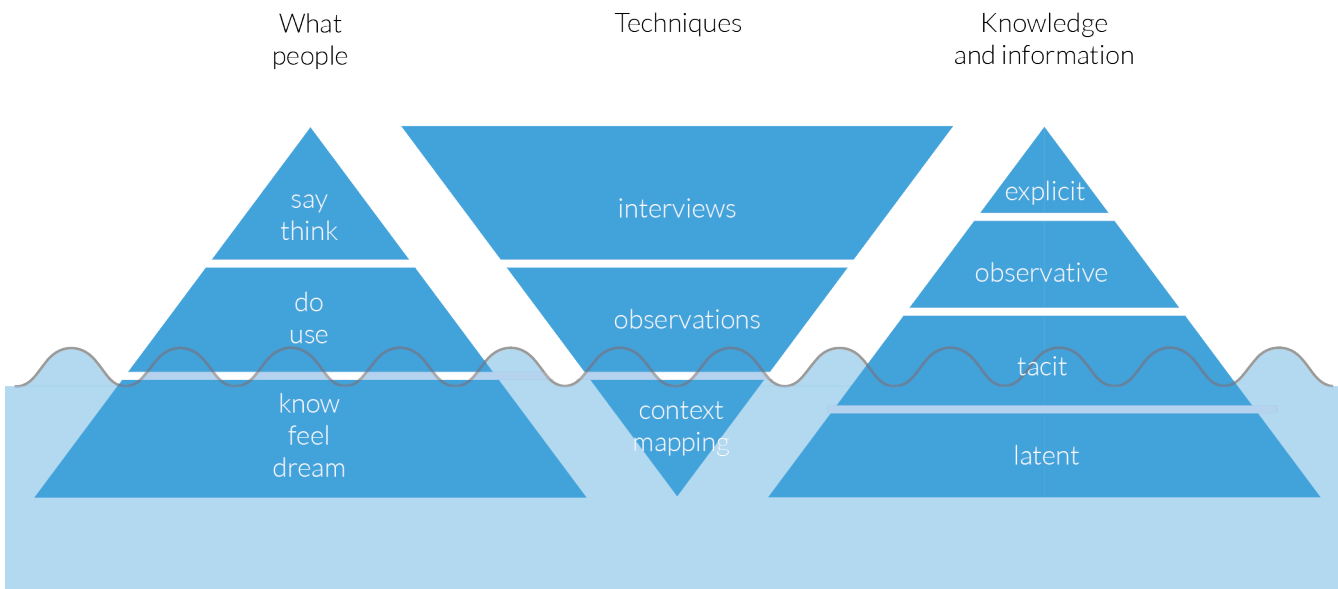
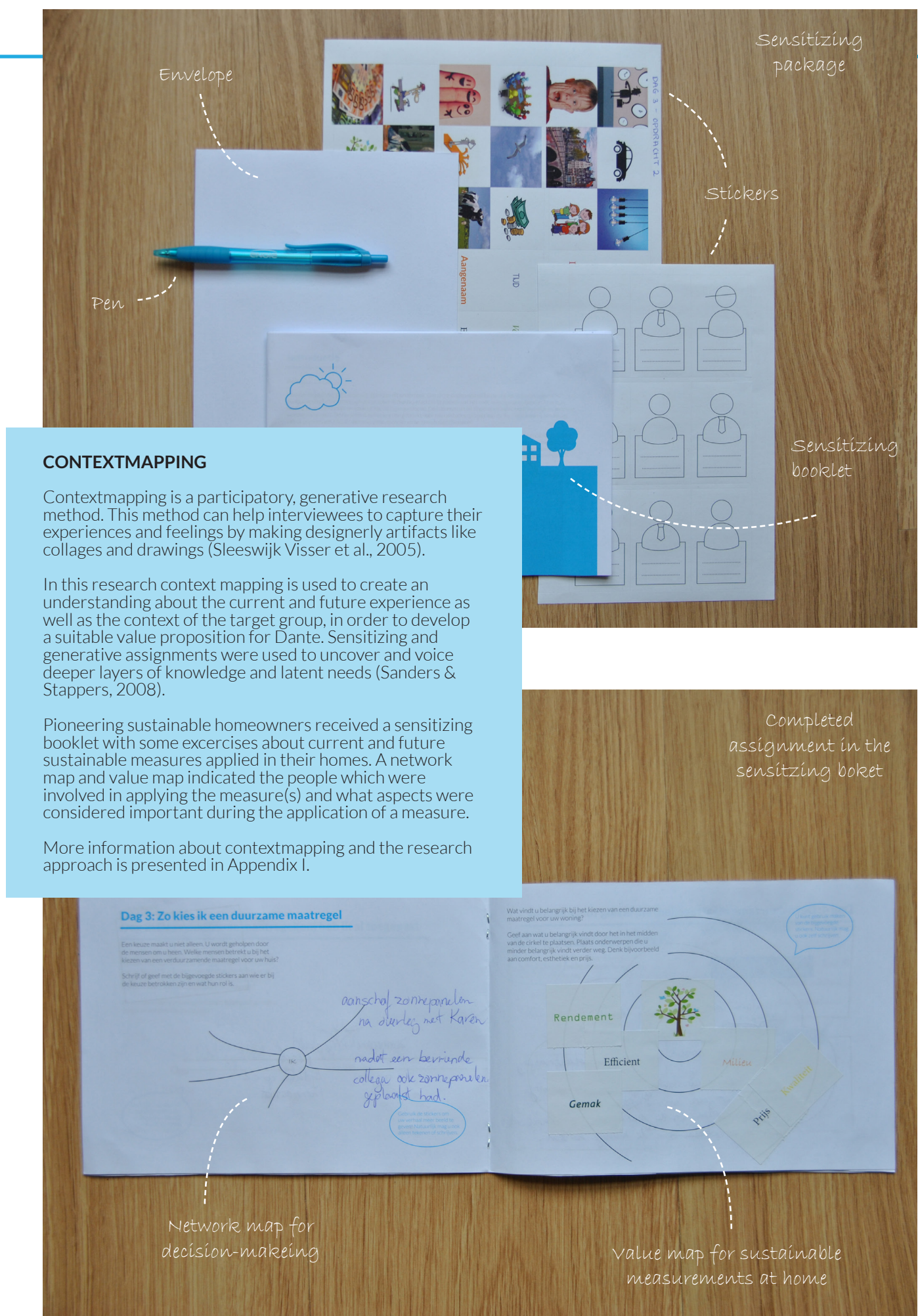


Figure 4.3. Levels of knowledge (based on Sleeswijk Visser et al., 2005)





### 4.3 PROFILES OF PIONEERING HOMEOWNERS

As a result of the contextmapping research, profiles of homeowners are developed. These profiles show how customers experience the application of sustainable measures at home and yields insights into the decision making process and usage of sustainable products and services. The profiles are developed to create an understanding of different pioneering homeowners and why they act in a certain way. This is not only key to designing a product and service, but also for developing an introduction plan to target real customers.

#### Profiling

Based on the qualitative research into homeowners and their sustainable behavior, four profiles are developed. These profiles indicate how different pioneering homeowners go about applying sustainable measures. Realize that the homeowners are considered as pioneers when it comes to sustainable measures in, on or at home, meaning that for other product categories they might not be pioneers or early adopters. The complete profiles, including information and specific guidelines for the process of applying sustainable measures, are presented to ENGIE as a separate deliverable.

#### Framework

The profiles are based on the developed framework, see figure 4.4. The two axis of the framework represent the most important and representing characteristics of the homeowners. The motivational axis indicates the motivation of the pioneering homeowner, which could be sustainability focused (for the world) or very rational (own interest). The support axis indicates the type of support the homeowner desires.

#### Needs and behavior

The homeowner profiles are defined based on needs and behaviors. These are influenced by the context, the environment, the available information, the network and past experiences. This means that a change in these factors can lead to a change in needs and behavior.

#### Not just one profile

Mostly, a person will fit one of the defined profiles. Yet, a pioneering homeowner can have characteristics of multiple profiles. Depending on the time and situation, the homeowners can move towards a different profile. This movement asks for a different offering, communication or approach toward this homeowner.

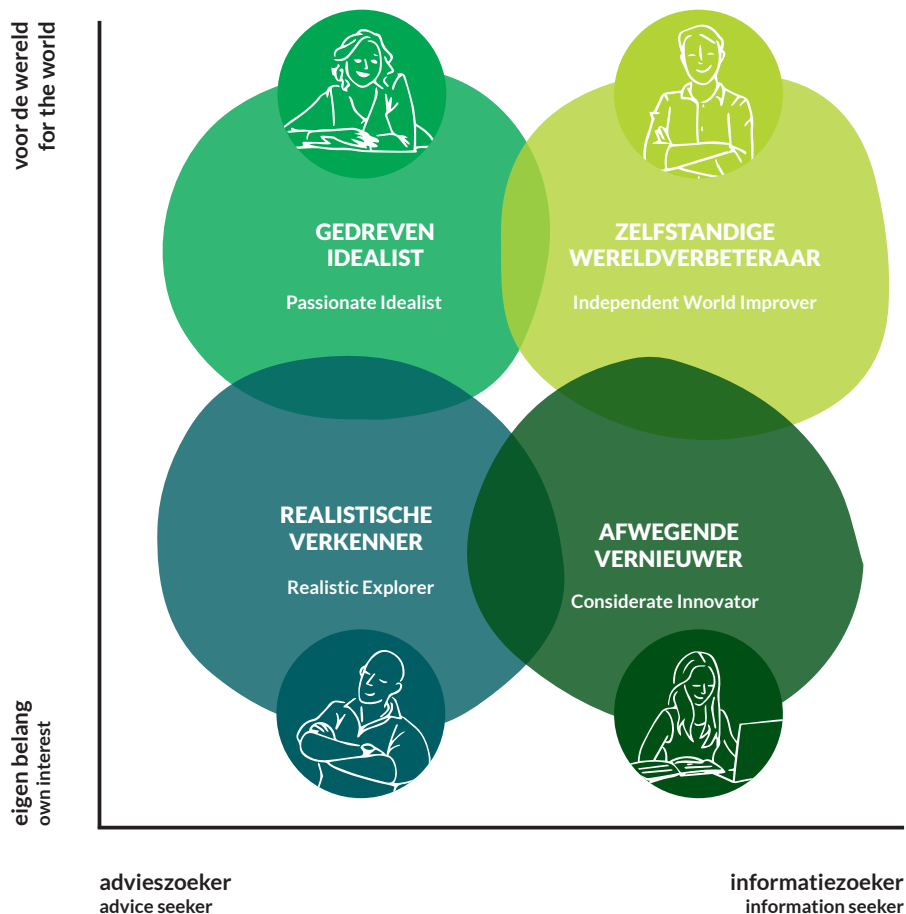


Figure 4.4. Framework for the profiling of pioneering homeowners



#### Passionate idealist

The passionate idealist is someone who actively wants to do the best for the world around him/her. This group easily adopts sustainable measures when they are guided and when they are provided with understandable information. As the passionate idealist is not informed about the latest sustainable options and whether they fit their personal situation, they feel insecure about making decisions. Family, friends and neighbors are knowledgeable co-thinkers which can provide insight into the personal situation. Support this group by providing personal advice and coaching during the process. Make the sustainable benefits tangible, in order to empower this group to make their own, sustainable choices.

"We presented the sustainable measures ourselves, but the architect then looks at the choices and whether these are suitable."



#### Independent world improver

The independent world improver is a real sustainable pioneer with a clear vision. When choosing a new measurement to improve their home, sustainability is the most important criteria in the decision making process. This group knows about sustainable measures they can apply in their home and believes in their own ability to compare alternatives and make the right choices. Support the independent world improver by providing objective information and experiences of like-minded others. Make clear you understand their vision and be a knowledgeable discussion partner. Do not be instructive and do not focus on investment costs or return.

"I want to be self-sufficient and want to use our own energy as much as possible. I actually want to store energy, to use it later on."



#### Realistic explorer

The realistic explorer wants to take measures to make his/her home more comfortable or value-increasing. However this group does not have the necessary knowledge and therefore finds it hard to make a decision themselves. Friends and family are seen as valuable counselors. Sustainability is seen as a good side-effect but is not a standard criteria when choosing a certain measurement to improve a home. Support the realistic explorer by helping them to set priorities and providing different alternatives which suit their needs and wishes. Advise this group and focus on personal contact, but at the end, empower them to make the decision themselves. Avoid jargon and technical terms throughout the entire application process.

"For the renovation, we actually did not mention energy or sustainability at all."



#### Considerate innovator

The considerate innovator is a pioneering homeowner with an open mindset. They are interested in new technologies and developments and know which measures fit their home. When making decisions, this group searches for information and analyzes different options to make the best choice. Sustainability is not key for them. It is rather one of the aspects they take into account, just like price, comfort and fun. To support them when applying a sustainable measure, provide reliable information. State sustainable advantages but never push sustainability. Throughout the process of applying a new measure, offer demand-driven information and expertise.

"The pellet stove is beautiful. It fits into our living room. If this was not the case, then we would have said 'we will not do it.'"

Figure 4.5. Summary of profiles of pioneering homeowners



For example, a consumer might be eager to invest in improved insulation of his/her home, knowing a lot about different materials and the current insulation of the house. In that case, the homeowner feels confident to make the decision and apply the measure him/herself. In another situation, for instance when changing the heating system on the upper floor, the homeowner might desire advice for applying the best solution to fit the comfort needs of the household. This represents a different type of desired support and ensures the homeowner to move over the support axis.

Different pioneering homeowner profiles

The four different profiles defined by the framework, see figure 4.4, are briefly described in figure 4.5. The elaborate profiles and guidelines on how to support and approach them, are separately delivered to ENGIE. These profiles provide an understanding of different pioneering homeowners on sustainable measures, which could be possible consumers for Dante and other ENGIE products and services.

Generalization of pioneering homeowner profiles

The profiles of the pioneering homeowners are based on values, needs and behaviors concerning the application of sustainable measures in, on or at home. Like indicated, the profiles can serve as an inspiration for the development of new ENGIE products and services. However, the profiles can not be generalized for all product categories. Having a product or service that does not have to do with sustainable measures might thus have different pioneering consumers with different values, needs and behaviors.

Key moments

At certain moments, homeowners are more likely to consider the investment in a sustainable measure. These moments represent moments of change: a new construction, when moving or remodeling the home and at a (product or system) repair or renewal. The moments are briefly presented in figure 4.6.

These moments present opportunities for ENGIE to target the homeowner and to provide information or advise. Regardless the personal motivation, every homeowner is easier to approach and convince at these moments.

“When we will rebuild the kitchen, that will be a moment to consider a heat recovery system.”

“In 2013, we replaced the boiler. That was pretty quick, a heating boiler normally last 15 years. But we had relatively many failures and wanted a larger water capacity.”



NEW CONSTRUCTION

In new construction homes, homeowners often have choices regarding installations. This is thus a key moment to choose sustainable measures.



MOVING & REMODELING

When moving, or remodeling a home, there is already nuisance and change. The barrier for implementing a new sustainable measure is therefore lowered.



REPAIRING & RENEWAL

If a system or product is broken and therefore needs a repair or renewal, this is a moment to think of sustainability.

Acceptance of new, sustainable products

The adoption of new innovations like Dante, among innovators and early adopters is crucial for market success. For these consumers, symbolic attributes which concern the owner’s identity and status, are important for adopting a sustainable product. Just like the previous adoption of solar panels, the adoption of Dante is expected to benefit from symbolic attributes, making the owner perceived as sustainable within social networks. To truly understand consumers and their needs, values and behaviors, consumer profiles can be developed. The profiles of Motivaction can serve an example. These profiles describe consumers based on motivation for sustainability and the expected early adopters of Dante, the pioneering homeowners, can be categorized as the ‘responsible’.

Pioneering homeowners

Qualitative research following the contextmapping method was conducted to gain an understanding of pioneering homeowners. Generative tools and interviews provided insight in the process of applying sustainable measures in, on and at home and the opinions regarding the product Dante.

Profiles of pioneering homeowners

Based on the described research, a framework was developed to segment different pioneering homeowners. Taking the motivation (own interest vs. for the world) and the type of support (advice vs. information) into account, four different types of homeowners can be defined:

- Passionate idealist
- Independent world improver
- Realistic explorer
- Considerate innovator

All of these different homeowners are easier to target and convince on certain key moments. On these moments, the homeowners are more likely to consider a sustainable measurement like Dante. These moments include the construction of a new home, the renovation or remodeling of an existing home and the repair or renewal of products or systems within the home.

Figure 4.6. Key moments for considering sustainable measures at home



# 5 DESIGN

- In this chapter
- 3.1 Competitive landscape
  - 3.2 Market segments
  - 3.3 Target group: Pioneering home owners
  - 3.4 Conclusion

In this chapter, the results from synthesizing the various insights are presented. First, recommendations are given for the product Dante after which the introduction plan is explained. This plan includes an introduction roadmap and a product roadmap, focusing on the introduction and development of Dante over time. The roadmaps use three horizons in which Dante transforms from being a product which supports pioneering homeowners to use all their self-generated energy, to a home energy manager and Virtual Power Plant.



Based on the product review within the consumer interviews (8 participants), conclusions are drawn regarding the product Dante. The conclusions are divided into different topics. All topics are briefly discussed in this chapter.

Functionalities

Consumers already have the (future) need for energy storage and therefore see the battery as most valuable function of the product. However, to use the product as a battery, the storage capacity per panel is considered as low. Because of this low capacity and the sustainable mindset of pioneering homeowners, the energy storage is preferably used for optimization of own energy consumption. This means that consumers aim to use all their self-generated energy, and use the battery to store generated energy until they can actually use it. The possibility of charging the battery from the net is good, since then smart use can still be made of energy prices, even though the personal solar panels may not deliver that much at a certain time. The combination of the heater and the energy storage is seen as valuable. The battery is often the main driver for the purchase, whereas the unique selling point of the battery is then the additional heating function. However, the heating function can also form a barrier for the placement of Dante. This heating function can thus be an advantage as well as a disadvantage. Extra functionalities of the panel are not recommended for this target group. A function like light might be value-increasing in new construction, but in existing homes it is not. This is due to the fact that it complicates the placement of Dante. Other functions and especially additional technology is also expected to have a shorter life-cycle, which decreases the value of the product. Nevertheless, there is a need to add a cooling function to the product, to make sure it can both heat and cool a specific space. Consumers see a normal home battery or an electric heater as the alternative for Dante.

To illustrate the conclusions drawn, a few quotes are presented. These quotes illustrate the opinion of real homeowners and their attitude towards the product. Quotes are selected from the qualitative analysis.

Heater

*"In extreme conditions we would need it, if it is really cold. Then you would turn on the heater upstairs. We also spoke about this with the architect. Do we want radiators for these extreme days? We said 'if we can also save some money, then we won't install radiators upstairs.'"*

*"It is just like an electric heater. When I studied, I used the electric heater a lot and also in my office upstairs I use it often."*

Battery

*"I want a battery for sure. But if I just want a battery, than I want this panel to be in some kind of a cd standard. then I will not use it as heating"*

*"I would hang the panel in the barn. Oh no, because there I won't use the heating function."*

*"For example, we will be able to place these panels on the entire ceiling (construction). But then we only use the storage function."*

*"It would be nice if you could store your own energy and use it yourself again, that is the best thing."*

*"It is such a small fraction that you store here, that you want to use it yourself. It is my panel, so I want to experience the benefits."*

Additional functions

*"My experience is that you use almost none of the capabilities of a device. There are often many more options than we use. We are real creatures of habit."*

*"It should also be a cooling at the same time. It would be nice if you could use both, in the winter as heating and in the summer for cooling."*

*"We already have lighting. So I do not consider that now, but suppose we are going to build a new house. In that case, it would be nice if everything is there right away; a battery, a heater and light. Here we do not look at necessary functions."*

Controlling

In theory, both the heating and the battery storage function of Dante could be controlled by the user. In practice, users want to have control over the heater, but want the battery to function automatically. It is important however, to give insight into the functioning of the battery so that consumers can build understanding and trust. For the heating function, it is important that the consumer has full control him- or herself. This means that they want to turn the heater on and off, and set the temperature themselves. Although an APP is seen as convenient, most consumers (6/8) desire a physical control of the heating. This could be a button on the panel itself, or a switch, like the light switch, see figure 5.1. It is important that the product can also be used without an APP, by different residents. An APP or automatic heating system is seen as convenient as a standard timer could be set. In that case, users can not forget to turn off the heater and can also define detailed sessions. For the monitoring and settings, an (additional) APP is thus desired. For the energy storage, consumers do not want to be in charge. Especially when flexible energy prices are in place, the users don't want to be bothered by the functioning of the battery. It is ok if the battery functions automatically and if users can set some basic settings, like the preference for optimizing own energy consumption and external access to the battery for net balancing. Automatic functioning is seen as best, as a company as ENGIE knows the flexible energy prices and the weather forecast and can therefore make the best choices for personal energy storage and exchange. Usage of the stored energy for non-personal purposes, for instance to balance the net, is considered as useful. Consumers are open to this idea, but want this to be very transparent. They want to know when their battery is used and wherefore.

Figure 5.1 shows how the Dante panel can physically be controlled by the user.



Figure 5.1. Options for controlling the infrared heater

Controlling the heater

*"I want to control the heater with a button. I do not want APPs or internet. I do everything with a button."*

*"If you need an APP, than you have to learn how to deal with it and it has to be very clear, otherwise I do not want to use it and I won't feel any ownership. Than my husband or children will use the product, but I won't."*

*"I want the heating to turn on when I turn on my lights in the shower. And if I turn the lights off, the heating must also go off."*

*"The heater can also function automatically, that it is linked to existing systems and your home thermostat. Now the heating system is also programmed. In the morning it turns on, and in the evening, it turns off. That is perfect!"*

Controlling the battery

*"Via the APP, I want to build an understanding of the functioning of the battery."*

*"Balancing the net is a good idea. I would like to help, but I want a company to be transparent about it. I want to turn the access to my battery on and off whenever I want and I want to see when and wherefore they use my stored energy."*

*"Let's be honest. I want the battery to function automatically. It should be as easy as possible and I do not want to have any trouble with it."*

Monitoring

Consumers want to monitor the functioning of the battery and heater. This is especially interesting in the beginning, when the consumers just purchased the new product. In this phase, consumers are interested in how and if the system works. This is also the moment to suggest changes to reduce energy consumption.

Figure 5.2 presents ways to provide consumers with information and to enable them to monitor the functioning of Dante.



Figure 5.2. Options for monitoring the infrared heater and energy storage

Monitoring

*"I find it interesting to see how the system works and to get an understanding of the battery."*

*"I can see everything from the solar panels. It varies how much I look at it, but it is very nice to compare months and years. Then you really get insight into how it works."*

*"In the beginning, I looked at the energy production of the solar panels every day. But at a given moment, you believe it."*

*"A monitor is a useless gadget. I never look at it. After all, I can not change what the sun does. I only think it is important to see if the device works."*

Placement

In existing homes, Dante will not function as the main heating system as there is already a heating system in place. As additional heating, it could be used on the ground floor but this is often unnecessary as this space is the main accommodation and is therefore often on a comfortable temperature. Additionally, on the ground floor one specific space for heating is less desired and also the aesthetics are more important. Dante as (additional) heating on the upper floors is seen as useful. Especially the bedroom, bathroom and workplace are spots where consumers can and are willing to place the product. The infrared heating can also be used well in specific, draughty areas. If placed by consumers, the panel would be mounted to the ceiling (6/8). This is considered as beautiful, but also saves space. When placing the panel on the ceiling, the panel should be as neutral and unobtrusive as possible.

Figure 5.3 shows the placement of an infrared panel on the desired places. These examples can be used to help consumers to visualize Dante in their own home. When using examples, make sure these are interpreted as real situations rather than perfect design homes and stock pictures.

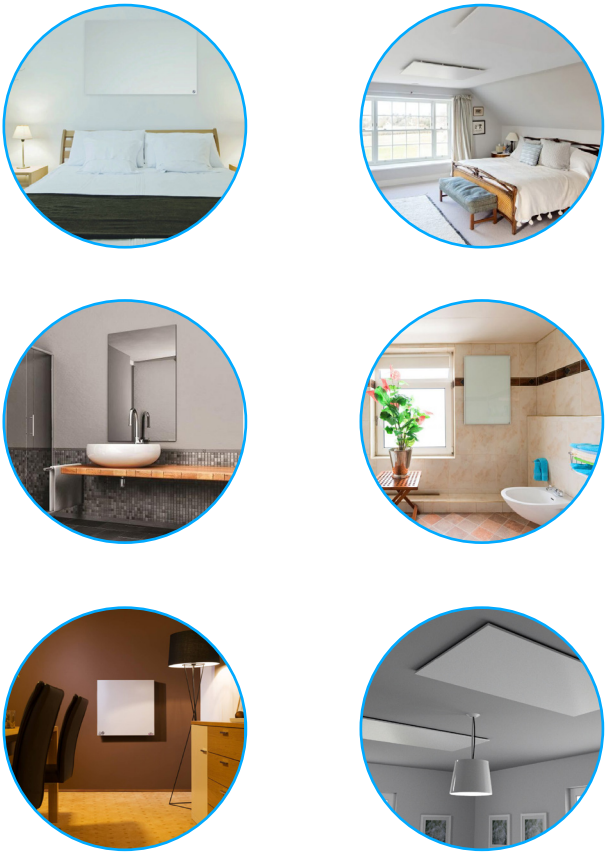


Figure 5.3. Infrared panels at desired places

Upper floor

*"That is a limitation to the system. You hang it where you sit the most and then it is very comfortable there. But at the moment that there are visitors, and there are also people over there (empty space), then it is still cold."*

*"In itself, I think it's a nice system, also because you can give it a different color or can make it a picture or painting. But I do not find it appealing in the living room."*

*"I can imagine a panel on the upper floors. Also because we have underfloor heating already and that is very pleasant."*

Bedroom

*"We never turn on the heating upstairs, only if the children are studying or if it is really cold. But you could place a panel above the bed. Then you will use it only when you are in the room or when it is really cold."*

Bathroom

*"The shower will be upstairs, there it might be nice. At our current house we have residual heat, a pipe from the radiator runs under the shower and that is hot. But I can imagine that if you will shower, then you want instant heat."*

Workplace

*"The children always study downstairs, but that is maybe also because it is a bit cold upstairs. Before it is warm up there.. it needs half an hour. In that time, they can be finished with their homework already."*

*"I would place the panel on the first floor, at my workplace. The computer is in front of the window and I notice that, especially in the winter, it can be cold because of the window. The radiator is underneath the desk, but therefore the heat really stays there. It would be perfect to place the panel on the wall there."*

*"In my office I use an electric heater. There is no other way to heat that space. The panel would definitely suit there."*

*"Maybe also in the garage. There is heating, but it is never used. But if you are working there, it would be comfortable."*

*"The product would be useful at the workplace on the ground floor, because that means that the heating does not have to be turned on. If you have such a panel, then just your workplace is nice and warm."*

Ceiling

*"In this house, there is a draft, then I would like it if there is a panel above my own spot, on the ceiling."*

*"The infrared panel hangs at the ceiling at those acquaintances. I thought that was a very nice, beautiful way to place it. You use space that you do not use otherwise. The radiant heat goes down and that is pleasant. On the wall the panel is fragile and takes up space. Also, you have to take into account the placing of the furniture and stuff if the panel is placed on the wall."*



### Appearance

The desired aesthetics of the Dante panel is closely related to the placement of the panel. Mostly, consumers like to mount Dante to the ceiling. In that case, the panel as well as the installation (plug, wire and socket) should be invisible. The color of Dante should fit the ceiling and blend in without drawing any attention. If the panel is placed in the bathroom, it is desired to be a mirror. This will be value-increasing as a function is added and it fits the interior. In case consumers already have a mirror or even a mirror cabinet, they can choose to replace it or they will decide to have an unobtrusive panel. The possibility to personalize the panel and print a picture, artwork or illustration on it is perceived as nice. However, when asking consumers to place Dante in their own home, this personalization option was not used (7/8) and consumers wanted the panel to blend in with their interior. The size and the rectangular form of the panel are fine.

Figure 5.4 shows how Dante can fit into the interior or can go unnoticed. Figure 5.5 presents the Dante panel as a mirror. This design suits especially well in the bathroom.

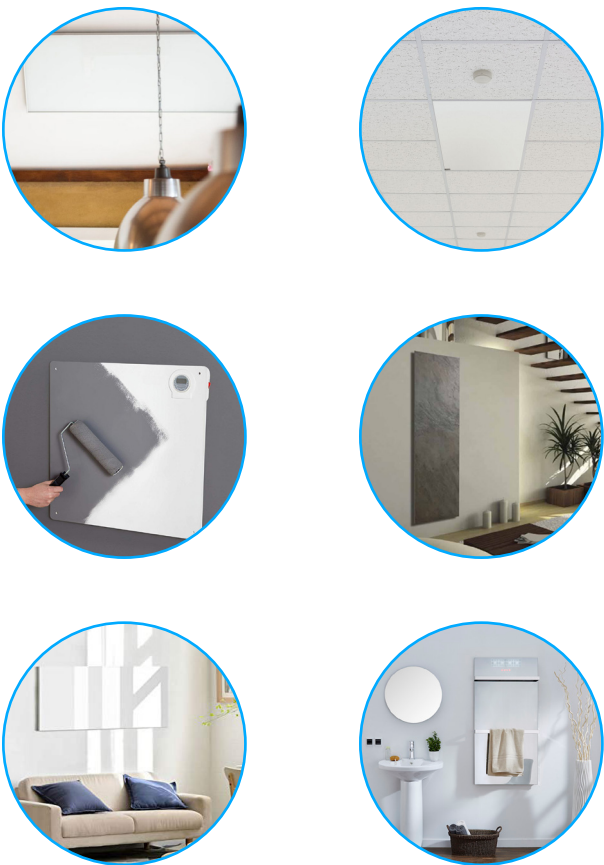


Figure 5.4. Infrared panels at desired places

### Appearance

*"In the bathroom a mirror would be nice. That is great! And maybe, there can even be racks attached to hang and dry the towels."*

*"On the ceiling it should not have to be a certain design. It should be the same colour as the ceiling. So that you don't see it."*

*"I would like to have it as unnoticeable as possible. I love neutral, simple things."*

*"There is also a plug. So you also have an outlet in your ceiling, I do not want to see that either, it should be behind the panel."*

*"Aesthetics are different for the upper floor as for the ground floor. Upstairs I think 'I close the bedroom door and I cannot see it anymore', but downstairs, where you live all day long. Then the eye wants something as well."*



Figure 5.5. Dante as mirror (Spark, 2018)

### Insecurity and advice

As Dante is a new product and consumers lack experience with both home batteries as well as infrared heating, they are insecure. The combination of energy storage and heating is hard to understand and consumers are not sure where the product would be placed at first sight. Consumers desire advice on where to place the product, how much panels they will need and if the product is applicable as main heating.

### Investment

For pioneering consumers, the investment can play a role when deciding to apply a sustainable measure like Dante. The purchase price, the return and the payback period are important. At this moment, most consumers estimate that Dante is not yet an attractive investment in their personal situation. Dante is seen as expensive since the netting arrangement is still in place and infrared panels can be cheaper. Nonetheless, the future potential is recognized.

### Purchase

Consumers prefer to purchase a new product when they have the financial means to do so (7/8). A 'free product' is not wanted as consumers will expect there will be hidden gains for the company, like data collection. A lease construction is seen as more expensive but can tempt consumers to look into the product and financially purchase it, with or without a try-before-you-buy model. Also, a lease construction might be interesting for consumers (1/8) that would like to innovate.

### Insecurity and advice

*"Why is this combination interesting? That the panel provides infrared radiant heat and energy storage? I get the value of energy storage, but why the combination?"*

*"How many panels do I need in my home? In the living room I can imagine that you need one on each wall as it emits radiant heat. Maybe even more on a large wall. I cannot foresee how this will act as main heating."*

*"Where exactly is it convenient to hang the panel? On which height and at which wall? Does this depend on the room or the usage?"*

### Investment

*"You can also just buy an infrared panel, which will cost you a few bucks."*

*"As long as I can return energy to the grid, than this product is not interesting."*

*"We generate more energy than we actually use, and we get almost nothing in return. That's a joke. This would be a great investment, also because you save on your heating."*

### Purchase

*"We must be able to buy the product."*  
*"If the product is free, then it is suspicious."*

*"I expect a lot of developments and improvements in this area. If you purchase a product, then you will wait until you have earned it back, or until it breaks, just like the solar panels. But if you lease it and you like it, you can easily lease a new, improved product."*

A brief overview of the recommendations:

## Control

- Manually, physical control of the heater
- No control over the battery
- Monitoring of the battery

*"I like APPs, but . Now my phone has a limited capacity. It is full soon and I'm not waiting for any more APPs. Besides, nowadays we also turn the heater on by turning the knob upstairs. I don't think that is a problem."*

*"Let's be honest. I want the battery to function automatically. It should be as easy as possible and I do not want to have any trouble with it."*

## Purchase and investment

- Purchasing is preferred
- Leasing is perceived as expensive
- Free is not trusted

*"If I use the heater only one hour a week, and the capacity is little, then I won't invest 850 euro. It depends on the changing netting arrangement and the developments of batteries if this is interesting for us."*

*"If you can't afford to buy a product, you should not lease it. In the long term, that is also more expensive."*

*"If the product is free, then it is suspicious."*

## Battery and heater

- Battery is considered as the most valuable function
- Heater is a nice extra, but forms a barrier for placing the battery

*"The first thing that appeals to me is the energy storage. Also because we have solar panels already."*

*"The combination is valuable. For energy storage, there are already a lot of products. But you have to look at the place where heating is useful, otherwise you will just place a battery somewhere. Than the design is less interesting, than I want a cheap battery which fits into the fuse box."*

## Battery usage

- Optimize energy consumption from own generation
- Virtual Power Plant should be transparent
- Capacity of battery is seen as small

*"To save my own sustainable energy, that sounds nice to me."*

*"It seems nice to me to use all the energy we currently produce, to store it and use it at a later time."*

*"It is nice that you can store energy, the battery function, but it is very limited. Per panel the capacity is of course small, but every bit helps."*

## Appearance

- Invisible
- Mirror
- No personalization

*"On the ceiling it should not have to be a certain design. It should be the same colour as the ceiling. So that you don't see it."*

*"An illustration ... mwa. Than you get some kind of an IKEA image. I do not want that."*

*"That is something, there has to be a socket close by, or there must be a cable on the wall. Then you have, for example, a nice panel and then that cord is very ugly."*

This chapter presents the introduction plan for Dante. First, it describes the future vision and the associated three horizons. Second, it contains the introduction roadmap and the product roadmap. The introduction roadmap indicates how to introduce Dante in different market segments. The product roadmap explores the future development of Dante as a product and service.

### Future product visions

The future vision serves as the end-goal of the roadmap. It is a strategic reference point that provides direction to the innovations on the roadmap (Simonse, 2017). The future vision of a roadmap is not a design vision or corporate vision, but rather a vision for a specific situation or domain. It is a shared vision which does not only apply to one product (Simonse, 2017) and is created on future intent (Simonse & Hultink, 2017). In order to link the future vision of ENGIE B2C on sustainable measures to the introduction and development of Dante, the three horizons framework is used.

### Vision of ENGIE B2C

In the B2C market ENGIE currently offers consumers energy, gas, energy products and advice, see Appendix J. The aim is to grow in this market segment. For the sustainable measures and energy products, ENGIE wants to help consumers to make their home more sustainable, by providing various measures and products which can be combined to deliver the best solution for every personal situation (Hummel, 2019). Dante will be one of the products in this 'fruit basket' of energy products.

### Three horizons framework

The three horizons framework helps companies to sustain growth by managing current performance and maximizing future opportunities (Coley, 2009). Next to this, the framework ensures that innovation activities can be linked to the organization's strategy (Hobcraft, 2015). The framework is especially useful in uncertain times, which is the case for both the infrared and the energy storage market as there are lots changes in terms of regulations, market trends and technology improvements. It is therefore valuable to create three horizons for Dante to use them as a base for the roadmaps.

The frameworks presented in figure 5.6 and 5.7, indicate the future horizons of Dante from the perspective of the consumer and ENGIE. In the framework, the x-as represents time. The y-axis represents the strategic fit of the vision and therefore clearly links to the provided value of Dante. A brief description of the horizons as well as an explanation of the horizons defined for Dante are presented in the upcoming paragraphs.

### Horizon 1: Optimization of energy consumption

Horizon one represents the near future, in which innovation is incremental and businesses are readily identified. In this horizon, there is a focus on improving the performance. This results in maximizing the profits and cash flow on one hand, and maximizing value on the other (Coley, 2009).

In the first horizon, Dante will be introduced to pioneering homeowners. From a consumer perspective, the product focuses on maximizing the consumption of self-generated energy. Although using all self-generated energy is not financially attractive yet, pioneering homeowners think this is fun and interesting. For ENGIE, introducing Dante means expanding their current B2C product portfolio, see Appendix J. Strategically, this is in line with the current ENGIE activities of providing energy products. Within this first phase, Dante will be proven in the market and there is room for improvement of the product and service.

### Horizon 2: Home energy management

Horizon two represents emerging opportunities. This horizon aims to bring the third horizon closer to reality (Hobcraft, 2015). It is a phase of transition, in which there is tension between the reality and the vision.

In the second horizon, Dante is introduced to the majority of the housing segment, both private and social. From a consumer perspective, Dante is a product which helps them to become sustainable and to reduce their energy bill. For ENGIE, this is the moment to build a consumer base for the future Virtual Power Plant. A Virtual Power Plant is a cloud-based, distributed power plant, in this case consisting of the a large amount of Dante panles which can store energy. The power plant can be used to trade and sell energy on the electricity market, and especially for harmonizing the grid. However, in this phase ENGIE will not use Dante as Virtual Power Plant, but supports consumers by optimizing their home energy consumption. This is done by storing their self-generated energy or low-tariff energy and using this at a later moment in time. This is especially interesting for consumers with solar panels as the netting arrangement changes.

### Horizon 3: Virtual Power Plant

Horizon three represents the desired future state. It contains ideas for growth and builds a new vision. At the first look, this horizon might seem incompatible with today's reality.

In the last horizon, Dante will be used for energy management. As flexible energy tariffs are introduced, consumers are willing to accept help when it comes to their home energy management and the functioning of the energy storage of Dante. They do not want the hassle of interfering with energy prices and exchange and still have the preference to use all their self-generated energy and/or reduce their energy bill. Dante is one of the products that ENGIE offers to reach this goal and to help consumers to make their home more sustainable. For ENGIE, this is the horizon in which the Virtual Power Plant will be introduced. First, the existing consumer base can be approached. Consumers could be convinced to join the Virtual Power Plant with (a part of) their Dante panel in return for a fixed energy bill or a financial compensation. Second, the Virtual Power Plant can become a standard for still to sell products.

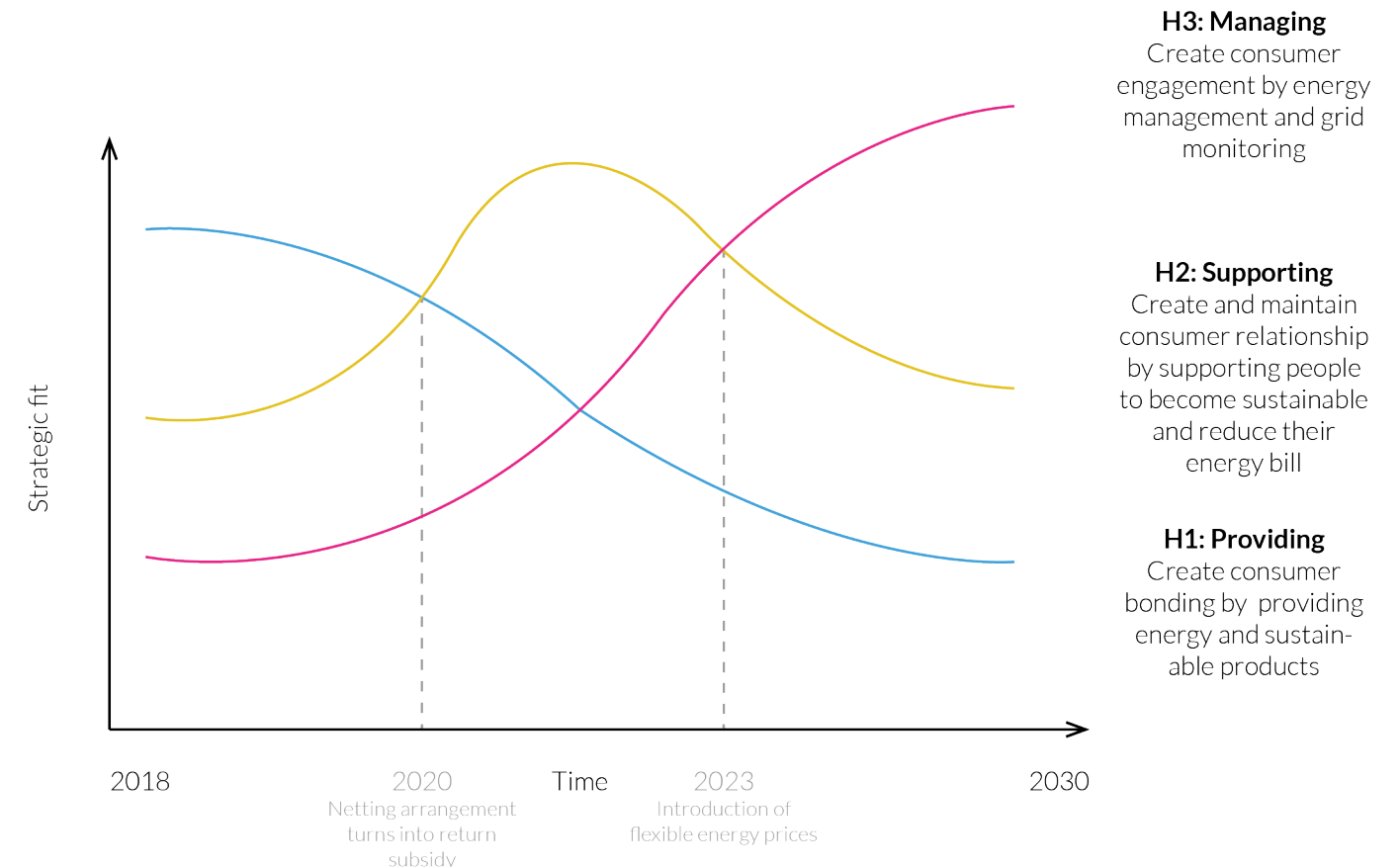


Figure 5.6. Three horizons - Consumer perspective

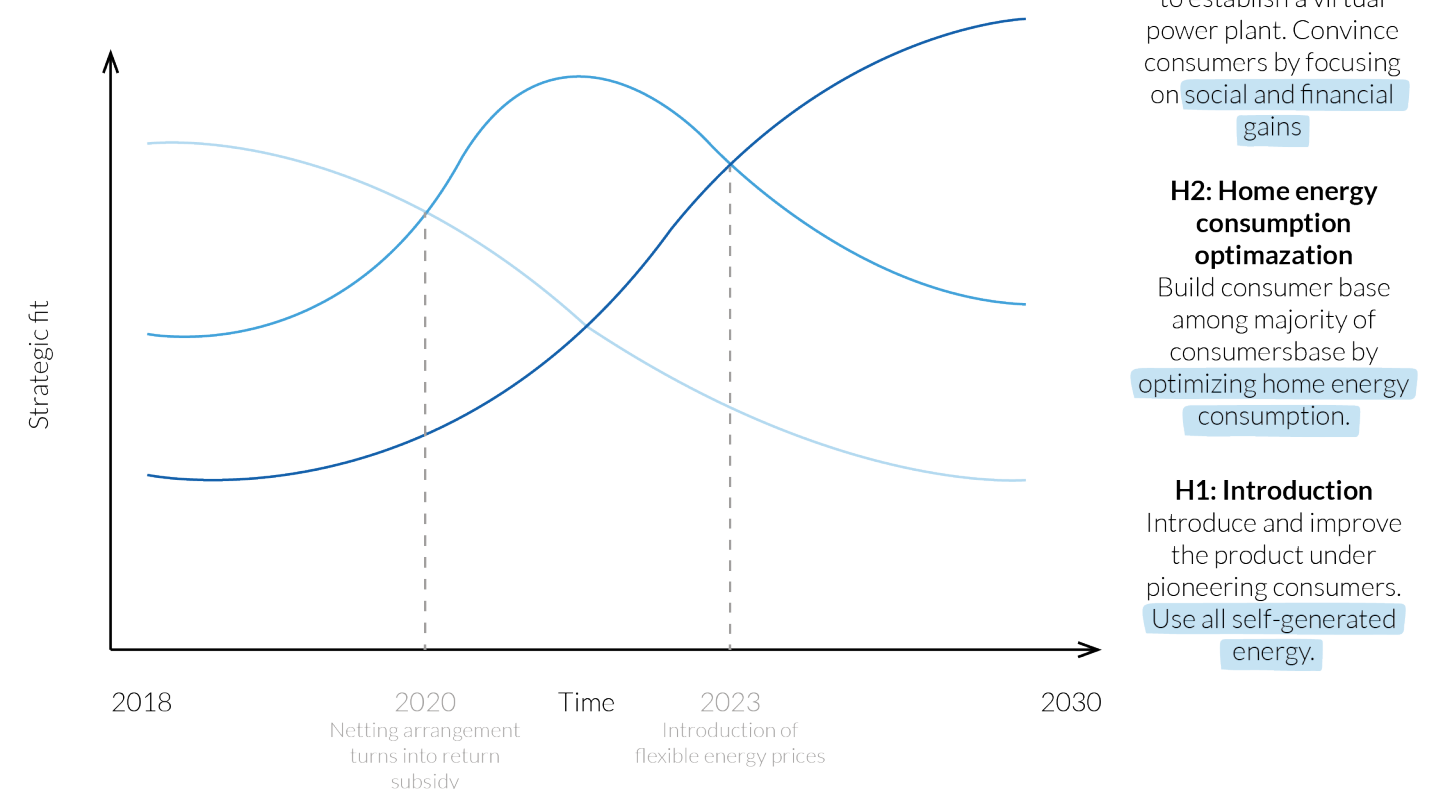
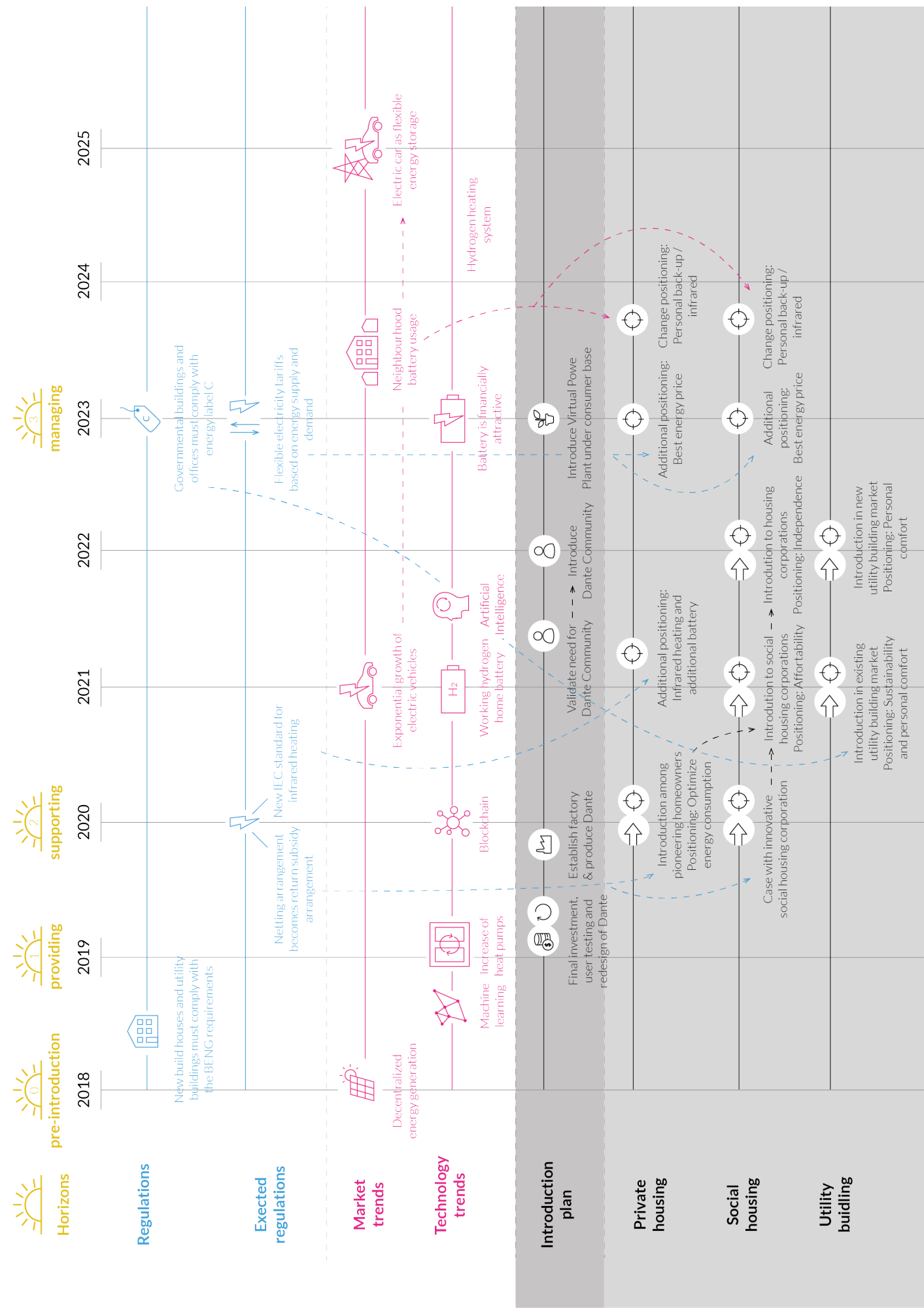


Figure 5.7. Three horizons - ENGIE perspective





### Introduction roadmap

A roadmap enables an organization to create responses for future strategic challenges, occurring by market and technology trends as well as regulations (Simonse, 2017). Roadmaps are used to explore and track future design innovations (Simonse, 2017). In order to define the introduction of Dante in the different segments and its relation to these future challenges, an introduction roadmap has been created, see figure 5.8.

The roadmap portrays the introduction strategies and elements along a timeline. It does so per market segment, visualized as different yet interacting tracks, and shows the link to new regulations, market changes and technology applications. The different layers of the roadmap are briefly described to support the visualization.

### Horizons

The designed introduction roadmap shows the three horizons, as presented earlier in this chapter. The future vision and the associated horizons form the destinations of the roadmap (Simonse, 2017).

### Regulations

The regulations are presented as they could support or slow down the adoption of a new sustainable product. This can be seen, for example, for the increased adoption of heat pumps that receive support due to the increasing awareness and subsidy options. In this roadmap, a distinction is made between fixed regulations and expected regulations. This indicates that the expected regulations can still be postponed and are dependent on the government and future legislation. Expected regulations for instance include the changing netting arrangement and a more positive calculation method for infrared heating in homes (IEC). As these expected regulations can have a big influence on the attractiveness of Dante, it is important to keep a close eye on these regulations and when exactly they will be applied. Ideally, three scenario's will be developed with associated roadmaps. Having a high, medium and low scenario can help to estimate under which conditions and timing Dante can be successfully introduced. Additional information about the regulations can be found in Appendix G.

### Trends

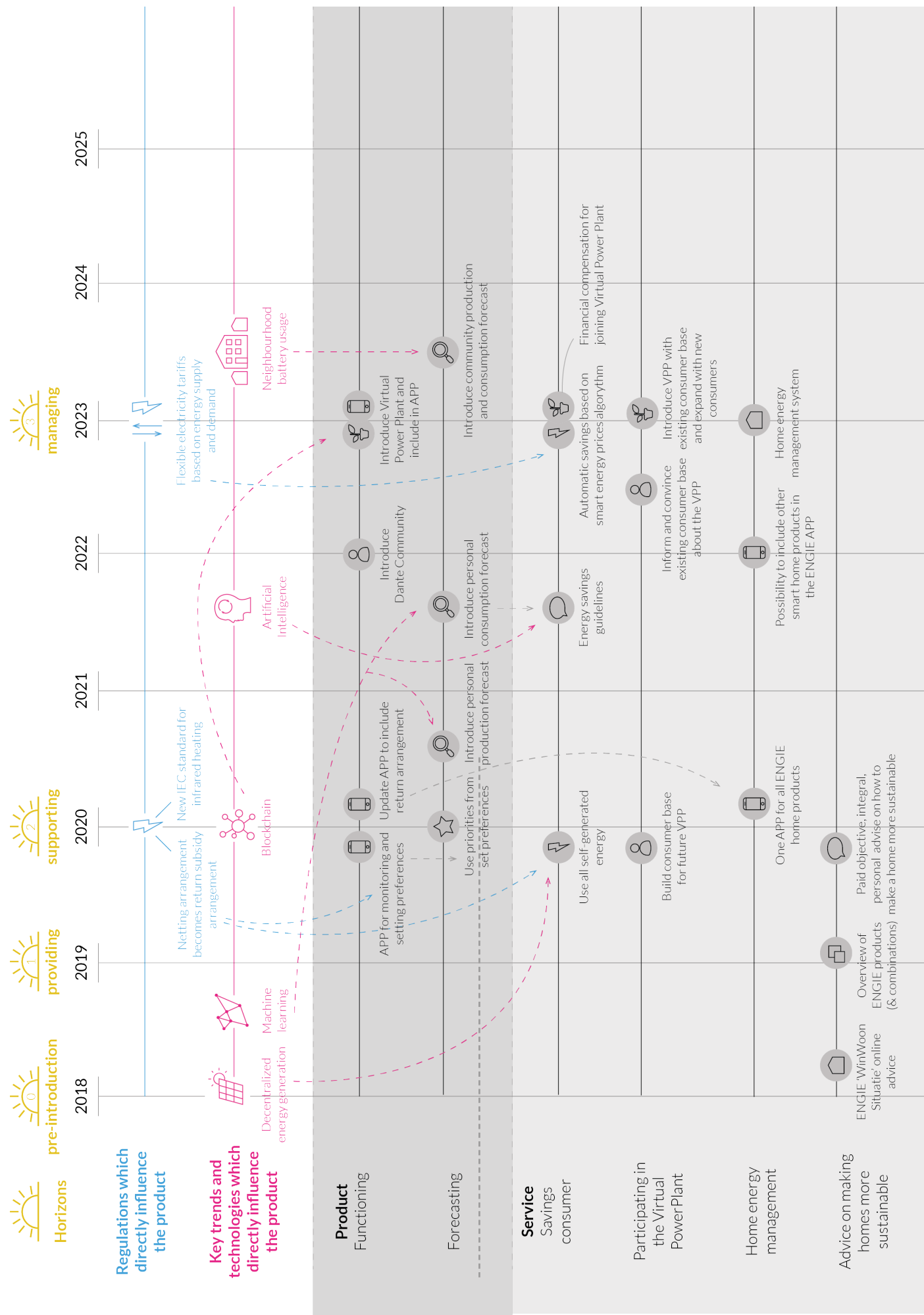
The market and technology trends are described as they might present opportunities and threats for the Dante. On one hand, new values and technologies can increase the demand for the product and can improve the functioning as well as the connection to user behavior and needs. On the other hand, new market trends and technologies can also result in a decrease of demand due to different consumer needs and desires or the appearance of new competitors. The most important trends are plotted on the roadmap. The selection of trends is based on creative trend research, a technique that combines strategically scanning the environment and intuitive observations (Simonse, 2017). Over time, it is important to scan new trends and see if presented trends should be moved along the timeline in order to respond at the right time.

### Introduction among different market segments

The roadmap shows the overall introduction plan of Dante, including necessary steps like establishing a factory for production and the application of the Virtual Power Plant. At the same time, it indicates the market entry per segment. For the defined market segments, the roadmap presents the time of introduction as well as the specific positioning and how this positioning possibly changes over time.

<< Figure 5.8. Introduction roadmap of Dante





### Product roadmap

Just like the introduction roadmap, the product roadmap aims to create a response to future challenges (Simonse, 2017). In this case, the roadmap is focused on the development of the product and service rather than the introduction, see figure 5.9. It is therefore only about the housing market.

### Horizons

The three horizons are the same as presented at the start of this chapter and as displayed in the introduction roadmap. Again, the horizons form future destinations for the functioning of the product and service.

### Regulations and trends

As the regulations and trends are plotted in the introduction roadmap, repetition is minimized. This product roadmap includes just the regulations and trends which directly influence the product Dante itself. This enables the roadmap to be more detailed.

### Product

The product Dante will be developed over time, to smoothly fit future consumer needs as well as technology applications and regulations. The product roadmap presents new functions like production forecasting, neighbourhood consumption forecasting and the Dante Community, but also indicates when the management system and associated APP needs an update to include new functions and electricity prices.

### Dante Community

The introduction roadmap shows the introduction of a Dante community. This is a digital network of consumers owning a Dante panel. The idea of building a community is based on the successful launch of the SonnenBatterie in Germany, Austria and Switzerland (Sonnen, 2019). The so called SonnenCommunity shares power surpluses with one another, also see Appendix C.

In The Netherlands, peer to peer, local energy is increasingly popular and more and more organizations respond to this trend. For instance, the new energy supplier PowerPeers, offering the purchase of green energy from other consumers, such as friends or family. (PowerPeers, 2019). Hence, sharing energy with other consumers is not recommended as a first step for the Dante community. As Dante is a new product, being a part of this community will be interesting for pioneering consumers as they can share experiences. Later on, when ENGIE can use the Dante panels as a Virtual Power Plant, it provides opportunities to show the impact made by the community and give users the feeling of involvement, connectedness, education and fun. These feelings are especially important for less innovative consumers (Mourik, 2018), which will purchase Dante when this is financially attractive. Although not specifically examined, one of the questioned pioneering homeowners mentioned the desire for a community within the acceptance phase of Dante.

*"If only a limited number of people have this product, then I would also find it fun and important to follow this community and the development. Giving feedback or learn about what you are doing. (..) and to exchange experiences."*

### Service

The service row in the product roadmap represents the service which ENGIE will offer, seen from the consumer perspective. Hereby, four main themes are presented; savings for the consumer, the introduction of the Virtual Power Plant, the steps to apply a complete home energy management system and the advice which ENGIE can offer on making homes more sustainable.

<< Figure 5.9 Product roadmap of Dante - Housing segment

In the product roadmap, different functionalities of Dante are presented. The most important functionalities are briefly described and the applied technologies are presented in figure 5.10.

#### Personal production forecast

The personal production forecast gives users insight into the estimated short-term self-generated energy and hereby manages their expectations. In order to provide a personal forecast, Dante can use existing data of energy production and personal data of prior self-generation, together with the weather forecast to make a detailed prediction. To combine and compare the different data, machine learning can be used. This technology allows machines to learn from accessible data and experience to optimize the algorithms (Marr, 2016; Mitchell, 2006). The aim is to create an accurate predictive model, based on supervised learning, which models relationships and dependencies between input data and target predictions (Iriondo, 2019).

#### Personal consumption forecast

The personal consumption forecast is a function which allows ENGIE to optimize the functioning of Dante, both as an automated heater and energy storage. Linking the predicted consumption to the predicted production of energy, both personal and communal, and weather forecast, the user gains can be maximized in terms of financials and comfort. Next to this, it also provides insight into the users consumption patterns. Therefore, the users can actively change their behavior if they are willing and able to do so. At the same time, ENGIE increases their understanding of consumer energy

consumption by analyzing the anonymous data. This information could be used for further development of the Dante product and corresponding services. Again, to examine and compare data to discover patterns and explore nuances, the machine learning technology can be used.

#### Energy saving guidelines

Dante can play a role in actively managing household energy and heating, but really acting sustainable and reducing the energy bill also highly depends on the behavior of residents. Therefore, Dante can propose energy saving guidelines to users that are willing and able to actively work on this. Artificial intelligence can be used to provide the user with guidelines. Here, artificial intelligence is more applicable than machine learning as the guidelines are ideally not a repetitive motion but rather an adaption to different situations (Iriondo, 2019). Hence, in case the artificial intelligence can not be applied yet, basic guidance could be provided by linking machine learning to guidelines and personal patterns.

#### Virtual Power Plant

With big data and blockchain technology ENGIE can manage independent Dante panels. The technology provides the algorithms to aggregate separate Dante panels and to anonymize these. A group of Dante panels can thus together, act as a Virtual Power Plant and help to stabilize the electricity grid. ENGIE's role is to connect and manage the independent, small assets, see figure 5.12, and to provide them as one large capacity to TenneT, the transmission system operator. The weather forecast makes it possible to smartly manage the Virtual Power Plant up front.

Figure 5.10. Functioning of Dante >>

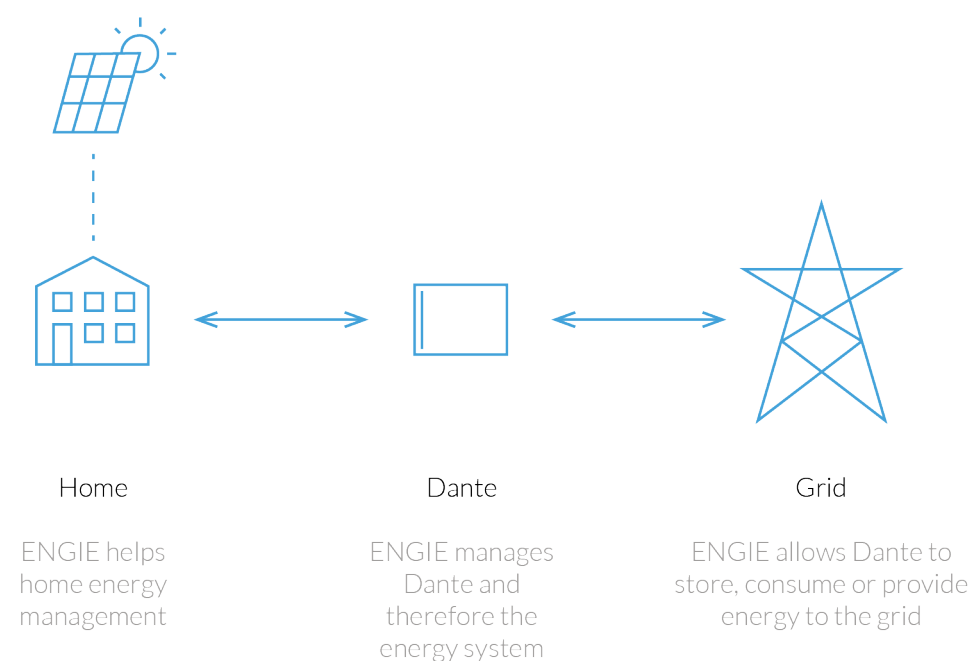
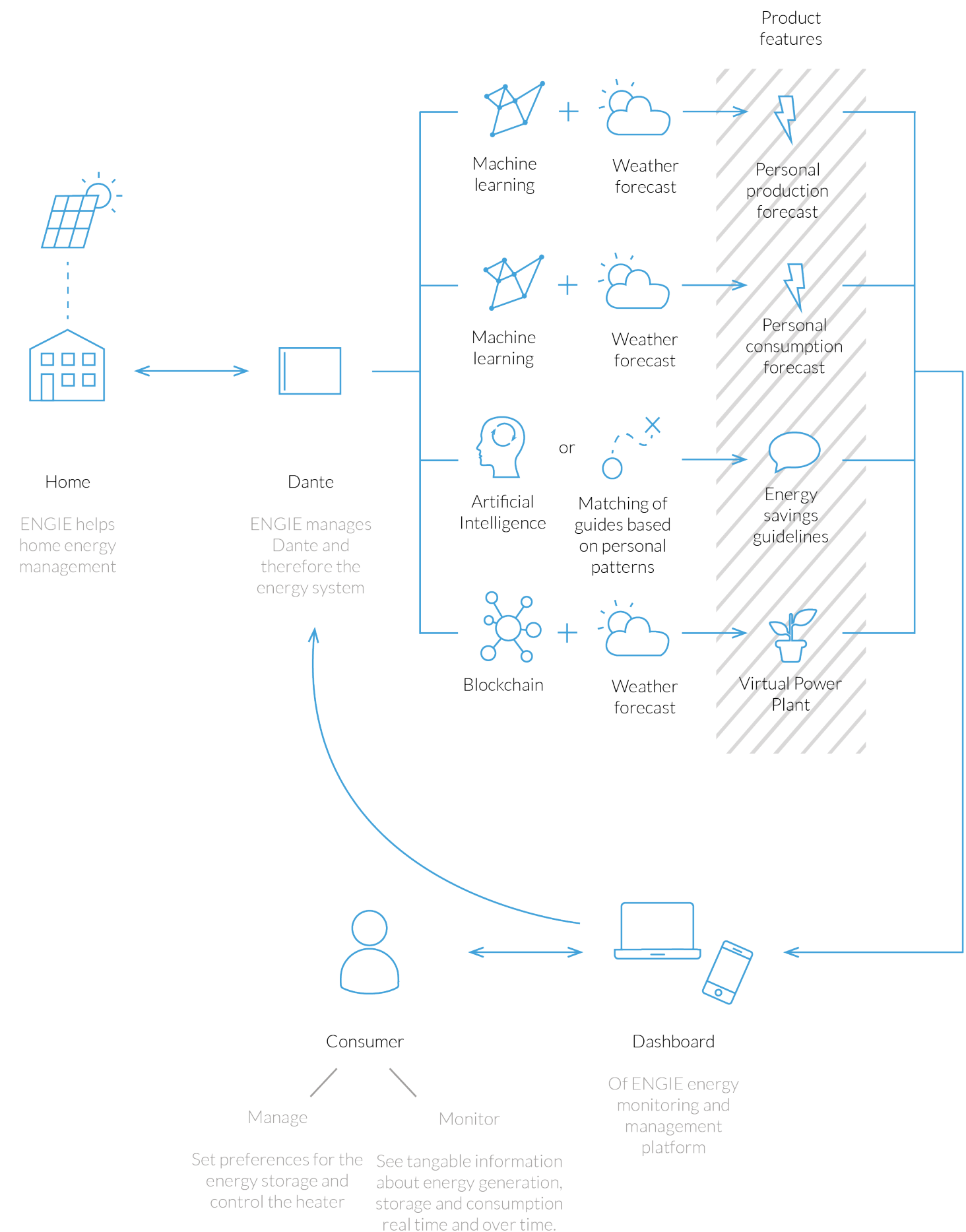


Figure 5.11. Dante providing home management and stabilizing the net





## CONCLUSION

### Recommendations for Dante

Based on the consumer interviews with pioneering homeowners, recommendations about the functions and design of Dante are formulated. In terms of functionality, users value the energy storage most and see the infrared heating as a nice additional feature. The users generally do not desire control over the battery. This could be automated to function optimally, as long as the users can monitor the product. This is also the case for using the energy storage as Virtual Power Plant. Conversely, users would like to control the infrared heater themselves. Hereby, it is important to not only provide an application, but also to support physical control. The infrared heating, as well as the appearance, can form a barrier for the placement of Dante. At home, people often want to mount Dante to the ceiling and do not want the panel to stand out, but rather to go unnoticed and blend in with the interior. The possibility to personalize the product is therefore not seen as an unique selling point. When placing the product in the bathroom, the appearance of Dante as mirror can be desired as this adds value by providing an extra function. Although the energy storage of Dante is considered to be a small capacity, pioneering homeowners would already use it for optimizing their own energy consumption, making sure they can use all their self-generated energy. Regarding the business model, pioneering homeowners prefer to purchase the product instead of leasing it based on a service contract.

### Introduction plan

The developed introduction plan for Dante consists of the formulation of three horizons, which form the basis for two roadmaps. The introduction roadmap and product roadmap describe how the introduction and product development of Dante will respond to new regulations, technologies and market trends. To summarize, the introduction plan follows three steps, based on the defined three horizons, in which the introduction targets different consumers and new functionalities are added.

Dante as means to use all the self-generated energy

Dante is introduced among early adopters, defined as pioneering homeowners which apply sustainable measures. Dante supports the homeowners by allowing them to use all their self-generated energy.

ENGIE's role is to develop the product and sell the product with a service that optimizes the consumption of self-generated energy. Including the weather forecast and predictive energy generation algorithms, ENGIE is able to use the home energy storage smartly in the moment and up front.

Dante as home energy manager

In the short term future, presented by the change of the netting arrangement in The Netherlands, Dante will appeal to a bigger market, including the majority of the private housing market as well as the early adopters in the social housing and utility buildings market. Dante can increase its value by providing services as a home energy manager, which ensure the optimization of functioning as heater and energy storage. This helps consumers to reduce their energy bill and to become more sustainable.

ENGIE's role is to manage the energy storage and household energy consumption smartly. Integrating weather forecasts as well as personal production and consumption forecasts using machine learning enables Dante to function optimally.

Dante as Virtual Power Plant

At the moment that flexible energy prices are applied, Dante can adopt the additional functionality as Virtual Power Plant. The current energy grid needs stabilization due to the fluctuations caused by the increasing amount of sustainable energy. When a large number of Dante panels can be connected to function like one big capacity, they can subtract or supply energy at the right moment to stabilize the grid. This could be financially attractive to both consumers and ENGIE.

ENGIE's role is to connect and manage the big amount of Dante panels, all presenting small, independent assets which were otherwise not useful. In order to do so, big data and blockchain are used to anonymize and manage the Dante panels.

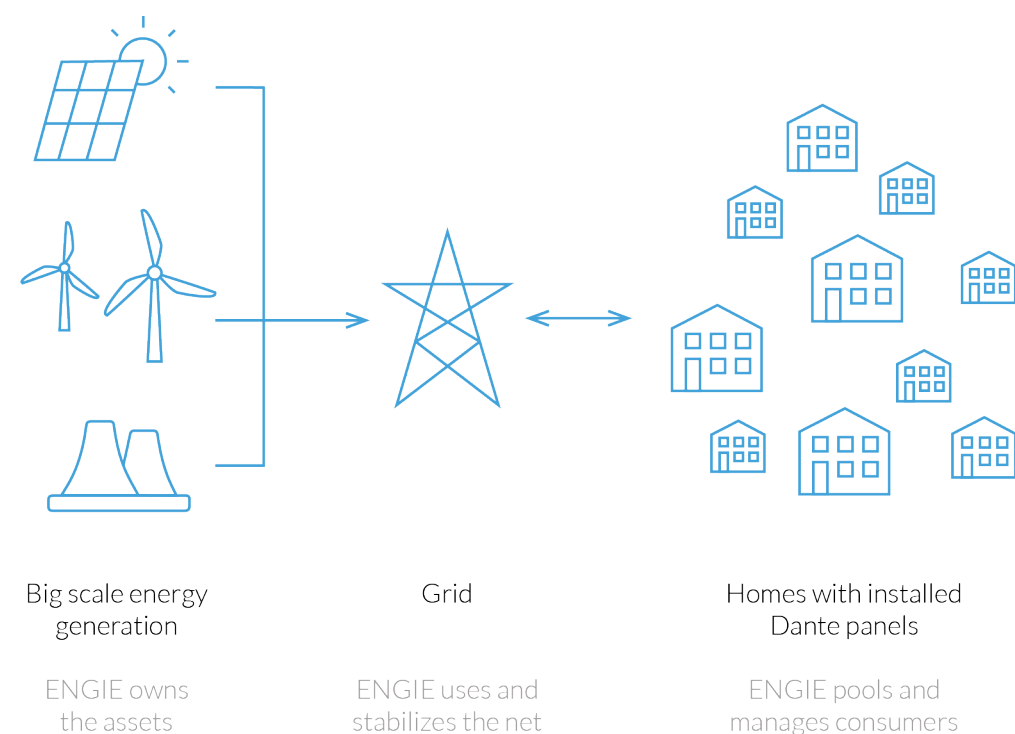


Figure 5.12. ENGIE's role in stabilizing the electricity grid



## 6 IMPLEMENT

In this chapter  
6.1 Business models  
6.3 Introduction abroad  
6.3 Implementation within ENGIE

This chapter discusses the implementation of the designed introduction and product roadmap. It explores the implementation within ENGIE and suggests suitable business models. As the design is especially focuses on The Netherlands, this chapter also looks into the introduction of Dante abroad.



The introduction and product roadmap of Dante show how Dante will evolve over time. Hence, it could be beneficial to apply different business models as the functions and features of Dante change. This chapter suggests business models for Dante as a product and a service, tuned to the different phases of the introduction and product development.

**Business models for Dante**

For each of the three horizons, a business model is suggested and elaborated upon. Horizon one, in which Dante is introduced to pioneering homeowners forms the starting point and applies a single purchase business model. The ideal business model is applied in the third horizon, in which a subscription based business model supports Dante as home energy manager and Virtual Power Plant. Lastly, the business model of horizon two is discussed. This model forms the transition from a purchase to a subscription based business model.

**H1: Business model for the introduction**

In the first horizon, Dante is introduced among pioneering homeowners. Targeting this market segment, the single purchase model would fit best. This means that the consumer pays for the Dante at the moment when he/she actually gets it. This is desired as pioneering homeowners have a strong preference for directly purchasing products and also have the financial means to do so. As ENGIE currently has a webshop, but no physical retail stores, it is necessary to partner up with a retail store which can sell Dante. Especially as users want to gain experience with infrared heating, it is key to demonstrate the product in real life in a shop or experience center. A suitable partner would be BCC, which is known for sharp prices and good service. BCC is an electronics shop which owns 64 stores in The Netherlands and currently has a big product range of climate control products, like electric radiators, fans and weather stations. Figure 6.1 presents the overview of the proposed single purchase business model for Dante.

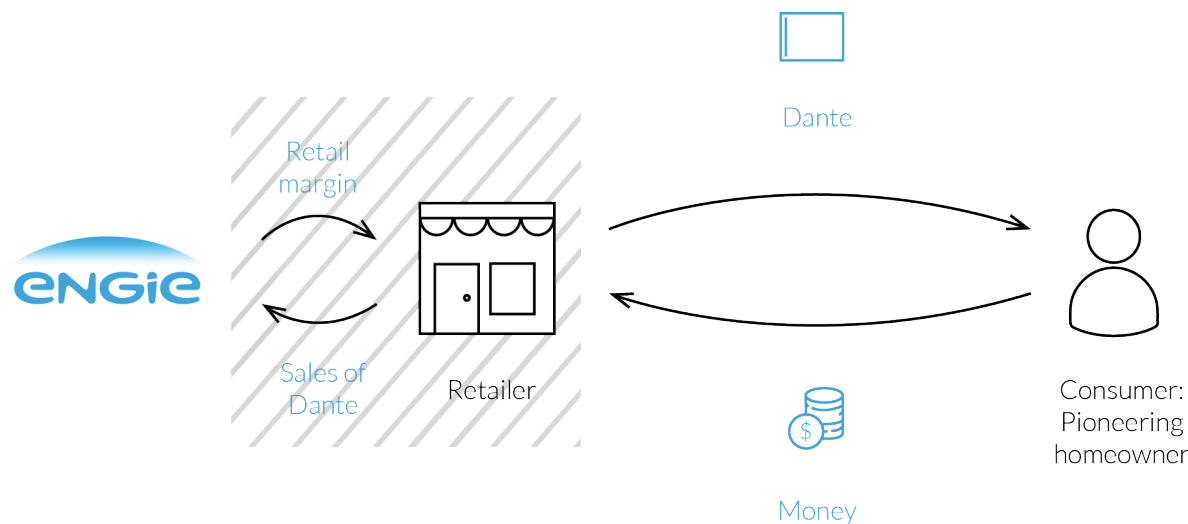


Figure 6.1. Horizon 1 business model: Single purchase

**H3: Business model for the Virtual Power Plant**

In the third horizon, Dante acts as home energy manager and Virtual Power Plant. This means that the consumer obtains a service rather than just a product. This service manages the home energy and makes it possible for the energy storage to act as a Virtual Power Plant. A subscription based model is therefore most suitable as service functions as management could be offered and exchanged. The advantage of a subscription model is the sustainable, recurring revenue stream for ENGIE and the consumer bonding. The collaboration with the established retailer or a new set up of an ENGIE experience center is still needed in this phase, as consumers do want to gain real life experience with the product in a show room. Figure 6.2 presents the overview of the proposed subscription based business model for Dante.

**H2: Transition towards the subscription model**

The second horizon, in which Dante acts like a home energy manager, functions as a transition period. In this period, the single purchase business model transitions to the former described subscription based model. Special attention should be paid to the existing customer base in order to make them migrate to the new business model. The existing consumer base, owning a Dante panel, can see the Virtual Power Plant as an add on and could be persuaded to participate in the Virtual Power Plant by improving the value or by offering social, emotional or financial incentives.

Learning from the software industry (Petthey, 2018; Wurster, 2018), where business models transitioned from traditional licenses to subscription based models, a few guidelines and targets can be formulated:

- 1) Not all consumers have to migrate
- Not all consumers of the existing consumer base have to migrate to the new subscription offering. Or at least, not all at once. It is advised to set a timing

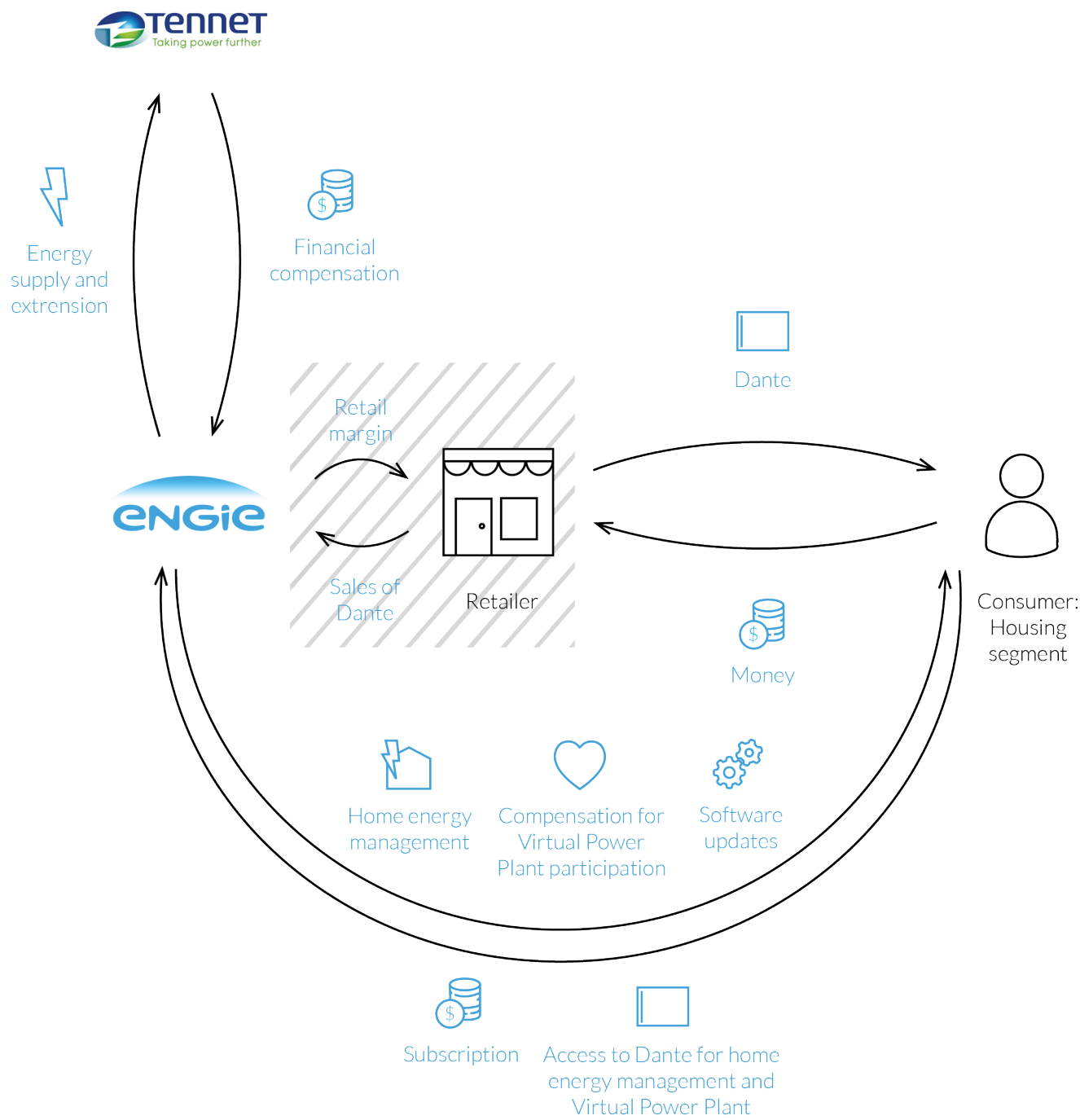


Figure 6.2. Horizon 3 business model: Subscription

## 6.2 Introduction abroad

for the conversion of 50% of the existing consumer base. This helps and to keep track of financial goals and assumptions. Next to this, Dante could still be sold using the single purchase model, next to the new subscription. This might attract different consumers and can help less innovative consumers to adopt the product.

2) Make migration attractive and simple

To boost the transition, make the migration to the new model attractive by offering additional features and new software updates with a subscription-first strategy. Also make it easy for consumers to switch. Offer a try-before-you-buy program in which consumers can experiment with Dante as Virtual Power Plant for a few months, or adding modular features which could be applied as subscription-based add-ons to existing as well as new consumers.

3) First move new consumers and contracts

A subscription model lowers the financial barrier of an entry-level pricing and therefore increases the adoption of a new product like Dante. Big contracts with (social) housing corporations should migrate first, to reassure revenue streams and ensure a minimum amount of Dante products which could be used as Virtual Power Plant. Also new consumers should be stimulated to go for a subscription model right away, as this saves resources for migration for both ENGE and the consumer later on.

4) Improve and communicate the value

By providing extra features or a social or financial incentives, the value of the subscription based model can increase. This is also easily done making the subscription offerings more flexible than the single purchase offering. At the start, it is key that ENGIE demonstrated this value of moving to the new business model to consumers, but also to the sales teams and partners. For consumers, it is important to understand the improved value and to know the actions needed to migrate. There should not

be any ambiguity as a complex new offering deters consumer. For sales, it is important to understand the new offering of Dante end to be reassured of the growth potential and profit. Partners would like to receive information about the changes for the value chain. Of course, they do not want to reduce their own revenue and therefore ENGIE should state how they can benefit with the new subscription model.

### Business models for different segments

When introducing Dante in different segments, the business model has to be adjusted. Where single purchase and subscriptions are suitable for the housing segment, other business models could be more profitable and successful in other markets. Especially targeting the utility buildings segment, it is expected that a subscription model would be best in which the organization pays ENGIE for the functioning of Dante as well as the software and management. This contract thus comes with a service agreement.

ENGIE is a multinational company and therefore has the possibility to launch Dante in another country. This is beneficial and even considered as a better option compared to the first introduction of Dante in the Netherlands, as other countries like Germany and England have different regulations which make energy storage and infrared heating more attractive (ENGIE & Navigant, 2018). This chapter presents the most important factors for examining whether Dante could be successfully introduced in other countries.

### Governmental incentives and standards

Both governmental incentives and established as well as developing standards can stimulate or discourage the introduction of Dante.

#### Governmental incentives

In this case, governmental incentives can be split into financial compensations and regulations. Financial support, like subsidies and rewards, or penalties can directly influence (purchase) behavior and as these can differ in different countries, they present both opportunities and threats for the introduction of Dante elsewhere.

The regulations, both legal and unspoken, have a major influence on the attractiveness of Dante. The financial attractiveness of the energy storage of Dante is higher in other countries as there is no netting arrangement or return subsidy for self-generated energy. Also, flexible energy prices play a role. For the heating function of Dante, the building standards and applied calculation methods are especially important. Appendix G presents the most important regulations applied in The Netherlands. Creating such an overview for other countries will help to estimate the potential of Dante elsewhere.

#### Standards

The energy transition presents many challenges and already, lots of (partial) solutions are developed. Although the different solutions can function side by side and complement each other, the consumer

might benefit from standardization. This is the case for both heating and energy storage. Take energy storage for instance, there could be a neighborhood battery, a home energy system or a hydrogen solution. As long as there is no standard created by the market, a committee or regulations (Wiegmann et al., 2017), the consumer might refrain from making an investment in a product like Dante. It is therefore important to look at the state of the standardization process of the country and estimate the chances to win or interrupt a market battle (de Vries et al, 2007).

### Climate and weather conditions

The climate and weather of countries can vary greatly according to the location of the country and the altitude. This can affect both the efficiency and desirability of the energy storage and heating function of Dante, making the product more attractive for certain geographical areas.

#### Self-generation of energy and energy storage

The climate and weather conditions have a great influence on the profitability of self generation of energy. For Dante, especially self-generation by means of solar panels is interesting as these can easily be applied by consumers and companies. For solar panels, the climatic conditions determine the effectiveness and profitability. The weather conditions have a little impact on the average profitability. Hence, weather conditions do have an effect on the electricity production and the short-term growth of the solar market (Lamp, 2017). It seems logical that consumers and companies are more willing to invest in solar panels in a country with a suitable climate and lots of sun hours. In that case, they can take advantage of the sunshine, which is a direct input for solar electricity production and a stimulus for the purchase of Dante.

#### Infrared heating

At the other hand, for the heating function of Dante the climate can present a barrier. Nice weather



6.3 Implementation within ENGIE

usually means that consumers do not have the need for infrared heating, or at least, will not use the infrared heating a lot. Therefore this function is less valuable to consumers, which can negatively impact the value proposition.

Consumer demand

The consumer demand for a new product like Dante is hard to estimate for an international market. Especially the alignment with consumer job to be done and cultural dimensions are expected to be

Job to be done

In different situations, it is key to understand the consumer needs, values and behaviors and to translate these to 'jobs to be done' (Christensen et al., 2007). These could be similar to those of target groups in the Dutch market. However, if the situation results in different jobs to be done or other motivations for the same jobs, it is suggested to position Dante in a different way. Additionally, the product might also require a different functionality. For example, look at the energy storage demand in Australia, a country with lots of power outages. The need for an energy storage system is clearly present and based on the need to be independent and to have certainty. At the same time, the consumers might not want to participate in a Virtual Power Plant, as they prioritize their personal energy security. Dante could be successfully introduced in this market with a positioning focusing on independence and without the aim of using Dante for social benefits. In foreign markets, Dante should thus be adopted to fit the needs of foreign consumers.

Cultural dimensions

The cultural dimensions of Hofstede (2011) can be applied to general business. As the dimensions present a model to compare and indicate cultural differences, it can be used for the introduction of Dante. Hereby, the dimensions individualism, long term orientation and uncertainty avoidance are especially interesting. They can help to formulate the right positioning of Dante and to align the marketing strategy with the culture and motivations for adoption.

The most important dimensions for Dante are presented in table 6.1 (Hofstede Insights, 2019). The values of the Netherlands are displayed as this presents the benchmark of the current project. Values of Germany, the UK and Australia are presented as these may present promising markets and last, the dimensions of France are presented as ENGIE is a French multinational. Looking at the values, the dimension of individualism tells that the UK and Australia are highly individualistic. The positioning of Dante can thus be to provide certainty to oneself or immediate families. The other countries are less individualistic. The positioning and marketing can focus on the private as well as social benefits. Here, the establishment of a Virtual Power Plant is more likely. The dimension of long term orientation gives insight into the encouragement of change and preparation for the future. It is noticeable that especially Germany scores high on this dimension, indicating that German consumers are willing to save for the future and focus on long term results. This is beneficial for the investment decision of Dante. In other countries, marketing should clearly communicate the short term benefits of Dante. The last important dimension, the uncertainty avoidance, presents how people deal with uncertain situations and if they try to avoid these. As the current heating and energy context present uncertainty in the Netherlands due to changes and the lack of standards, this could affect consumers and their purchase behavior. This dimension should thus be examined if the context for the product in the specific country is known.

Interesting countries for introduction

Like discussed in chapter 3 and 4, the US and Australia have more developed energy storage market and within Europe, Germany and the UK are currently in a leading position when it comes to the adoption of energy storage and infrared panels. These countries might thus be suitable for the first introduction of Dante. To be sure, market and consumer analysis should be conducted and a close collaboration with local ENGIE offices should be established to introduce the product.

Country	IDV individualism	LTO long term orientation	UAI Uncertainty avoidance
Netherlands	80	67	53
Germany	67	83	65
United Kingdom	89	51	35
Australia	90	21	51
France	71	63	86

Table 6.1. Cultural dimensions (numbers obtained from Hofstede Insights, 2019)

This chapter draws attention to the future steps of branding, further product development and the organizational challenges for implementation of the introduction plan within ENGIE.

Branding

Dante can be introduced as a new product of ENGIE, as a new brand endorsed by ENGIE or as a new, independent brand, see figure 6.3. This decision is called the brand extension decision. In case Dante is introduced by a new brand, possibly sharing the products name, the brand name could be changed.

Brand extension decision

Brand extension is the use of an established brand name for a new product class (Aaker & Keller, 1990). When Dante is introduced by ENGIE, this represents a brand extension into heating and energy storage. This brand extension is beneficial for Dante as introducing a new product under a known brand reduces the risk of new product failure and provides the opportunity to exploit brand equity (Bhat & Reddy, 2001). However, the fit with the brand association of ENGIE is key for consumer acceptance (Broniarczyk & Alba, 1994; Salinas and Pérez, 2009). For Dante, this means that the new product should not naturally fit the current ENGIE products, but rather the perceived brand association of ENGIE. It is therefore recommended to examine the evaluation of the brand extension among pioneering homeowners, the innovative consumers of Dante, before introducing Dante under the umbrella brand of ENGIE.

ENGIE currently does not directly sell or produce consumer products, but rather offers these as a part of an integral solution or service, see Appendix J. Additionally, the company is mainly known as a supplier of electricity and gas among consumers. It is therefore expected that consumers do not easily associate the product with the ENGIE brand. In that case, both Dante and ENGIE are better off by introducing the product as a independent brand as none of the brand perceptions can be influenced by the (former) actions of one another. However, when the brand is introduced and the product is accepted, ENGIE can choose to endorse the brand when there is a significant amount of users. An endorsement helps to scale-up the product.

Brand or product name

For the brand or product name of Dante, it is suggested to adopt a different name. The current name 'Dante' can be easily associated with the Italian poet and his famous work Dante Inferno, which describes the journey through Hell. As this can cause negative associations, choosing another brand/ product name should be a part of the future branding process, together with designing a logo and deciding on marketing activities. Aurora, a name suggested by the design company Spark (2018) currently suits the product better and the name itself is expected to have no direct positive or negative associations. This name is especially interesting if Dante can function as light, since Aurora is the Roman goddess of the dawn. The link to the goddess can provide a nice background story. Additionally, a metaphor can be used explaining the product is especially valuable for the transition period between day and night, when energy is not necessarily generated, but the demand for energy and heating is often there.

Product development

The previously mentioned recommendations for the product design of Dante should be included in the development of the product. The product design should be unique but very simple. Consumers should intuitively understand how the product works. This means that there is still a lot of work regarding the actual product design of Dante. Next to this, attention should be paid to testing the product, educating the consumers and scaling up.

Independent testing

Dante currently lacks formal independent testing. Although ENGIE, with support of the French headquarters, is running technical tests to see if the products technically functions as required, it is key to do independent consumers test. Consumer tests will provide insight into how consumers will actually use Dante in real life and will help to optimize the product and service design. The consumer test will help to support claims and to verify the benefits (Schneider & Hall, 2011)

Characteristics

New ENGIE product

- Should fit with brand association
- Using known ENGIE brand
- Exploit brand equity

New brand endorsed by ENGIE

- Use consumer base of ENGIE
- Endorse brand after a significant amount of early adopters have accepted the product

New independent brand

- No association with ENGIE
- Possible collaboration with ENGIE

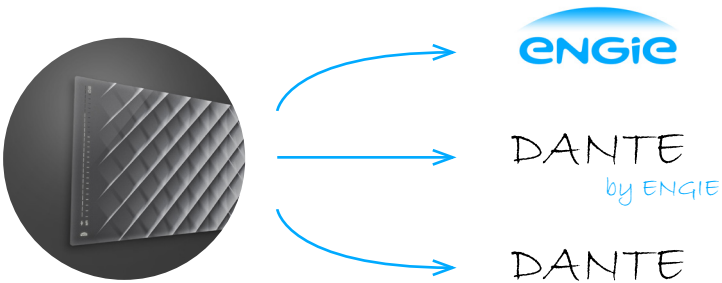


Figure 6.3. Brand extension decision

## CONCLUSION

### Consumer education

Dante is a new product and requires consumer education for two reasons. First, Dante defines a new category of smart home products which manage and store energy. Consumers have to manage their expectations and create an understanding about the product. Second, the functioning of Dante as infrared heater needs to be understood by the consumers. As this fast, radiation based heating functions in a different manner than the high temperature radiators and low temperature heating systems, most consumers need to adapt their behavior. This mainly concerns turning on the heater when warmth is desired and turning it off when there is no need for the radiation beam.

### Scaling up

Defining the time to scale up is hard, but looking at the introduction plan, the scale up of Dante takes place when the regulations change. ENGIE should thus have a good product and introduce it at the time, also when the product is not perfect yet. For consumers, it is important that the quality of the product remains equal (Schneider & Hall, 2011) during the scale up of the product. When expanding from serving a small market to a mass market, the future production plant of Dante should be able to support this growth.

### Organizational challenges

Introducing a new product is not as easy as it seems. There are many organizational challenges involved in new product introduction. For Dante, the main challenges concern involvement and training of ENGIE employees as well as establishing the right distribution channels.

### Involving employees in the development

The development of Dante should involve marketing, sales and public relation employees within ENGIE. These employees can provide valuable feedback for the launch of Dante and should align their activities to enable a fast and successful product launch. Within a big organization like ENGIE, multidisciplinary teamwork can be hard to manage and execute.

### Training employees

Before the product launch, training the line workers, sales force, customer care and management is key to create an understanding of Dante in the organization and to be able to communicate it to the world on these different levels. Taking the time to teach implementation in the organization helps to create understanding and to build trust (Hackett, 2007). This trust speeds innovation and execution of the implementation of Dante.

### Distribution channels for introduction

To reach pioneering homeowners, see figure 6.4, different distribution channels could be used. These channels are connected to the brand and form a basis for interaction between the brand and the consumer. The brand extension decision therefore impacts the choice for suitable distribution channels.

As ENGIE does not have own shops and experience with infrared panels is desired, working with a retailer is necessary. Retailers can provide to experience the product and know how to reach the consumers and will therefore be able to target pioneering homeowners in an effective way. The webshop of ENGIE or the new brand can also be a channel to present and sell Dante.

### Business models

As the introduction and product features of Dante change over time, the most ideal business model also changes. For the introduction among pioneering homeowners, a single purchase business model is most suitable, in which the consumer purchases Dante. Later on, when Dante will act as home energy manager and Virtual Power Plant, a subscription based business model fits better as ENGIE provides additional services. Features like personal energy management, participating in the Virtual Power Plant and software updates can thus be seen as additions for which the existing consumer base and new consumers will transition to a subscription model. The subscription model allows ENGIE to connect the different Dante panels, to create a recurring revenue stream and to build consumer relationships.

### Introduction abroad

ENGIE is a multinational company and can therefore introduce Dante in another market. This is especially interesting as The Dutch market has to deal with barriers for both functions of Dante: infrared heating is not yet accepted by the majority and energy storage is not financially attractive. By examining whether another country is suitable for the introduction of Dante, a few aspects should be taken into account. First, the governmental incentives and standards can stimulate or discourage the application of Dante. Second, the climate and weather conditions can influence the need for storing self-generated energy and using infrared heating. Third, the 'jobs to be done' should be defined and adjusted to the consumer needs, values and behaviors as well as to the culture. The introduction of Dante elsewhere should thus be validated by consumer and market research. At this moment, Germany and the UK present good conditions for the introduction of Dante in Europe.

### Implementation within ENGIE

For the introduction of Dante and the implementation of the introduction plan, attention should be paid to branding, further product development and organizational challenges. Dante can be introduced as a new ENGIE product, an endorsed brand or as a new brand. As ENGIE currently does not produce or sell their own consumer products, setting up a new brand for Dante seems the best option. A collaboration with ENGIE could be established to make use of the consumer base of ENGIE and later on, ENGIE could decide to endorse the brand when there is a significant amount of users. This could help to scale up the product and to exploit ENGIE's brand equity. When setting up a new brand, it is suggested to take another look at the product name 'Dante'. The recommendations for the functioning and appearance of Dante, as presented in chapter 5, should be implemented in the further development of the product. Independent testing should be done to validate the technical functioning as well as the consumer experience. Next to this, consumer education is important for the new product and the timing of the scale up can be defined by the application of more attractive regulations in The Netherlands. For Dante, the main organizational challenges concern involvement and training of ENGIE employees as well as establishing the right distribution channels. The involvement and training of employees is necessary for the alignment of development activities as well as sales of the new product. Finally, new collaborations should be formed in order to reach and target the consumers as ENGIE currently does not directly sell consumer products in shops or experience centers.



Figure 6.4. Dante applied at home



## REALISTIC EXPLORER

"It just needs to be good and comfortable."

- For the renovation, we actually mention energy or sustainability.
- Applying sustainability with neighbours is more or less also cheaper. Also in terms of nice to do things.

Own interest  
Advise seeker

## INDEPENDENT WORLD IMPROVER

"With the installed solar panels, we produce more energy than we consume ourselves."

"I want to be self-sufficient and want to use our own energy as much as possible. I actually want to store energy to use it later on."

For the world  
Information seeker



"I also wanted to insulate the floor. So I asked specialists for advice twice, but it is not possible in this house."

## THIS IS ME

The Realistic Explorer is willing to innovate and improve his/her home, but does not know where to start. They are not interested in innovations or improvements in, on or at home, but try to involve in these matters when a renovation or renewal is desired. Sustainability is not really important to them but is seen as a good side effect, a benefit when chosen for a certain measurement.

### MY GOAL

The Realistic Explorer aims to improve his/her home. This could be based on the desire for more comfort, to reduce energy/gas consumption or due to a logical renewal. If pointed out by others, sustainability could become a consideration in the decision making process. Naturally, this is not deliberately the case.

"A neighbor got solar panels and we participated. It was a small effort, and of course, we could make a better deal. That has turned out."

"We have purchased an airco. That is not environmentally friendly, but it is very comfortable."

# 7 CONCLUSION & DISCUSSION

In this chapter

- 5.1 Conclusion
- 5.2 Limitations and recommendations
- 5.3 Personal reflection

This final chapter presents a brief conclusion of the project. Limitations for the research and the implications of the introduction plan are specified. Lastly, a personal reflection on the project is presented.



# 7.1 CONCLUSION

The purpose of this graduation project was to understand how the product Dante could be introduced to the market to create value for both ENGIE and its future consumers.

Dante is a product which can function as an infrared heater as well as an energy storage. It is based on a new nano technology and the technical functioning of the product is proven. Opportunities for introduction of the product exist in the B2B and the B2C market. After exploring the competitive field and former market potential analyses, three market segments were defined as most suitable for the introduction; the private housing segment, the social housing segment and the utility buildings segment.

Extensive research was done to identify in what way the product could be introduced in these specific segments and what value the product has to deliver. Nine expert interviews were conducted, analyzed and integrated into strategies for the introduction of Dante for each segment. To realize a successful short term market entry, Dante should target the private housing segment and especially pioneering homeowners which apply sustainable measures in, on or at home. These consumers are willing to adopt an innovative product and can help to build example cases to stimulate the acceptance of Dante in other market segments. Later on, when the product is proven and energy regulations as the netting arrangement and energy tariffs in The Netherlands change, other market segments will grow an interest in the application of Dante.

## CONCLUSION REGARDING DANTE

Estimating whether Dante could enjoy a successful market entry, adopted by consumers is -even after finishing this project- very hard. The current application of Dante in the Dutch market is rather limited as the present energy regulations are disadvantageous making energy storage financially unattractive. Also the function of infrared heating is a difficult case as it only suits very specific situations and places in existing buildings with installed heating systems and it is rarely applied in new constructions due to mistrust and lack of experience. The combination of the two functions seems to offer a unique positioning but also complicates the placement of the product, both in real and in the head of consumers. In the future, I do see potential for the product, especially in new construction buildings, where Dante can provide either main or additional heating and energy storage to make homes comfortable and sustainable. Opportunities are also presented abroad, as the regulations as well adoption of infrared and batteries are more beneficial, improving the foundation for market success is bigger. Time will tell whether Dante can become a successful product, able to claim its place in the multiple -to be integrated and personalized- solutions for the energy transition.

To gain a deep understanding about the target group for introduction, eight pioneering homeowners were interviewed about deciding and applying sustainable measures and their opinion about Dante. This resulted in four consumer profiles as well as recommendations for the product design and functioning of Dante.

The insights gained throughout the project resulted in the design of an introduction plan. This introduction plan consists an introduction roadmap and product roadmap. The introduction roadmap describes which market segment to target and how this is in line with the regulations, market trends and emerging technologies. It defines the introduction and positioning in different market segments over time. The product roadmap demonstrates how Dante can develop from supporting pioneers in optimizing their own energy consumption from self-generated energy towards becoming a home energy manager . Eventually, the existing consumer base of Dante can be used to establish a Virtual Power Plant, which supports the public power grid by subtracting or supplying energy to stabilize the grid.

In conclusion, the choice for the private housing market segment and the corresponding roadmaps are the first steps towards applying the new nano technology and commercializing Dante.

# 7.2 LIMITATIONS & RECOMMENDATIONS

This chapter presents the limitations of the research and design as well as the recommendations for future research and the introduction of Dante by ENGIE.

## Limitations

This research offers an understanding of the application of Dante among consumers and the product launch of Dante within the new product development process. However, some limitations should be considered. The main limitations are discussed.

### Market segmenting and expert interviews

Market segmenting was done on the basis of exploratory research, former market potential reports and the competitive field rather than on the 'job to be done' (Clayton et al, 2012) due to the lack of knowledge regarding consumer values, needs and behavior. Another look can be taken to the segmenting, defining the market segments on jobs and including smaller discarded market segments, like the recreational market.

The expert interviews enabled the researcher to gain an in-depth understanding of the different market segments. The experts were retrieved from the researchers own network and . All experts worked within the housing, construction or design domain and . Although each market segment was presented by at least one expert, more expert interviews could be carried out to retrieve more information and reach an equal understanding of the different segments. This is especially the case for the complex utility buildings segment. For future research, it is suggested to conduct an equal amount of interviews to enlarge the understanding of the market segments and to compare the segments. The different expert interviews provided many different perspectives and insights. However, the large amount of data made the data analysis and communication of insights difficult. Although two researchers worked on the analysis, the overwhelming amount of information may have ensured that insights have been missed.

### Pioneering homeowner profiles

Unlike the analysis of the expert interviews, the analysis of the consumer interviews was solely performed by the researcher. Therefore, biased interpretations could arise as this analysis was not done with another designer, researcher or ENGIE employees. In order to increase the credibility an validity of the analysis and the corresponding results, an additional data analysis could be done.

Due to time constraints, only eight pioneering homeowners were interviewed. To increase the validity of the insights and the developed homeowner profiles, a greater number of interviews should be conducted. Hereby, it is especially important to test the profiling framework and the completeness of the profiles. Additionally, the profiles could be validated by a quantitative research, linking the qualitative results to quantitative statistics which can be used in the introduction and marketing strategy. Finally, a validation of the correctness of the profiles in other countries and cultures is desired as the profiles are developed based on Dutch consumers.

### Validation of the introduction plan

The three horizons and a first draft of the introduction roadmap were presented in an Innovation & Incubation team meeting, but a true validation within ENGIE and with early adopters is desired. Within ENGIE, the horizons framework as well as the roadmaps should be validated by different employees and departments. It is suggested to set up a meeting with a multidisciplinary audience. High management, employees of ENGIE B2C, marketing employees and ENGIE employees working on energy storage ideally validate the design. Consumer validation is desired especially regarding the redesign of Dante and the future functioning of the product and system as Virtual Power Plant. It is suggested to test these with early consumers and make use visualizations in this process.

## Recommendations

Some limitations presented are useful to indicate recommendations. Additional recommendations are briefly discussed.

### Introduction and development of Dante

If ENGIE wants to implement the design improvements for Dante and follow up the developed introduction plan, it is suggested to ..

### Application of the nano technology

Dante is the first product of the new nano technology. While the technology enables the material of Dante to function as infrared heating and energy storage, the nano technology can also make a material function as a solar cell or light.

Although ENGIE deliberately decided to not use the technology for making solar cells, due to the decreasing value of solar panels, the combination of a solar cell and energy storage presents a huge opportunity. This is a logical product combination, which consumers will understand and value. In the crowded solar panel market, it presents a clear differentiation and positioning. With the increasing demand for energy storage in the future, it is expected that this product can be successful if the purchase price is less than the purchase price of solar panels and batteries together.

### Future research

An opportunity for future research is to examine the value proposition design for really new products. Literature on market introduction and consumer research to validate value propositions is extensive. Yet, little research is done on testing the value and design of really new products, which consumers are not familiar with and of which a consumer demand might only arise in the future. Both theoretical and practical guidelines could be created to provide methods and techniques to test the future viability and desirability of really new products.

Lastly, future research could look into the market introduction of products that have multiple functionalities and therefore have to deal with different markets and competitors. Linking the characteristics of the market to different approaches for market entries could lead to the formulation of strategies for the successful introduction of products which provide multiple functions.



In this final chapter, a reflection on the graduation project, the process and the personal progress is presented.

## Reflection on the project results

A good solution or design brings together desirability, feasibility and viability (IDEO, n.d.). Missing one of these aspects makes innovating riskier and more costly. The result of this project is therefore briefly assessed on these three criteria.

**Desirability** | Desirability indicates if an innovation provides a solution which consumers really need or want.

The desirability presented the main focus of this project and is therefore the basis of the introduction roadmap. How Dante can provide value to future consumers is extensively examined and described. I therefore believe that Dante, if positioned in the right way, presents a valuable and desirable solution for consumers in the different market segments. For ENGIE, the introduction roadmap provides a clear view on the introduction of Dante and the further development of the product and supporting service. The introduction roadmap is seen as desired as it will be used in future decision-making regarding the launch and product development of Dante.

**Feasibility** | Feasibility indicates if an innovation is actually possible in the foreseeable future and how this builds on strengths of the current capabilities and resources.

The technology of Dante is already developed and being tested. The product is therefore technologically feasible. Also the proposed service is feasible, as it uses existing data gathering and analysis techniques as well as known back-end development. The machine learning technology used for the creation of optimal energy consumption and application of personal preferences needs to be developed. In terms of product design and B2C sales, ENGIE has to acquire knowledge and experience, establish partnerships or contract companies like design offices and sales channels.

**Viability** | Viability indicates if an innovation can become a sustainable business model.

The economic viability of Dante in the short term is hard to estimate without fully calculating business cases. It can be stated that the current netting arrangement in the Netherlands makes Dante unsuccessful and unprofitable in the short term. However, in the long term when Dante can be deployed in a construction where it can act as Virtual Power Plant, it will be viable. Especially when a factory can be developed which can produce different products based on the nano technology. In that case, investment costs can be shared among different products.

## Reflection on the process

During the entire process, I felt autonomy in executing the project while at the same time, I experienced the support of the organization. Being involved in the weekly stand-up and the knowledge sharing sessions of the innovation team were fun and informative. It provided me with some kind of team feeling, although individual and flex working is not only standard within the graduation but also in the EVIS activities. The meetings provided me with an idea of ongoing business while I could also share my considerations and request for help.

## Approach

At the start, the Brand Driven Innovation method (Roscam Abbing, 2010) felt like a suitable approach for this project in which the value of a new product for both the consumer and the organization had to be defined. However, during the process the aim to look at both the consumer and the organization side was neglected. Focus was placed on the consumer side as this proposed the biggest challenge and there were multiple possibilities for branding the new product. I therefore think it is not necessarily bad that the method was not performed as usual. Nonetheless, the phases of the Brand Driven Innovation Process were maintained throughout the process and offered structure.

## Reflection on the personal performance

The personal motivation for this graduation project comes from the interest in the energy transition and the conviction of the fact that designers can and should play an important role in this transition by creating desirable solutions for real people. After learning about making buildings more sustainable for 20 weeks, I do not even dare to call myself an expert as there are so many factors influencing this process and there are plenty upcoming challenges presented by the energy transition. However, I also hope I demonstrated that designers should not back away from complex innovations, as I think they are key to make people embrace technology, innovation and change.

The most challenging aspect of my graduation project was to deal with the uncertainty of the introduction of a very new product in the unknown and complex marketplaces of energy storage and heating. It asked for synthesis of facts and opinions about the future and considerate decision-making. I learned to be systematic and confident and to keep focus on set goals.

## Learnings

Based on this graduation project, I became more aware of the qualities of strategic designers. We have the ability to understand people, technology and business and can connect those in order to facilitate

the smooth transition towards the future. Especially visualizing is a skill that helps doing so by making ideas and strategies tangible and therefore easier to communicate and share.

One of the personal goals which was set up at the start of the graduation project was to balance work and life. Looking back on the entire process, I can state that I really improved sticking to working hours and truly enjoying my free time. I am proud of myself for being disciplined and committed to both my graduation project as well as friends, family and volleyball. I am eager to improve this even more and see how this will turn out with real 'work'.

Next to this, I wanted to improve decision making and make things concrete. I think within this project, I really learned more and more how to do this. I learned that you have to make decisions in order to proceed, even if you are not 100% sure of your choice. This is also the case in a business context and I am eager to improve my decision-making process, be confident and make things concrete in an earlier stage. Hereby, the skill of visualizing can really help me to understand and make decisions but also to communicate them.

Although a true design project is never finished, I am happy with the end result and the valuable insights for the introduction of Dante. I am proud to know the findings of my research are seriously taken into account and can have a real influence on the further development and commercialization of the product.

I am curious to find out whether Dante, both as the described first product and as a technology, will reach its full potential. In any case, I enjoyed working on the application of an innovation and look back on a wonderful experience.



Figure 7.1. Working on the data analysis of the expert interviews



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