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Transition from product to service focus through servitization

The case of the Swedish heat pump market

Master's Thesis in the Master's Programme
Management and Economics of Innovation

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Abstract

Problem

Due to saturated customer segments and increased competition, the Swedish heat pump market is starting to reach a higher level of maturity. Thus, the concept of servitization is relevant to investigate in this context, since servitized solutions are a way to sustain a competitive advantage. However, as industries experience an increased level of servitization, the rules of the game shift. This implies that markets and its actors will undergo changes, in terms of emerging structures and new roles, as well as new players entering.

Purpose

The purpose of the master's thesis is to map different supply chain configurations of the Swedish heat pump market, in order to analyse its future possibilities with focus on servitization. The mapping involves an investigation of actors and their roles, what services are offered, and the interactions between players. The heat market has already started to develop towards heat-as-a-service, hence the aim is to find future scenarios which current actors can prepare for.

Theoretical framework

Different theories and frameworks regarding level of servitization, supply chain management and sustainable performance, are included in the theoretical framework. These theories lay foundation for the analysis of the study, i.e. how to shift from product to service focus in a manufacturing context. To reach a higher level of servitization, actors must be aware of the network in which they are embedded and strategically manage their relationships. Moreover, balancing cooperation in the supply chain can have a positive effect on the sustainable development of the firm. Providing advanced services can further facilitate a higher environmental performance within the supply chain through a shift in customer value creation.

Methodology

Semi-structured interviews were performed with 20 different actors on the heat pump market. The collected data were analysed according to content analysis, where the research questions and pre-existing theories worked as a guidance. Lastly, the results of the initial analysis were connected to models of servitization to analyse the market's current level and its potential development.

Results and implications

When investigating the Swedish heat pump market, four main supply chains are identified. These include different actors occupying various roles, resulting in that different services are exchanged in their interactions. When one actor takes on a comprehensive role in the supply chain, more advanced services are delivered to the user. Overall, the heat pump market does not currently reach the highest level of servitization. Moreover, when services on the heat pump market reach a higher level, focus shift from the customer to the product. The current servitization level can be a result of customers' low ability to procure services together with the suppliers' traditional culture, where services are mainly seen as a complement to the product. Based on the status of the heat pump market today, three future pathways concerning increased servitization are identified. These are recognised as an increased service focus, digital development and a consolidation of the market. In conclusion, there is a possibility that the three pathways result in a future scenario of delivering climate-as-a-service, with the heat pump as the main heating/cooling device.

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1. Introduction

Today, many industries experience global trends, which in turn affect manufacturing companies' performance and operations (Dohrmann, Hölter, Bigdeli & Musson, 2015). These trends are increased competition due to low cost economies, constantly changing customer needs, and disruptive technologies such as Internet Of Things (IOT). In order to sustain a competitive advantage, manufacturing companies need to find new ways to compete and increase their customer base. The concepts of service development and servitization have started to become essential parts of manufacturers' value propositions today. *Servitization* refers to manufacturing companies that shift their focus from merely delivering products to offer a package of products and services to their customers. This shift implies a series of opportunities as well as challenges for manufacturing companies. The ones that manage to successfully implement servitization could benefit from increased customer knowledge and loyalty, and thus create a more sustainable competitive advantage.

In order to discover the opportunities that servitization enables, different driving forces such as new customer demands, technological development, digital transformation or increased environmental standards are often required (Coreynen, Matthyssens & Van Bockhaven, 2017; Pigosso & McAloone, 2016). These forces can push companies to investigate new revenue models and therefore move into the field of service development. Being successfully implemented, servitization can create economic benefits in terms of new revenue streams, lowered production costs, or the possibility to re-use product materials. One example of a traditional industry that is starting to face the abovementioned driving forces is the heat market in Sweden (Rydén, Sköldberg, Ludvig, Göransson, Johnsson, Williamsson, Holmberg & Shaad, 2017). Heat supply is an essential function in society and further has a considerable effect on sustainable development. Today, the Swedish heat market is facing several challenges regarding increased competition, stricter efficiency goals, as well as changes in regulations.

One heat solution that has experienced significant growth the last decades is heat pumps (Rydén et al., 2017). A heat pump is a heating device that utilize thermal energy in e.g. the air or the ground, to create heat or coolness in an environmentally friendly manner (Thermia Värmepumpar, 2019). However, the heat pump also requires a large amount of electricity, compared to e.g. district heating, in order for the process to function (Energi & Klimatrådgivningen, 2017). Hence, the heat pump's environmental impact is dependent on how the electricity is produced. Many households and facilities choose to convert their heat supply from oil furnace, electric boilers or even district heating, to heat pumps (Sköldberg & Rydén, 2014). However, little attention has been drawn towards heat pumps since the majority of Sweden's households and facilities still use district heating. Thus, the competition, both within the heat pump market, but also between heat pumps and other heating solutions, is considered to be high. In aspect to this, it becomes interesting to investigate servitization within the heat pump market, since services have the potential to sustain companies' competitive advantage while contributing to a more sustainable societal development. Thus, this report will focus on servitization within the heat pump market today, as well as investigate future possible pathways to increased service development. Due to the unexplored nature of the heat pump market, and in order to perform a proper analysis of servitization and its development, a mapping of the current market structure is essential.

1.1 The development of servitization

The concept of merging products with services started to receive attention already in the second half of the 19th century (Olah, Popp & Maté, 2017). It was companies that produced new and innovative products in a simple manner that led the direction. According to Shostack (1977), services are intangibles that cannot be stored, tried, or touched. No amount of money can buy ownership of intangibles that need to be either experienced, processed or time consumed. Services started to be further considered in the offering and thus it was argued that services should not be treated merely as a complement to a product, but as a core element. Levitt (1976) also acknowledged the possibility of service development as a way of bringing service-dominated economies to future business. Moreover, Shostack (1977) argued that markets consist of very few "pure" products or services, and that many business models build on physical objects which are correlated with some kind of service, e.g. cars as a way of transportation.

In many companies and businesses today, service elements are increasing alongside products, as a way to sustain the supply chain and to create barriers for other companies to enter the market (Olah et al., 2017). The development of new services in connection to products affects the company's capabilities and processes, and increases its possibility to deliver higher user value for the customer. However, in order to successfully deliver services, a closer relationship with customers is of essence to target their needs and opinions. The providing company could expect financial, strategic and marketing benefits in correlation with successful servitization of the company (Rapaccini, Visintin & Saccani, 2014). One example of a company that successfully experienced the servitization journey is the engine manufacturer Rolls-Royce (Smith, 2013). The company has moved from merely selling a product with additional charges for repair, to offering a service package where the engine is rented by the hour. The service includes monitoring of data for preventive maintenance, which both reduces unnecessary repairs and engine downtime, resulting in cost savings for Rolls-Royce as well as its customers.

1.1.2 The case of the Swedish heat pump market

Today, the Swedish heat market is one of Sweden's largest energy markets that capitalises around 100 billion SEK per year (Rydén et al., 2017). The market has been growing steadily the last 40 years, with start in the large diffusion of oil in the 70s. Today, however, the growth rate is tending to decline due to increased efficiency of the heat systems and lower heat requirements (Sköldberg & Rydén, 2014). Moreover, the importance of creating heat in a sustainable manner is increasing, due to higher customer demands and stricter regulations. The market is dominated by four major heating alternatives: district heating, electric heating, biofuel boilers, and heat pumps (Sköldberg & Rydén, 2014). District heating constitutes the major part of the market, referred to in TWh used, while heat pumps and electric heating dominate in revenues. Thus, the competition between current heating alternatives could be seen as high.

On the heat pump market in Sweden today, there are more than one million installed entities across the country, where the main part is located in small houses or villas (Sköldberg & Rydén, 2014). The market has been growing the last decades, replacing electric boilers or oil furnace, but it seems like the market is reaching saturation since the entities sold have declined in later years. However, an exchange market is now being observed, where old heat pumps are updated with more efficient heat pumps that fulfil current environmental standards. Moreover, heat pumps have increased their application towards larger real estates and industrial facilities, where both heat and cool solutions are

needed. There are a variety of different heat pumps on the market, but the most common are: air/air heat pumps, geothermal heat pumps, exhaust air heat pumps and air/water heat pumps. The market constitutes of a large number of actors that mostly compete on a local or regional level. Since the number of entities sold have started to decline, the competition could be expected to increase. Thus, it becomes even more essential for companies to create and sustain a competitive advantage. In connection to this, exploiting service development as a strategy could be a way for companies within the heat pump market to sustain their competitive advantage and create barriers for new actors to enter (Olah et al., 2017).

1.1.3 Profu and "Heat Market Sweden"

This study has been assigned by the consultancy and research company Profu. Profu has been operating in the market for 30 years and focuses on energy system analysis, transportation systems and waste disposal systems (Profu, 2019) The company originates from Chalmers University of Technology and still has a close cooperation with the school and its research department. Currently, Profu is the initiator and project leader for the research project called "Heat Market Sweden", where the aim is to jointly present a picture of the current heat market in Sweden together with its possibilities and challenges (Sköldberg & Rydén, 2014). The project involves different actors within the heat market such as consumers, producers, suppliers and authorities. Several financiers have also contributed throughout the process. This master thesis is a part of Heat Market Sweden and will contribute to the project's future development.

1.2 Purpose

The purpose of the master's thesis is to map different supply chain configurations of the Swedish heat pump market, in order to analyse its future possibilities with focus on servitization. The mapping involves an investigation of actors and their roles, what services are offered, and the interactions between players. The heat market has already started to develop towards heat-as-a-service, hence the aim is to find future scenarios which current actors on the market can prepare for. In other words, the target group of the study consists of companies within the heat market and, more specifically, the business development functions of these companies.

1.3 Problem analysis

Due to saturated customer segments and increased competition, the Swedish heat pump market is starting to reach a higher level of maturity. Thus, the concept of servitization is relevant to investigate in this context, since servitized solutions are a way to sustain a competitive advantage (Olah et al., 2017). However, as industries experience an increased level of servitization, the rules of the game shift. This implies that markets and its actors will undergo changes, in terms of emerging structures and new roles, as well as new players entering. Given the purpose of the thesis, the study will answer three research questions presented below.

Description

In the description, the purpose is to map the current structure of the heat pump market, which requires a deep insight of the actors, their roles, and how they interact, resulting in different supply chain configurations. Hence, the first research question is:

Who are the actors in the different supply chains, and what roles do they have?

Analysis
In the analysis, gathered information from the first research question forms the basis of determining the current level of servitization within the heat pump market. Moreover, the analysis has its starting point in the identified supply chains, resulting in the second research question:

> *What level of servitization can be observed on the heat pump market connected to the identified supply chains?*

Recommendation
Lastly, the recommendation will consist of possible future pathways regarding servitization of the heat pump market. Information from both the description and the analysis will be used in order to develop these pathways, which together forms a future scenario for the market. The third research question is stated as:

> *What future pathways are possible for the heat pump market concerning servitization?*

1.4 Delimitations

Due to time constraints and to maintain a clear focus throughout the thesis, certain limitations are made. First of all, the study is strictly limited to the Swedish heat pump market and its Swedish actors. Moreover, the suppliers to the heat pump producers are excluded, since these actors were considered as irrelevant in terms of service exchange. It is also decided to exclude construction companies in the supply chains, because an investigation of these customers demands a more thorough insight of the construction industry and its actors. Further, no clear distinction is made between different users in a B2B context in the identified supply chains. However, private villa owners are separated from other users, since all interviewees made this categorisation.

The presented supply chains in chapter 4.2, represent general cases within the heat pump market. Hence, due to the complexity of the market, there exist exceptions that are excluded from the study. Moreover, since heat pumps today are technically advanced, the market becomes closely related to smart homes in general. However, the focus of the thesis is on the heat pump as a heating device, therefore, smart homes and other energy- and heating systems are not further investigated.

The main risk of the abovementioned limitations is that important information regarding market structure or exchanged services is unintentionally excluded from the study.

2. Theoretical framework

In this chapter, different theories and frameworks regarding level of servitization, service supply chains and sustainable performance, are presented. These theories lay foundation for the analysis of the study, i.e. how to shift from product to service focus in a manufacturing context. The theoretical framework also functions as a guide for the findings chapter, where roles, interactions, and attitudes regarding service advancement are highlighted.

The main aspects of this chapter are visualised in Figure 2.1 below. To reach a higher level of servitization, actors must be aware of the network in which they are embedded and strategically manage their relationships. Moreover, balancing cooperation in the supply chain can have a positive effect on the sustainable development of the firm, e.g. through pooling of resources. Providing advanced services can further facilitate a higher environmental performance within the supply chain through a shift in customer value creation.

Figure 2.1: Visualisation of the theoretical background, and hence the chapter's content

2.1 Servitization in manufacturing firms

To get an understanding of the concept of servitization, a brief review on the subject is presented below. This includes possibilities of servitization, important factors to be considered regarding service development, and how smart connected products can function as service enablers.

Servitization in manufacturing firms refers to the process of making required changes in the company's operational processes, relationships and organizational structures (Dohrmann et al., 2015). There are different types of services that have different potential to affect the competitive advantage of the firm. With higher potential services follow an increased risk, since these are more advanced to deliver and require large customer insights. Services with lower risk are focused on supporting the product itself, e.g. spare parts, while higher potential services are focused on supporting the customers' processes. Servitization in product-centric contexts, i.e. manufacturing firms, implies that the product is central in the value proposition (Rapaccini et al., 2014). The product is integrated with product-related services, e.g. maintenance and support, when delivering the final offering.

Servitization or adoption of product-service systems (PSS) is a strategic approach for manufacturers to create additional value for their customers. This approach can affect their competitive advantage by enhancing customers loyalty and by creating new customer segments (Opresnik, Zanetti & Taisch, 2013). Servitization is also a way of enabling increased revenues, a longer product life cycle and new network collaborations, without having to reduce operating costs (Alvarez, Martins & Silva, 2015). Moreover, adding services to the final offer makes it more challenging for competitors to imitate and replicate business models, which further sustains the competitive advantage (Opresnik et al., 2013). In addition, manufacturing companies that operate in a B2B environment could benefit from servitization by servitizing different components in their own value chain. However, it is important that the company recognise its core strengths and weaknesses in this process to avoid negative consequences, like duplicability.

Although services have a lot of potential to increase revenues for manufacturing firms, some researchers have found that net-revenue profits could be lower for these companies than for pure product focused companies (Gebauer, Fleisch & Friedli, 2005; Neely, 2012). According to Neely (2012), one reason for this effect is the increased labour cost that some services entail. In addition, servitization requires the manufacturing firm to change internal structures and processes in order to successfully combine production and service offerings (Olah et al., 2017). In the process of transforming a manufacturing company towards a service oriented business, there are several factors that will affect the adoption (Baines, Bigdeli, Bustinza, Guang Shi, Baldwin & Ridgway, 2017). These factors are both internal and external, and include organizational structure, culture and leadership, as well as economic, environmental and technological components. Moreover, servitization transforms manufacturing companies to not only produce and sell gods, but to perceive and respond to customer needs (Alvarez et al., 2015). To be able to respond to customer needs, the manufacturing company should integrate customer opinions in its product design process.

A key factor to succeed with the implementation of servitization is a strong, customer centric approach (Olah et al., 2017). Customers do not only want a product, but a customized solution, which requires that manufacturing companies further change their technologies and system integration capabilities. In aspect to this, technologies like Big Data could play an important role. Moreover, the company's employees must be aware of, and support, these cultural and organizational changes in order to successfully implement the strategy.

2.1.1 Smart connected products as enablers

Technological development, or smart connected products, can offer several opportunities regarding product utilization and performance, as well as new capabilities beyond traditional product boundaries (Porter & Heppelmann, 2014). Today, IT is integrated into many products, which creates connectivity to other computers and clouds where data can be stored. Using smart connected products to gain competitive advantage requires that manufacturing companies rethink and retool their internal processes. Through smart connected products, the internal value chain is affected and processes such as marketing, manufacturing and designing after-sale services can be improved.

The functionality of smart connected products can be grouped into four different areas: monitoring, control, optimization and autonomy (Porter & Heppelmann, 2014). What functionalities to include is a strategic choice that the company must make to ensure that customer value is delivered. Each functionality, or capability, brings several possibilities for manufacturing firms to develop their

product design and production, market segmentation and service development. Monitoring is seen as the first level of functionality that smart connected products enable. The next levels build on each other, where autonomy is the last level of functionality. The autonomy level implies that monitoring, control and optimization are combined into a smart solution, which e.g. could reduce the need for operators. Further, smart connected products can enable new business models that reduce the demand for product ownership. These models are referred to as product-as-a-service and can imply that the user has full access to a product and only pay per use. Another possible business model includes shared usage of products, i.e. the customer could access the product whenever they need it.

2.2 Level of servitization

Chapter 2.2 aims to present a framework of how services can be categorised and measured in terms of added customer value. Moreover, pathways and barriers for companies to increase their current level of servitization are described.

In literature today, there exist many different categorisations of services (Coreynen, et al., 2017). One common categorisation is rooted in the company's revenue model, or value proposition, to its customers. The first level in this categorisation is when the company offers to perform a deed, i.e. an input-based value proposition. The second level focuses on performance, to provide product convenience through e.g. preventive maintenance or supply of materials. The third, and last, level is a result-oriented value proposition where the parties agree on a certain output. For example, agreeing on reduced energy consumption through product usage or agreeing on a solution of integrated systems. Another popular service categorisation is built on the connected focus of services, i.e. if the manufacturer offers services that support product function, or services that support customer's own business processes.

Coreynen et al. (2017) introduce a framework, called the servitization pyramid, to provide guidance for manufacturers in creating successful service offerings. The pyramid is based on the two categorisations mentioned above; in the horizontal dimension, there are services that either support the product or customer processes. The vertical dimension is divided into services connected to different value propositions, i.e. input, performance, or result based.

The servitization pyramid adapted from Coreynen et al. (2017) is presented in Figure 2.2 below.

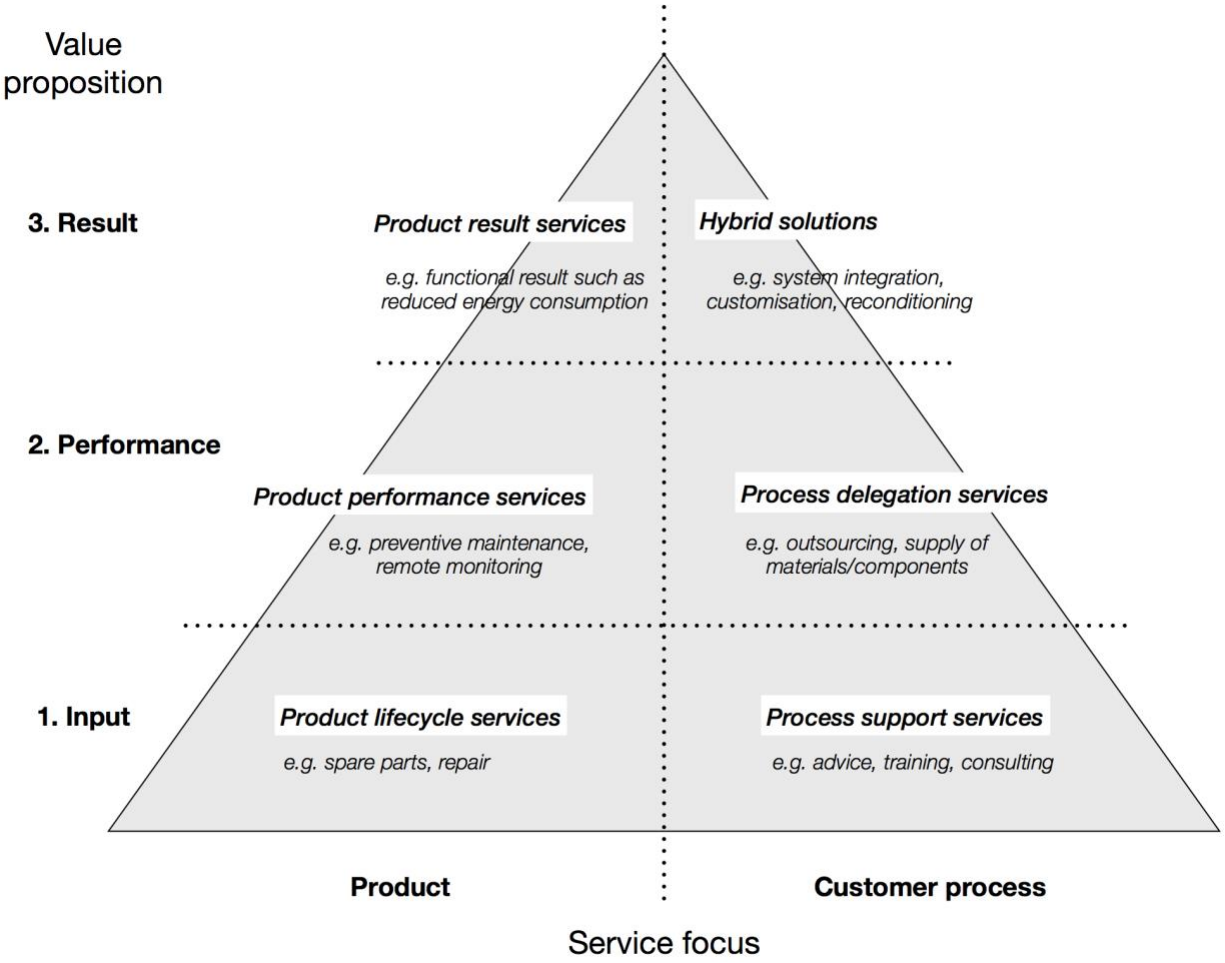


Figure 2.2: The servitization pyramid

2.2.1 Pathways of servitization

It is suggested that exploitation of digital solutions could enhance different types of servitization by translating data or other computing power into knowledge (Coreynen, et al., 2017). The authors performed a case study regarding exploitation of digitization as a way to enable servitization. The study resulted in a framework that illustrates three potential pathways that can increase companies' service offerings by using digitization. Each pathway leads the company to different levels of services and integration with its customers' processes.

The first pathway is referred to as *industrial servitization* and entails that the manufacturing company is focused on improving its own abilities to create efficient solutions (Coreynen, et al., 2017). This knowledge can then be used to translate information that the company gains from the customer's internal process optimization into services for the customer. The path is considered to be an inside-out process, where the providing firms' internal capabilities and capacities are important in order to create value-adding services. These companies could use digital manufacturing tools in order to optimize their own production. The tools could also be used as a way of leveraging expertise delivered in advisory services to the customer. Services like this are often requested when customers want to preserve control over their own operations. Thus, digital tools could be used to convert data into knowledge, which in turn can develop a more sustainable competitive advantage. Moreover, another function that can enable the company's service development, is its sales force. Since the sales process

of services often requires more time and customer understanding, this enables the company to easier adapt to customer needs.

The second pathway is called *commercial servitization* and refers to companies that align their value creation processes with the customer's internal processes via different interaction forms (Coreynen et al., 2017). The goal is to better understand the customer and help it reach its own goals. When using this path, information and communication technologies are essential to manage customer relationships and to understand the customer's value-creating processes. These technologies further enable the firm to benefit from scalability, but it also opens up the possibility for continuous customer interactions, which enhances the relationship. Commercial servitization implies that manufacturing companies provide their customers with online self-service data in order to maintain control over their operations. The pathway could be seen as an outside-in perspective, which uses companies' capabilities to support their customers' linking, channel bonding and technology monitoring. To successfully implement these services, it is important to involve and engage users during the development of the customer interface. Moreover, the providing company should be able to balance both its front-office customization and back-office production to ensure its capabilities. When successfully managed, these capabilities can enable manufacturing companies to capture their customers' needs and thus develop new products or services.

The last pathway is referred to as *value servitization* and implies that manufacturing companies have the potential to further integrate into their customer's processes by combining the first and second pathway (Coreynen et al., 2017). This pathway is often reached by the creation of new digital products that impact the current value chain and customer processes, and develop the provider-customer relationship in a disruptive manner. Value servitization typically involves boundary-spanning processes, e.g. installing a field service organization, that can distribute and service the firm's installed base. Examples of services that could be offered in such cases are maintenance and repair that guarantee that the product can deliver a certain performance or outcome. Further, this pathway should enable the providing company to change its customer's processes and to gather data that help the company itself to constantly improve its service. The goal is to be able to customize, integrate and improve its offering to the customer, in order to reach a stage where the company provides a solution to the customer.

2.2.2 Barriers of increased servitization

As manufacturers develop their service offerings and move upwards to higher-value added services along the servitization pyramid, they might face several internal and external barriers (Coreynen et al., 2017). Barriers to move to the first level of the pyramid can arise from unwillingness within companies to expand customer focus after the point of sale. The resistance is founded in the large focus on tangible-oriented features and an uncertainty regarding the economic benefits of services. Hence, for companies to overcome this first barrier, a major change in corporate culture is often necessary. In addition, customers have in many cases a mind-set that services should be free of charge and are thus not interested in paying extra for them.

Barriers to reach the second level in the pyramid, develop from the scepticism of customers to pay for performance or function instead of acquiring a product (Coreynen et al., 2017). To overcome these barriers, a cultural change is again necessary. In this case, customers need to shift their focus on value creation, from owning a product to having needs met. Moreover, customers can also be sceptical to involve themselves in deeper relationships with the supplier, since they are afraid of sharing valuable

information about the firm to outside actors. Lastly, barriers to reach the third level in the servitization pyramid are connected to inexperience among manufacturers on how to structure the organisation, in order to create and deliver product-service systems successfully. There can also be barriers arising from manufacturers who are afraid to captivate the earlier mentioned risks that customers consider. In conclusion, as the manufacturer move up in the servitization pyramid, they will face barriers connected to adaption of the current business model.

Lütjen, Tietze and Schultz (2017) performed a study concerning service transitions, in which they interviewed managers from 19 energy utilities in Germany. The service transition stages were evaluated from type of service offering, service innovativeness, and the amount of internal and external resources invested. The authors identified three stages that firms undergo when moving into servitization: the service initiation stage, the service anchoring stage and the service extension stage. In the service initiation stage, firms are still product-oriented with a traditional past focus on delivering commodities. Firms that are in the service anchoring stage have only small investments in service development, but they also show an increasing service budget and have in many cases separate service departments. Finally, firms in the service extension stage have already delivered more advanced service types. Moreover, they are also more successful in integrating customers in new service development and often perform service-focused innovation processes.

In the service initiation stage, firms are often confronted with strategy-related barriers such as cannibalism of current business models and ambiguity in market strategy. Lütjen et al. (2017) found in their study that energy utilities, being in the service initiation stage, decided not to offer energy efficiency services. This was often due to that the services did not fit well enough with the existing strategy and might cause a conflict of interests. For example, one firm emphasised that having multiple coexisting business models will ruin the scope of its current core business, i.e. maximising energy sales. To deal with the barriers connected to strategy fit, firms should first develop a high awareness of these issues, and then try to find more flexible strategies that can serve several business models.

In the service anchoring stage, firms are mainly concerned with barriers connected to implementation, e.g. lack of resources and a rooted product-oriented culture (Lütjen et al., 2017). They have developed service awareness and instead need to cope with culture-related problems. Moreover, the firms lack both financial and human resources for creating innovative services, for example, most firms do not have an R&D department and thus do not have enough organisational options to develop service innovations. Related to this issue, the firms have a low formalisation of the service development processes, with no specific KPIs for service innovation. In addition, they must deal with more complex innovation processes regarding financial and organisational requirements, but also in terms of increased customer integration. To overcome the barriers in this stage, firms must develop a culture with well-defined service structures and a formalised, service-oriented innovation process.

In the service extension stage, firms are foremost reporting market-related barriers (Lütjen et al., 2017). Their culture is more inclusive of service innovation and knowledge is shared in a relatively frequent and easy manner. However, they struggle with problems such as developing market acceptance and delivering customer solutions that entail continuous profit streams. Since firms in this stage develop extended and more innovative service offerings, they often deal with insufficient customer demand and low economies of scale. This, in turn, might lead to that new services fail. Value is often co-created with customers in innovative services; hence the customers must also be integrated into the development processes. Further, in this stage, there exist a strong need of human

skills and know-how to be able to create highly innovative services, e.g. with an increased technological complexity.

2.3 Service supply chains

In order to understand how companies can develop and deliver valuable services to their customers, service supply chains are described in this chapter. Thus, aspects of service constellations, relationships between actors, and aftermarket services are included.

Advanced services focus on supporting main customer processes, through the capabilities of the product (Dohrmann et al., 2015). To capture the full potential of advanced services, manufacturers must adapt, or even redesign, supply chain concepts accordingly. The authors list some of the implications of servitization for manufacturers, and also give recommendations on how to restructure the supply chains to best fit with these changes. One servitization implication brought up by the authors is the shift in focus from product provision to product capability and the connected service offering. To succeed with this, manufacturers should centralize production and increase product standardization, while at the same time customize services to differentiate. Agility in advanced services is key, and it is recommended to invest in agile aftermarket systems.

Another implication of servitization is the change in roles and requirements for the workforce (Dohrmann et al., 2015). To handle this, the manufacturers should review the skills of the workforce and ensure that they have a position as relationship builders, working closely with customers and having flexibility in responding to customer needs. The manufacturer should also review its sourcing strategy, and either leverage its services through a distributor network or through selling them directly to the customer. Moreover, to mitigate revenue risks, the manufacturer must ensure continuous provision of services. The risk management includes setting up a more reliable supply chain in order to support the existing assets. In addition, the manufacturer should put effort into demand planning and inventory management, which is especially important in the aftermarket network. Lastly, to handle these risks, an increased visibility of the supply chain is recommended. It is achieved through refined preventive and predictive actions, where the use of big data plays an essential role. In cases where the manufacturer remains as the product owner or takes responsibility of it, a circular economy should be considered. This includes accountability for reverse logistics and waste management.

2.3.1 Service triads

The trend of a supply structure, where vertically integrated companies are replaced by network-based constellations, is due to an increase in specialisation and outsourcing among firms (Wynstra, Spring & Schoenherr, 2015). They focus on their key competencies and outsource other activities to outside actors. The outsourced activities include in many cases important service operations. In turn, many of these services are included in the buying company's offering to its customers, i.e. the services are bought by one company from another, but distributed to a third party, which is the customer. The services in this context are referred to as front-end services or component services. The constellation consisting of a buyer, supplier and the customer of the buying organisation, where the supplier is contracted to distribute services straight to the buyer's customers, can be referred to as a *service triad,* see Figure 2.3 below. The critical difference between the service triad and a more linear supply chain is that in the service triad, each party has a direct connection with the remaining two. These connections can be either constant or sporadic, and in some cases, the service activities are never

mobilized. For example, a repair shop (supplier) is only in contact with, and deliver services to, a policy holder (customer) in case of an accident covered by his/her insurance company (buyer).

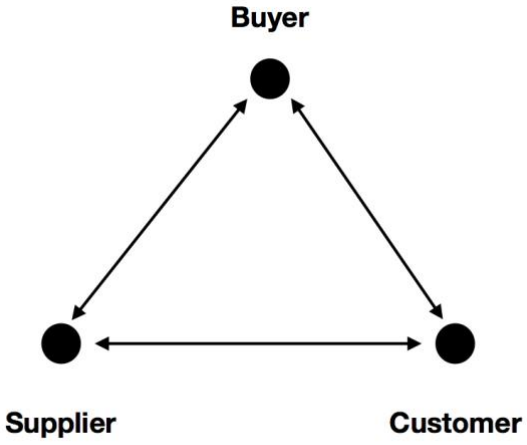


Figure 2.3: The service-triad inspired by Wynstra et al., 2015

The constellations can be initiated either by the buyer, supplier or customer (Wynstra et al., 2015). The buyer-initiated triads originate from a sourcing or outsourcing decision made by the buying organisation. In this constellation, the buyer initially becomes the broker between the other two actors. Customer-initiated triads appear when the customer wants to use a third party to support or mediate the interaction with a supplier. One example is a customer that hires a project management firm to coordinate and monitor one, or several, contractors that provide construction work services to the customer's new office building. Lastly, supplier-initiated triads originate from wanting a third party to mediate or support the interaction with the customer.

Depending on who the initiating party is, there exist differences in who benefits from the service and what contracts are set up between the parties, and thus also differences in interdependencies (Wynstra et al., 2015). In buyer-initiated triads, the buyer, besides the customer, also benefits from the service, e.g. because the assets used by the buyer to provide services to the customer are in a better condition. In supplier- and customer-initiated triads on the other hand, it is the supplier besides the customer that benefits from the service. These benefits are often created for the supplier through support of buyers; handling and accessing customers. Regarding contracts likely to be set up, the buyer- and supplier-initiated triads are similar. A contract is usually taking place between the supplier and buyer, and between the buyer and the customer. Hence, in these triads, all actors have direct ties with each other, either through a service exchange or through a contract. The triads are then referred to as transitive. In some cases, there can exist a supplier-customer contract, e.g. when a customer has the option to choose one supplier from an assortment offered by the buyer. In customer-initiated triads, the main service exchange is between the customer and buyer, thus it is most likely to exist contracts between the buyer and customer and the supplier and customer.

In the case of service outsourcing, there is a risk that the broker position of the buying organisation might decay when the supplier interacts directly with the customer (Wynstra et al., 2015). This in turn can lead to a loss of broker benefits, i.e. to provide and use information from the triad. In order to better control performance, the buyer should invest in communication with both the supplier and customer. This will generate information of the supplier's performance, limiting opportunistic behaviour. Another risk in service outsourcing, which needs to be managed by the buying company, is

that the customer often perceives the supplier of service activities to be the same organisation as the buyer.

2.3.2 Relationships in supply chains

Depending on the type of service that is being outsourced, the buyer-supplier relationships in servitized environments should be formed in different ways (Rapaccini et al., 2014), see Table 2.1 below. Beginning with product support (PS) services, i.e. more traditional after-sales services such as maintenance and installation. These services are characterized by low-intensity relationships between provider and product user, little customization and complexity, and have transaction-based nature. To successfully provide PS services, comprehensive product knowledge together with workforce and capacity management capabilities, are necessary. In line with this, the authors found that the information exchange is scarce and mainly concern technical and operational features. In cases where a supplier solely provides PS services, the manufacturer's (buyer) resistance in providing information is driven by its bargaining power. Moreover, the supplier also restrains the information exchange to what is required by the contract. However, the study indicates that PS services may require a closer buyer-supplier relationship than traditional manufacturing relationships.

Service type	**Examples**	**Relationship**	**Focus**
Product support	Maintenance	Transaction-based	Technical aspects of product
Customer support	Remote support	Customer-oriented	Customer needs
Process related	Simulation	Close collaboration	Business processes

Table 2.1: A categorisation of services and their corresponding relationships

The second category is focused on services that train the user to correctly interact with their product, i.e. customer support (CS) services (Rapaccini et al., 2014). CS services are built upon customer interactions, and thus they demand a customer-oriented approach to be effectively delivered. However, the level of complexity and customisation of these services can differ a lot depending on the business context. The information exchange of technical information is comparable to that of PS services, but is complemented with customer related information, such as complaints, perceived product or service quality, and customer suggestions. This exchange is needed to create a shared knowledge of customer behaviour and customer needs. Since both parties are interested in enhancing customer satisfaction and reducing costs connected to service delivery, the buyer-supplier relationship should be cooperative and have a rich information exchange.

Process-related (PR) services have the purpose of responding to specific business needs and improving processes connected to the product (Rapaccini et al., 2014). Hence, to successfully provide PR services, the supplier needs to have great knowledge of the product itself, individual user needs, and the business environments of the targeted organisations. Examples of PR services are consultancy services or services that require a high degree of knowledge or professionalism. This knowledge can be used to test and simulate different processes and scenarios, which the product could create. The buyer-supplier information exchange should be intense and exist in both directions, in order to increase the knowledge of the customer's value creation processes. Both parties benefit from this sharing of information, which can, in the optimal scenario, lead to the advancement of new revenue generating mechanisms, e.g. pay-per-use. A long-term relationship requires a lot of effort, hence it should be cooperative and include a large amount of information, since both actors are keen on enhancing customer satisfaction and reducing service delivery costs.

2.3.3 Aftermarket services

As products become commodities and profit margins decrease, aftermarkets gain further importance in terms of revenues, profits, differentiation and customer retention (Wagner, Stephan, Jönke & Hadjiconstantinou, 2017). In addition, customers expect and request something beyond just a technical solution to a problem. Hence, after-sales have a strategic impact on businesses and also create real value for their customers. Oliva and Kallenberg (2003) emphasize three key reasons for a company to include after-sales services in the product offering: market competitiveness, increased knowledge of customer needs and relevance of after-sales service markets.

The aftermarket contains activities connected to products, e.g. spare parts, and services, e.g. maintenance and upgrades, which take place after the initial product sale and help customer usage (Wagner et al., 2017). Ren and Gregory (2009), see Alvarez et al. (2015), investigated the evolution of different types of after-sales in terms of added customer- and company value, see Figure 2.4 below. Traditionally, product repair has been a way for companies to attract new customers and increase sales of manufactured products. However, the first step of product repairs is only considered a cost for companies; a type of necessary evil, which includes warranty services. The second step consists of out-of-warranty services, which can be a good way for companies to gain additional revenue. In this step, the process is originated in customer contact, and labour- and material charges are based on the services provided. Moreover, the authors suggest three types of contracts connected to the evolutionary process of after-sales, see the green boxes in Figure 2.4. The contracts are preventive maintenance, maintenance with fixed costs of labour and materials included, and performance-based maintenance, often associated with a fee.

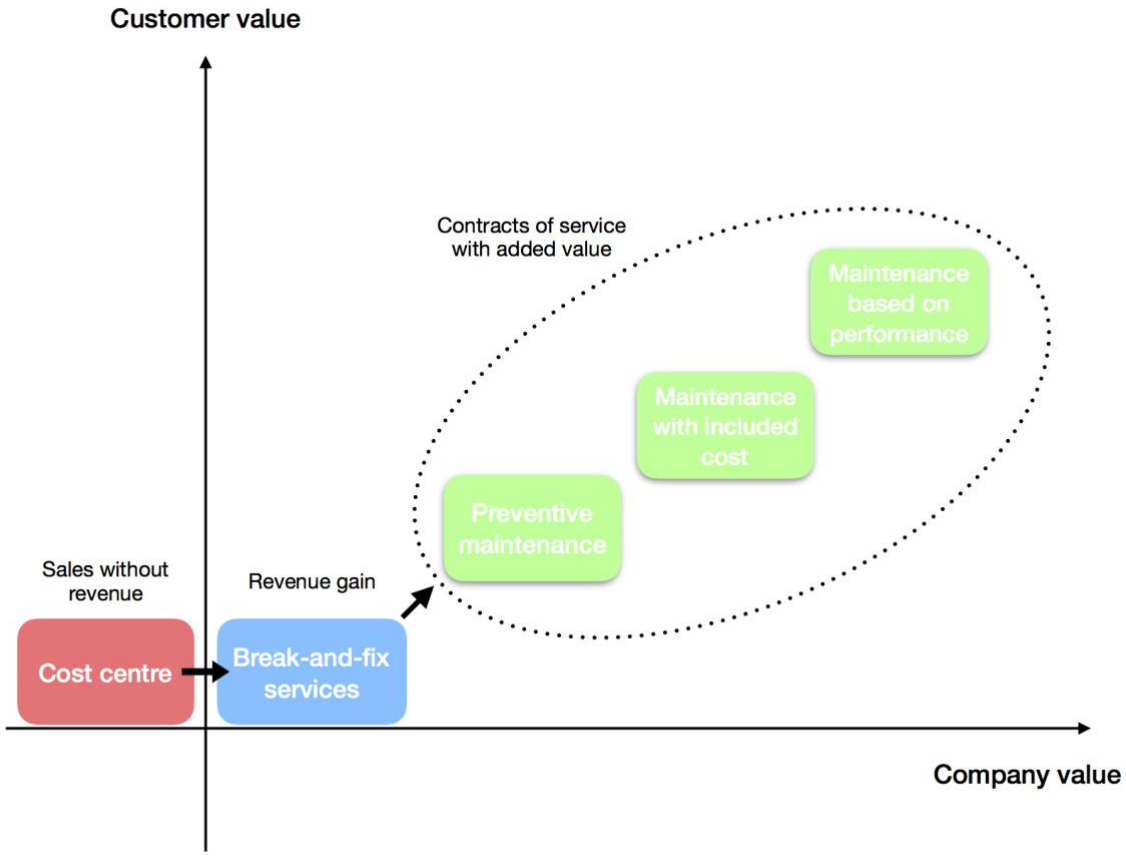


Figure 2.4: Model of the evolution of after-sales, adapted from Ren and Gregory (2009)

Today, customers not only focus on product performance in comparison with its cost when considering a purchase, they also review the connected service offering, in terms of price and quality, to support product usage (Wagner et al., 2017). Given the large, and increasing, proportion after-sales generate to the firm's revenues and profits, these service offerings are now viewed as a source of competitive advantage. In relation to this, suppliers and outside competitors compete with OEMs in the aftermarket, creating new, complex network constellations and relationships between the actors included.

Wagner et al. (2017) emphasize the importance of understanding how one relationship between two actors in a network can affect the other actors within that same network. Moreover, firms must consider the larger aftermarket ecosystem in which they are embedded, in order to build well-informed relationship strategies. Another way for firms to gain competitive advantage is by taking on the bridge position in cases where *structural holes* appear in the network constellation. A structural hole is the result of non-direct connection between network actors, i.e. when one actor is connected to other actors, which in turn are not connected to one another, see Figure 2.5 below. Hence, when a firm occupy the bridge position, it has a greater information access and thus enhanced control opportunities. However, the bridge position cannot be seen as a permanent state, it can decay or even transfer between actors.

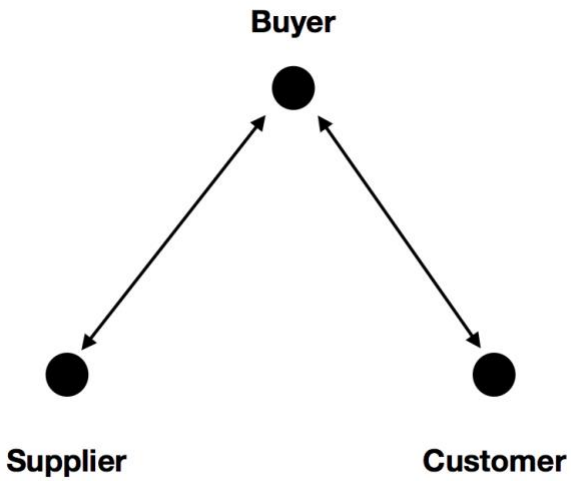


Figure 2.5 Service-triad with a structural hole inspired by Wagner et al., 2017

2.4 Sustainable development and servitization

Chapter 2.4 focuses on the connection between increased servitization and sustainable development in terms of environmental aspects. Both regarding how advanced services affect sustainable performance, but also how environmental factors affect service development within firms. The content highlights environmental strategies and sustainability pressures as driving forces to increased service focus. In addition, service advancement can create a competitive advantage for firms regarding their sustainable performance.

Servitization and product-service systems (PSS) are mostly associated with economic and business-related advantages (Pigosso & McAloone, 2016). However, other motivational forces for servitization could be environmental strategies and enabling a more sustainable society by providing offerings with

higher environmental performance. Servitization is often stimulating manufacturing companies to use materials efficiently and maintaining products in a proper manner, which could lead to potential environmental benefits. For example, servitization could lead to lowered material and energy consumption, increased responsibility for products after end-of-use by re-using materials, or by developing eco-efficient technologies. Moreover, customers are challenged by stricter environmental standards, which is an opportunity for manufacturing companies to use their expertise in advisory services regarding how to efficiently operate and maintain their products (Dohrmann et al., 2015). However, adding services to the final offering does not imply a direct reduction of environmental impacts (Pigosso & McAloone, 2016). The performance of a PSS is dependent on the product design, the system, and the efficiency of networks and infrastructures that the company is using. Moreover, once servitization is reached and the solution is offered to the market, it is important that the system constantly is reviewed in terms of economic, environmental and social impacts.

Increased servitization of PSS implies that more advanced services focused on delivering a result or an outcome is developed (Sharma & Singh, 2017). These advanced services can lead companies to pool up resources in order to create efficiency of scale in some area. When systems experience this development, and move from merely producing goods to offering services, they generate collaborative consumption, which can lead to dematerialization. This is a result of an enhanced utilization of the equipment, which leads to that less equipment or material is needed. In addition, Armstrong and Lang (2013) emphasize that PSS separates value from material consumption, which further contributes to a more sustainable movement. Servitization of this kind, could be seen as moving from ownership towards use or access of a certain product. Sharma and Singh (2017) exemplifies this with paper printers which originally were bought, then started to be leased. A more advanced servitization is created when the printer is no longer owned by the user, only used or accessed. This service involves that the customer is buying a pay-per-use service, where they pay for each paper printed.

Engaging in collaborative consumption, or pooling of resources, implies that companies need to cooperate with each other (Sharma & Singh, 2017). Benefits associated with the cooperation should be reasonably distributed between all participants, i.e. the total benefits of pooling must be positive in order to be successful. Cooperation of this kind allows firms to access a greater base of resources, which can have a positive effect on the bottom line and the profitability. However, there are also associated risks with cooperation in terms of less control in the marketplace, since a company's success is dependent on that its partners are willing to commit to the cooperation. Sharma and Singh (2017), mentions the concept of coopetition, which implies a new relationship where involved parties are both competing and cooperating with each other, to obtain the best possible result. This relationship can be a way of operationalizing servitization in order to enhance resource utilization and sustainability, as well as create lifetime solutions. The authors argue that coopetition could result in dematerialization, longer life and better utilization of material resources.

Szász and Seer (2018) performed a study on service-based operations strategies, and the role of sustainability pressures for manufacturers to pursue them. In addition, they investigated the sustainability performance effects of said strategies. The authors found that manufacturers can adopt service-based operations strategies as a result of sustainability pressures from stakeholders. Moreover, by highlighting services in their strategies, manufacturers offer both product- and customer-oriented services, i.e. basic and advanced services, more intensively to customers.

The results also showed that only customer-oriented services can create a competitive advantage for manufacturers, both regarding service and sustainability performance (Szász & Seer, 2018). The

competitive edge in service performance is explained in the general opinion of product-oriented services as merely being a way for companies to extend sales and give support to the product. While the provision of customer-oriented services indicates a much further servitization development of the company. To reach such stage of servitization requires that the company overcome several organizational challenges, e.g. shifting from product focus to a service-oriented mind-set. Further, by providing customer-oriented services, the manufacturer must consider all costs throughout the lifetime of the product. Hence, a customer-oriented service approach incentivizes manufacturers to develop more efficient, and sustainable technologies, recycle materials and optimize energy use, which in turn gives a competitive edge in their sustainability performance. However, product-oriented services are still important, they need to be in place before developing customer-oriented services and function as platform for providing additional customer-oriented services.

3. Method

In this chapter, sampling methods for the study are presented, followed by how the research data were collected and later analysed. Lastly, a critical discussion of the method process is held to motivate the validity of the results.

3.1 Sampling

To gather a representative sample for the purpose of the study, different sampling methods were used. In addition, considerations were made regarding the sample size and its relative cost. How the researchers chose appropriate interview candidates, i.e. a representative sample, is presented below.

3.1.1 Convenience sampling

To come in contact with appropriate interviewees for the data collection, convenience sampling was used. Convenience sampling is a type of non-probability sampling where the researcher uses easy accessible data to perform a sample (Bryman & Bell, 2011). In this study, contacts were provided to the researchers from the principal - Profu, and a supply association within the heat pump market – Svenska Kyl & Värmepumpföreningen (SKVP). The initial contacts consisted of persons with high knowledge of the heat pump market, representing different actors along the supply chain.

The issue with convenience sampling is that it is not possible to generalise the results (Bryman & Bell, 2011). The sample merely consists of interview objects that are available to the researcher, and thus there is a lack of information of which population the sample is representative. However, convenience sampling can still be accepted in certain contexts. One example brought up by the authors is when there is a self-presented chance to gather data from a convenience sample and it is considered to be too good of an opportunity to miss. In connection to this study, receiving valuable contacts from Profu and SKVP was seen as the best option to begin sampling. In addition, the researchers were able to refer back to Profu and SKVP when initiating the sampling, which increased the legitimacy of the study for the potential interviewees.

3.1.2. Snowball sampling

Another type of non-probability sampling is snowball sampling, where the researcher uses its initial contacts to provide new, relevant contact with others (Bryman & Bell, 2011). After performing the first interviews with the contacts provided from Profu and SKVP, the researchers asked for further contacts with relevant actors on the market. In almost all cases, additional contacts were given. This process was continued throughout the sampling, and in the end, the researchers were more specific on what type of contact they needed to receive a representative sample. As with convenience sampling, snowball sampling has the problem of gathering a sample that is representative to the population (Bryman & Bell, 2011). However, what needs to be kept in mind is that concerns regarding external validity, or generalizability, in qualitative research are not considered as critical as in quantitative research. Moreover, as mentioned earlier, the researchers tried to control the snowballing by clarifying where in the supply chain information was missing.

3.1.3 Sample size

The sample size is often affected by considerations of time and cost (Bryman & Bell, 2011). After a certain number, the increased precision of adding to the sample size is slowing down. Hence, when the sample error is not declining as fast as before with additional data, it becomes more and more uneconomic to further increase the sample size. After performing 20 interviews with different actors throughout the entire supply chain, the researchers considered the sample size satisfying for the purpose of the study. The majority of information provided from the last interviews was only confirming previous knowledge, and therefore, it would be more time consuming than value adding to continue with the sampling.

Another concern connected to sample size is the homogeneity or heterogeneity of the population from which the sample is drawn (Bryman & Bell, 2011). With a highly heterogeneous sample, e.g. a sample of an entire city, the population is also likely to be highly diverse. A homogeneous sample on the other hand, e.g. from members of a company, will have less variations. Considering these aspects, the implication becomes that higher heterogeneity within a population requires a larger sample size. A population consisting of different actors in a defined market can, with this definition, be seen as quite heterogeneous. Therefore, the researchers performed relatively many interviews for the study, and also assured that several interviews were held for each type of actor in the supply chain, to generate a more representative sample to the population.

3.2 Data collection

In this section, the general working procedure of the project is outlined. Moreover, the chosen method approach is discussed together with what type of data that best fitted the research questions of the study, and how the data were collected. Lastly, a discussion is held on how other types of data collection would have affected the research result.

3.2.1 Working procedure

The main inputs of the study consisted of interviews with different actors on the heat pump market, together with a literature study. The interviews were performed with employees at different levels within companies that work with heat pumps and heat solutions. The aim was to map the market, its involved actors, their roles and how they interact with each other. Further, the interviews were a way to understand what services that are included in each step of the supply chain, which laid a foundation for the analysis. In addition, the literature study was weighted together with the collected data from the interviews, which was used to answer the second and third research question.

The study was initiated by the consultancy company Profu together with the thesis examiner, Árni Halldórsson. Thus, the purpose of the study could be specified early in the process and it also facilitated the development of the three research questions. The planning report was the first created document, which included the formulated purpose, research questions, possible outcomes, as well as a time plan. In order to collect necessary data, a semi-structured interview form was created, using the research questions and theory as a base. During the interview-phase, the literature study was performed with initial focus on servitization in manufacturing firms. As the knowledge of the subject grew, additional theories were added. From the interviews, it was decided to connect servitization to sustainable performance as well.

In the final part of the study, an analysis was performed where the collected data were connected to theories from literature. Here, different models were used in order to fit the purpose of the study, and to get relevant results regarding the current level of servitization and future possible scenarios for the heat pump market. Further, a workshop was held at Profu's office, where future possibilities for the market were discussed together with driving forces and barriers. This was a way of validating the research and to test different possibilities against a competent group.

3.2.2 Qualitative data collection

A qualitative approach is often suitable in explorative studies, and has the purpose of explaining and interpreting key concepts and connections in the area of research (Wallén, 1996). Moreover, Easterby-Smith, Thorpe and Jackson (2015) define qualitative data as "pieces of information gathered in a non-numeric form". The authors also describe the collection of qualitative data as an interactive and interpretative process. Historically, the Swedish heat pump market has not been a frequent subject of investigation, thus the study had an explorative nature. Further, since the purpose of the thesis was to map the heat pump market in terms of actors' roles and interactions, not to gather statistical data of the market situation, a qualitative data collection was therefore considered most applicable.

Interviews were used as the main medium to find qualitative data for the research questions of the study. However, in cases of uncertainties, interviews were complemented with information from the companies' websites and additional contact with the interviewees. The aim was to receive insights on actors' roles and interactions on the heat pump market, what type of services that are currently being offered, and trends recognized on the market. The interviewees were asked both specific questions about the market situation and previous trends, as well as more open questions about future trends where different scenarios were discussed.

3.2.2.1 Designing interviews

Easterby-Smith et al. (2015) discuss three main options for interview design: highly structured interviews, semi-structured interviews and unstructured interviews. Highly structured interviews include a detailed and predefined listing of questions, which might have predefined answers. Semi-structured interviews are more open and flexible in how the questions are addressed, but still include a topic guide with issues to be covered. Lastly, in unstructured interviews, questions are mainly asked to keep up the conversation, not to receive particular responses. Hence, unstructured interviews are difficult, or even impossible to prepare for. Since the aim of this thesis includes both a pure mapping of the heat pump market and a more speculative part with identified trends, semi-structured interviews were used to receive the most comprehensive result.

Three different interview templates were developed to fit all actors' position on the heat pump market. Hence, depending on where in the supply chain the interview candidate was categorized, the questions were adjusted accordingly. The three categories were named Supplier, User and District Heating Supplier, see Appendix 1. The interview frameworks were similar for all categories in order to receive comparable data from actors' holding different positions in the supply chain. However, some topics in the interview guide had category-specific questions to provide the authors with a more nuanced picture of the market.

To avoid common mistakes in interview design, e.g. including too many questions in one template, having multiple questions in one or asking overly complex questions (Eriksson and Weidersheim-Paul, 2008), an internal validation of the interview templates was made. Firstly, a brainstorming

session was held to develop areas to be included. Thereafter, the general areas were broken down into specific questions and sub-questions. The supervisors of the project also carried out an external review of the interview templates. Lastly, the questions included in the different templates were structurally analysed to ensure that they fitted with the research questions of the study, see Appendix 2.

One part of the interviews was to visualise the candidate's supply chain in terms of actors and their connections, from the candidate's perspective, with help of a drawing. In other words, the candidates had to draw a simplified and general picture of their view of the market in which they operate. This special part could only be achieved in the live performed interviews. In the interviews performed through phone calls, the supply chain was instead described with words. The reason behind including this visualisation in the interviews was to enhance the validity of the supply chains that were to be drawn by the authors.

3.2.2.2 Interview objects

Since the main purpose of the thesis is to provide a deeper insight into the heat pump market through a mapping of its current actors, interview candidates holding a position on this market were primarily chosen. To receive a wide and truthful view of the market, candidates from all parts of the supply chain were contacted, i.e. producers, users and the different actors in between. In addition, to get an outside perspective of the heat pump market, a candidate from a district heating company was included in the interviews.

In total, 20 interviews were conducted in this study. Information about the interview dates, the candidates' respective company, and the companies' market positions on the heat pump market can be found in Table 3.1 below. Four candidates chose to be anonymous in the study. They are only presented with their interview dates and the companies' market positions in Table 3.1. In addition, a discussion with two private users: one villa owner and one real estate owner, was held during a workshop in April 2019.

Interview date	**Company**	**Market position**
Feb 8, 2019	Nibe	Producer
Feb 8, 2019	Tesab AB	Franchise Group
Feb 11, 2019	IVT	Producer
Feb 11, 2019	-	Integrator
Feb 12, 2019	CTC	Producer
Feb 14, 2019	-	District Heating Company
Feb 14, 2019	-	Solution Provider

Feb 15, 2019	Nibe	Producer
Feb 18, 2019	Skånska Energilösningar	Solution Provider
Feb 19, 2019	Akademiska Hus	User
Feb 19, 2019	Nibe	Producer
Feb 25, 2019	Bostadsbolaget	User
Feb 26, 2019	Finspångs Brunnsborrning	Subcontractor
Feb 27, 2019	Energiförbättring	Solution Provider
Feb 27, 2019	-	Wholesaler
Feb 28, 2019	Kungälvs Rörläggeri	Installer
Mar 4, 2019	HSB	User
Mar 4, 2019	Enstar	Solution Provider
Mar 6, 2019	Catena	User
Mar 11, 2019	GS Kylservice	Installer

Table 3.1: Description of interview candidates

3.2.2.3 Performing interviews

Initial contact with the potential interviewees was made through a standardised email, thereafter, the authors made phone calls to check their interest and, if confirmed, interviews were scheduled. To give the candidates an opportunity to prepare for the interview, a confirmation email was sent with the category-related interview template. Prior to when the interview was performed, the authors searched for information about the concerned company to provide basic knowledge of its role on the market. Hence, appropriate follow-up questions could be asked. Moreover, in the first email, information about the authors, the aim of the study and intended usage of the interview data, was provided to the interviewees. Andersson (1985) emphasizes the importance of this type of first instructions to potential candidates in order to succeed with upcoming interviews.

The interviews were performed either through direct meetings or phone calls, depending on what the candidate preferred. All interviews were held in Swedish since this is the native language of the

candidates, which made it easier to avoid misunderstandings and made the candidates feel more comfortable. Hence, the authors could receive as much information as possible during the interviews. Depending on how elaborative the candidates' answers were, the time of the interviews ranged from 15 to 80 minutes.

There are several benefits of recording interviews (Andersson, 1985). For example, recording facilitates the analysing process and makes both the interviewer and interviewee more focused since they are not dependent on notes. 18 out of 20 interviews in this study were recorded, where the remaining two were solely based on notes. However, information that could reveal the anonymous candidates, or other confidential information, was always left out according to the participants' wishes.

3.2.3 Theoretical framework

When the theoretical framework was developed, it took its roots in the research questions, since these should guide and frame the data in order to fit the investigated research (Ghauri & Grønhag, 2010). Thus, the first search for articles were connected to servitization within manufacturing firms, complemented with articles from the course Service Management at Chalmers University of Technology. Keywords used in this search were *servitization, servitization within manufacturing firms* and *servitization in the heat industry*. Since one of the research questions in the study involves mapping actors within the heat pump market, it was decided to connect servitization to supply chains in terms of relationships and service triads. This, in order to draw interesting conclusions regarding the connection between level of servitization and actors within the market. Keywords that were used in this search were *service archetypes*, *servitization in supply chains*, and *servitization in aftermarkets*. Moreover, several articles were collected from the course Service Management and from recommendation by the supervisor. All articles were read and discussed in terms of relevance together with the supervisor of the thesis. Interesting parts from each article were summarized and presented within the project group, which made it possible to create a proper base for the framework early in the working process.

As the interviews were performed and data were collected, it was decided to complement the theoretical framework with theories that involve sustainability in connection to servitization. This was decided since sustainability is an important factor in the heat and energy market today. Moreover, some of the existing theories were evolved, while others were shortened, depending on the received information from the interviews. Adjusting the framework was a way to refine it and further assure its relevance for the study. Depending on what theories of the framework that were used in the analysis, it was adjusted and reframed once again in order to fit the study. Hence, the theoretical framework was finalized in a late stage of the working process.

The databases used to search information were Chalmers Library Search and Google Scholar. In addition, research reports regarding the Swedish heat pump market were received from Profu, which facilitated the understanding of the market.

3.2.4 Discussion

When performing the study, it was chosen to combine theoretical data collection together with interviews. However, different approaches to collect data were possible. For example, many interview questions could have been answered through a form or maybe through company documents (Easterby-

Smith et al., 2015). Using company documents implies that the researcher has less influence over the content (Easterby-Smith et al., 2015), which could have affected the result.

To perform interviews as a primary source of data, was a choice made together with the supervisors, since this method allows for broader questions and more developed answers. Thus, the interviews were not only a way to answer the asked questions, but a way to get a comprehensive view of the market and its structures. This in turn gave answer to the first research question, which the second and third question are based on. It might have been possible to perform more interviews, but since interviews are difficult to standardise due to their varying structures, time was a determining factor (Easterby-Smith et al., 2015). Performing additional interviews would have enhanced the aggregation of the data and created a possibility for statistical comparison. Moreover, the majority of all performed interviews were conducted through telephone, which lacks non-verbal communication and immediate contextualization (Easterby-Smith et al. 2015), that would have been beneficial when interviewees were asked to describe their supply chain. Connected to the time issue, secondary data were collected from company homepages, which demands a critical evaluation before being used (Easterby-Smith et al., 2015). If more time had been accessible, the same information could have been collected through the interviews.

3.3. Data analysis

To analyse qualitative data, most approaches use a systematic breakdown of the data's complexity, which in turn enables the researcher to develop theories of the studied phenomenon (Easterby-Smith et al., 2015). How the complexity of data is reduced and how the theories are created differ between the approaches. In other words, the approaches choose different data frames and also have different methods on how to structure and interpret the data to reach valuable conclusions. To analyse the collected data from the interviews, an approach called *content analysis* was mainly used. The purpose of content analysis is to make systematic implications from data, which have been organised according to certain concepts or ideas (Easterby-Smith et al., 2015). Hence, data is analysed with respect to the presence, meanings and relationships of the chosen concepts or ideas. These can either be developed from already existing theories, from the research questions or from the collected data themselves (Hsieh & Shannon, 2005; Flick, 2009). In other words, content analysis is suited for both hypothesis testing and theory building.

First, data were gathered from the interviews regarding the candidates' suppliers, customers and other collaborations, together with their relationships and offered services. To select relevant information for the research questions of the study, based on certain criteria, is often the first step in a content analysis (Easterby-Smith et al., 2015). The main criterion in this study was that every question in the interview template contributed with valuable material for at least one of the three research questions. The relevance of the interview questions to the research questions was analysed in a systematic manner, see Appendix 2. Initially, data from the interviews resulted in the creation of nine different supply chains. The supply chains were separated based on the involved actors, where no distinction was made between actors offering different services. Instead, the actors were defined based on their role in the supply chain and their organisational structure, since focus is on roles in the first research question of the study. Hence, the selected interview material was here analysed based on the concept of roles from the research questions of the study.

The initial nine supply chains were later summarised into four main supply chains to facilitate the analysis. These four supply chains were selected based on their number of appearances in the interviews and the relevance of their characteristics for the purpose of the study. Thereafter, the collected data were allocated to the four supply chains. To ensure credibility, all recorded interviews were listened to again and data for each supply chain were divided into roles, relationships, interactions, services and other. These categories were later summarised into *roles, offered services*, and *relationships and interactions.* In this part, the concepts were determined by existing theories in literature. Moreover, when structuring and summarising the data brought forward from the interviews, the four supply chains were divided equally between the researchers. Hence, a more objective view of the market could be received, since the researchers were rewriting each other's notes from the interviews.

To analyse the more open part of the interview templates, i.e. past and future trends, an approach called *grounded theory* was used. Grounded theory has the purpose of generating structure, i.e. theory, from categories grounded in the data, rather than framing data to already existing theories (Easterby-Smith et al., 2015; Charmaz, 2014). Hence, these categories are created from a systematic process of comparing different parts of the data itself. In this study, two separate sections were developed for past and future market trends. The trends were identified with respect to the main features brought forward by the interviewees, with no connection to pre-defined theory. Moreover, the trends were not directly linked to the different supply chains due to the varying nature of the candidates' answers in the interviews.

The second research question, i.e. the current level of servitization on the market, was analysed with reference to the frameworks brought forward in the theoretical framework. However, the researchers also chose to include data that did not fit into existing frameworks, either by expanding the framework or by discussing the contradicting data. This decision was made to not exclude relevant data for future research on the subject.

3.3.1 Discussion of research quality

According to Lincoln and Guba (1985), it is essential that a study is trustworthy when determining its value. Trustworthiness can be measured in terms of internal and external validity, as well as through reliability and objectivity (Bryman & Bell, 2011). When applying these concepts on the thesis, a critical discussion can be performed. To enhance the internal validity of the study, interviews were held with experienced people within the heat pump market and with industry experts. Moreover, actors at different levels within the supply chains were interviewed, which broadened the collected data. When the data had been compiled into chapter 4, it was sent out to all interviewees in order to be confirmed and approved, which was seen as a validation of the first research question.

When moving forward with the project and the analysis of the second and third research question began, a workshop was held with the supervisor, Árni Halldórsson, and a few consultants at Profu. Here, the results from the second research question were presented and discussed, which validated the analysing process of the project. The third research question had not been analysed yet, therefore it was only discussed within the group. However, three main pathways were developed during the workshop, and it was decided that these should be validated at a conference with Heat Market Sweden, where people from the Swedish heat industry would be present. At Heat Market Sweden, which took place during the 7th and 8th of May, the study was validated from 40-50 people working within the Swedish heat industry. Regarding the third research question, a discussion with the

participants was held where several important aspects were collected. These are presented in chapter 5.2.5. The overall feedback from the discussion was summarised as positive, which further validated the results of the study.

External validity concerns to what extent the study could be performed by another party (Lincoln & Guba, 1985). In this thesis, a thorough description of how the interviews have been performed is presented, together with all interview templates. Moreover, the collected data, as well as the analysis, are carefully supported with statements and referred frameworks. In order to create reliability to the study, the supervisors have guided and proofread the report in several rounds during the project. In addition, another thesis group has opposed the project. Finally, it is important to create objectivity in a study, i.e. making sure that the content is not angled during the investigation. Thus, all interviews were recorded when approved, which allowed the content to be repeated and clarified several times. Moreover, triangulation was used when analysing the problem. This implies that multiple data sources were used (Lincoln & Guba, 1985), e.g. the literature study and the interview study, which further increased the study's objectivity.

4. Findings - Mapping of the heat pump market

In this chapter, actors' roles, interactions and offered services are described in terms of different supply chain configurations of the heat pump market in order to answer the first research question of the study:

Who are the actors in the different supply chains, and what roles do they have?

Moreover, a discussion of trends within the heat market is included, both in terms of past events and speculations about the future. To get a comprehensive view of the situation on the market, interviews with actors on all levels of the supply chain have been performed. These actors include producers, wholesalers, integrators, heat solution companies, franchise companies, installers, subcontractors and users. In addition, an interview with a competitor to the heat pump market, a district heating company, has been carried out. On the producer level, four main Swedish actors, together with some foreign players, have been observed. Further, on the wholesale level, a few major actors have been mentioned, in contrary to the installer/subcontractor level where ten-thousands of actors operate.

4.1 Past trends within the market

From the interviews, it was understood that the heat pump market has experienced different trends the past 5-10 years. According to one interviewee, the heat pump has evolved from merely being a way to lower costs, to a heating device that can give the **customer independence**, as well as **contribute to a more sustainable environment**. In addition, another candidate mentions that European directives and long-term goals regarding renewable energy and efficiency are other factors that push technical development. Moreover, all interviewed producers mention that **connected heat pumps** is a technical trend they have observed during the last years. This involves that the heat pump is connected to an app which collects data regarding the usage of the pump as well as important alerts. However, one installer mentions that there is no actor that fully uses the potential of the collected data that connected heat pumps enable. Hence, he believes that new actors might enter the market and take this position when the data is located in the cloud. Moreover, one actor mentions that another trend is to **connect the heat pump with other systems in the building**, e.g. the ventilation system or solar panels. This results in an overall connected system that can be controlled through one device in an easy manner.

Another identified trend mentioned in several interviews is to install heat pumps in **larger properties and facilities**. This is a result of the high maturity level of the villa segment of the market, and thus other segments need to be found. Moreover, three interviewees emphasize the importance of coolness as a new segment linked to larger establishments. Using heat pumps as a way to **combine heat and coolness** is considered a new trend, especially during hot summers. Connected to the market, one candidate mentions that he has witnessed a consolidation. He argues that during the past 20 years, national producers have noticeably decreased and that international brands have out competed our Swedish brands. In addition, another candidate mentions that on the producers' level, **a consolidation has been witnessed** in terms of acquisitions by larger companies. However, one interviewed installer talks about how the plumbing industry is very traditional and conservative regarding movement of energy. Thus, **other actors have been able to enter** their market, since they already saw energy as a moveable product.

Moreover, some candidates mention that they have seen an **increased service development** within the industry. One interviewee says that without good service and support, companies are quickly excluded. In connection to this, the same candidate brings up connected heat pumps and the app that the company offers to its consumers as a relatively new service. Further, another candidate talks about how energy companies have started to enter the heat pump market and offer financial services to customers. He argues that this is a way to lock in the customer by leasing a heat solution, which he thinks that larger facilities will not appreciate. In addition, another candidate believes that many companies are trying to **change their initial concept** in order to make it more comfortable for the customer.

4.2 Identified supply chains

Initially, the mapping resulted in nine different supply chain configurations of the heat pump market, according to the purpose of the study. These have been summarized into four main supply chains illustrated in Table 4.1 below. Further, in Appendix 3, all nine supply chains can be found with connected descriptions of each actor's role. All actors' roles are described in the Traditional Supply Chain, and if a role is not mentioned in the other supply chains, it is equivalent to the traditional.

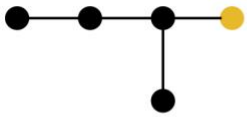
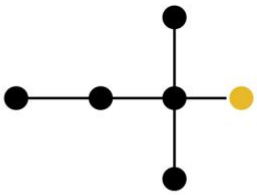
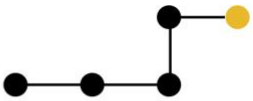
Traditional	Franchise	Integrator	Heat solution
			

Table 4.1: Four main types of supply chains

Moreover, the interactions between actors will be defined as either low, medium or high in the following sections of chapter 4.2. Explaining the interaction between actors allows to further understand the current level of service exchange and the prerequisites for service advancement. An interaction defined by a pure service exchange is illustrated through a dotted line in the upcoming figures, while an interaction that includes both services exchange as well as product distribution is illustrated through a straight line. If the interaction has been confirmed by several interviewees as a partnership, it is defined as high. Otherwise, the definition of the interaction is connected to the level of offered services and the resulting relationship between the concerned parties. The level of services is defined in chapter 2.3.2 as *product support services*, *customer support services* and *process related services* and their corresponding relationships can be seen as transaction based, customer oriented and closely collaborative, see Table 4.2 below.

	Low interaction	Medium interaction	High interaction
Level of Service	Product Support Services	Customer Support Services	Process Related Services
Relationship	Transaction based	Customer oriented	Close collaboration

Table 4.2: Categorization of interaction

4.2.1 The traditional supply chain

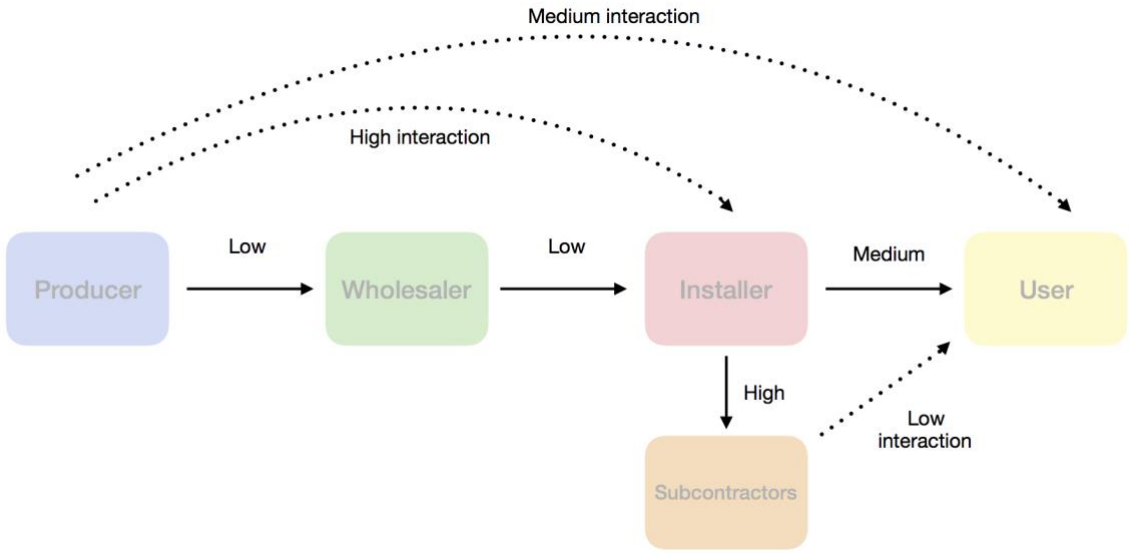


Figure 4.1: The traditional supply chain

The traditional supply chain is seen as the most common and well-established supply chain within the heat pump market today. It starts with a producer that manufactures and assembles the heat pump using different suppliers. Then, most commonly, the different products are distributed across the country using a wholesaler. The data confirm that all interviewed producers use wholesalers as their distribution channel. However, one of the interviewed producers choose to move its products directly to the installers as well. Using dual distribution channels can lead to tension between the producer and wholesaler, resulting in that the wholesaler will not prioritize these brands. Therefore, according to two candidates, producing companies often make a choice to either use installers or wholesalers exclusively as distributors.

According to several candidates, the installer is often rooted as a plumbing company and will either deliver the heat pump alone, or together with subcontractors, to the customer or user. Hence, the installer and its subcontractors have direct contact with the user. The subcontractors can for example be electricians, drillers, steering suppliers or constructors. Depending on how much competences the installer possesses in-house and how complex the project is, it will complement its competences with subcontractors. One interviewee mentions that due to tax deductions, it is financially more beneficial for the user to order the heat pump together with installation from one actor, instead of hiring several different actors. In the traditional case, the user or customer can be private persons, housing societies, small or large real estate companies, commercial and industrial facilities, as well as municipalities or other public properties. In some cases, a consultancy company is involved to help either the producer or user to perform more advanced calculations and deliver advisory services during project planning.

These types of customers often order large heat pump facilities that demand complex calculations. Moreover, it is possible that the user is a house manufacturer, and in those cases the producer sells the heat pump directly to the user, due to high price pressure. The traditional supply chain is illustrated in Figure 4.1 above.

4.2.1.1 Roles

Producer

In the traditional supply chain, all interviewed producers mention that their main role is to deliver functionality and performance, in terms of manufacturing and assembling different heat pumps. One of the candidates mentions that design and efficiency are important factors for the heat pump. Moreover, since the heat pump is a large investment for the customer, it is important that the producer delivers high quality and a long lifetime. Several of the interviewed producers agree on this. In addition, all interviewed producers offer different kinds of product support to installers and one company offers this to end-customers as well. The producer is then using its expertise of how the products should be installed as well as serviced during the aftermarket.

Wholesaler

Looking at the wholesaler, its main role is to distribute the product to the next level in the supply chain. According to the one candidate categorised as a wholesaler, its role often entails logistic services in terms of stockholding and delivery of products to the installer. If the wholesaler is not present in the supply chain, the installer will take on the role as distributor for the producing company.

Installer and subcontractor

The installer's role is to deliver and install the heat pump to the user. According to two candidates, this often implies that the installer takes on a full responsibility to plan and execute the project, making sure that the heat pump will operate in an efficient and successful manner. In connection to this, the installer function as a service provider, integrator and communicator, resulting in multiple roles. If the installer is a distributor of a certain brand, it also has a responsibility to recommend that brand to its customers. However, since the installer wants to please its customer, i.e. the user, it often uses wholesalers to complement its product portfolio with other brands as well. According to two interviews with installers, it is common that the installer does not possess all competences necessary to implement the heat pump alone. Thus, the installer often hires subcontractors that complement its in-house competences with special competences, such as drilling expertise or steering elements. Moreover, two users confirm that several actors often are involved in the installation process of the heat pump. However, in some cases, the user itself choose to hire different subcontractors, including the installer, for the project. Then, the user takes on the roles as communicator and integrator between all included parties. Reasons behind this can be that the user wants a certain expertise or a certain subcontractor to deliver the product. According to the interviews, public real estate companies sometimes execute projects like this, since they need to openly publish the requested solution by law, and thus applies first come first served to actors that bring offers.

4.2.1.2 Offered services

Producer

The traditional supply chain is product focused and thus the majority of services offered to the user are intended to serve the product. For example, all interviewed producers offer a warranty for several years that ensures the quality of the products. In addition, some producers mention that it is possible to extend the warranty, often through an insurance company, at an annual cost. However, some services

are intended to aid the installer's processes instead. All interviewed producers offer advisory services to installers in order to facilitate the installation of the heat pump and ensure that the procedure is performed correctly. These services often imply that the producing company offers a telephone support, but they can also include educational services delivered to the installer. Further, one producer mentions that they offer product support, in terms of a telephone service, to private end-users as well. In addition, all interviewed producers mention that they have an app for the end-user to control, steer and monitor their heat pump in an easy manner. This app is sold as a monthly or yearly service and allows the user to adjust its heating supply as they wish.

Wholesaler
Two candidates describe that the wholesaler's role includes offering logistic services in terms of distribution channels. These services aim to facilitate the installers' processes, but also to help the producers spread and stockpile their products across the country. Moreover, the wholesaler could offer the producer special marketing possibilities on its platforms, which will increase the amount of sold goods. In this part of the supply chain fewer services are offered, but the distribution channels are highly valued of both producers and installers.

Installer
The installation of the heat pump could be seen as a service performed by the installer to the user. In addition, all interviewed installers mention that they offer advisory services to the user, both during planning and execution. When the installer takes responsibility for the whole project, it ensures that the heat pump operate as promised during the first period of running. Moreover, in connection to the warranty, the installer often offers different maintenance services to the customer after the installation is performed. However, the extent of the maintenance services depends on how large the facility is. For example, large facilities often need to be controlled once or twice per year, which should be done by a company that possesses these types of competences. While small facilities, like private villas or housing societies, might not need the same support and services. However, two private users discuss several issues in service availability connected to malfunction of the heat pump, even with a valid insurance. They mention a time consuming and complex process in receiving appropriate assistance. In some cases, the installer offers operational services, but according to the interviewees, it is common that the user wants to operate the heat pump alone. Further, several users mention that they often hire a pure service organisation, i.e. a company that exclusively offers service deals for aftermarket services, instead of turning to the installer.

Subcontractor
When subcontractors are summoned to aid the installation of a heat pump, they could offer advisory services to the installer or the customer. One interviewee mentions that its company offers project planning, testing and simulation services to its customers in order to ensure that the heat pump becomes optimally dimensioned. However, once the product is installed, the subcontractor is most commonly not involved anymore.

4.2.1.3 Relations and interactions

Producer - Wholesaler
The interactions in the traditional supply chain vary depending on the type of customer and if the wholesaler is included or not. Three producers describe their relationships with the wholesaler as well functioning, and one candidate mention that the company has personal contacts with the wholesaler. However, this relationship is categorized as low due to a main focus on transactions and contracts. For

example, one producer brings up stockholding and delivery of products as the wholesaler's most important function. Moreover, the interviewed wholesaler focuses a lot on contracts and negotiation when describing the relationship with the producers. But the same interviewee also mentions that in some cases, the producer is partnering with the wholesaler and thus can benefit from special marketing possibilities.

Producer - Installer

If the producer sells its product directly to the installer, the two parties form a partnership with each other and the relationship and their interactions become very high. This is confirmed by one interviewed installer. Even with the wholesaler between the producer and the installer, the relationship between the two parties must be strong, according to all five producer candidates. This, in order to ensure that the installer favours a certain brand and thus recommends it to its customers. Since the installer is the actor that interacts directly with the customer, it also has a lot of influence regarding which brand the customer should choose. The influence is especially important with private users, since they generally do not possess enough knowledge about the products and their functionality. Therefore, all of the interviewed producers put a lot of focus on processing different installers across the country in order to get their loyalty and, many times, friendship.

Producer - User

Since all interviewed producers offer users an app to monitor their heat pump, which could be seen as a way to improve the users' product related processes, the interaction between producer and user is defined as medium. Through the app, the producing company gets access to its customers' user data and therefore learn more about their user behaviour.

Installer - User

From two of the interviews, it becomes clear that the installers are experiencing a lot of work. Their relationship and interaction with the user can vary a lot depending on the length of the project. With large customers, such as commercial facilities, the interaction points with the customer increase, since the projects take longer time to complete. Here, services after the end of the project also become relevant. However, with smaller private customers, the project is less complex and time consuming. Therefore, the relationship is often short and the number of interactions are fewer. Once the heat pump is installed and optimized, interactions on the aftermarket between installer and user appears in connection to maintenance services or if the heat pump breaks. All interviewed installers mention these interactions. Moreover, if the heat pump malfunctions or breaks, the user might contact the producing company instead of the installer.

4.2.2 The franchise supply chain

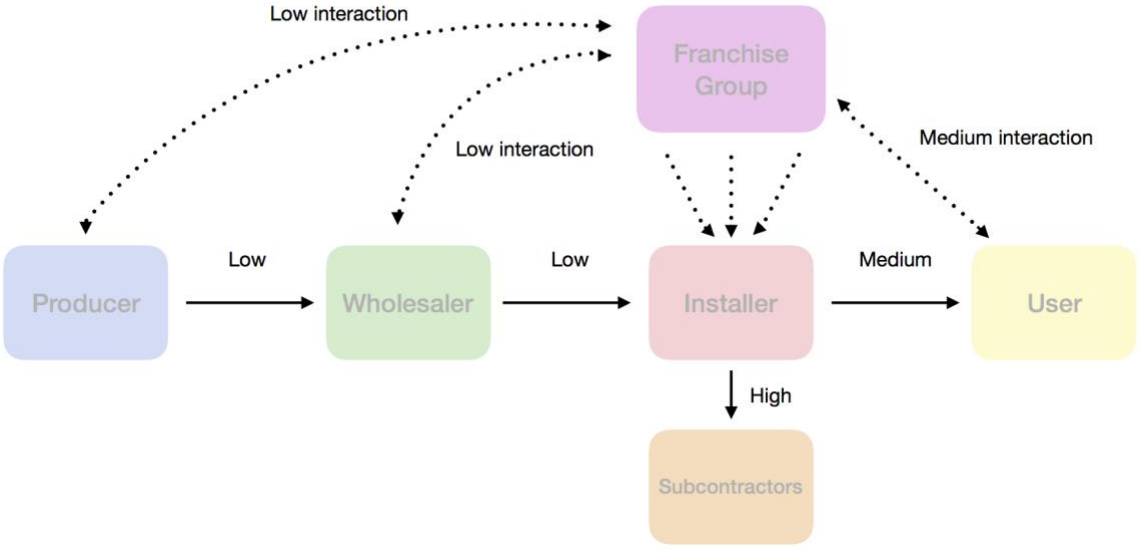


Figure 4.2: The franchise supply chain

In this supply chain, a franchise group functions as a coordinator for several independent installers, hence it is referred to as the franchise supply chain. Here, the heat pump is distributed from the producer to the wholesaler. Thereafter, it is bought from installers with various geographical locations, which in turn use different subcontractors to complement their own competences. Lastly, the heat pump is distributed from the installer to the user. The users can be house owners, housing societies, real estate companies, and industrial- and commercial facilities. In this supply chain, the installers are franchisees that take part in the franchise group's brand. In addition, the producers give the franchisees a bonus, which is transferred and charged for by the franchise group. The franchise group has contact with both the wholesaler and user. The franchise supply chain is illustrated in Figure 4.2 above.

4.2.2.1 Roles

Franchise Group

The franchise group takes on several different roles in the supply chain. The interview candidate mentions that the franchise group ensures that users and installers follow current regulations, and thus act as a coordinator. Moreover, the candidate emphasizes a helpful culture among the franchisees, and if one installer is short of manpower, the franchise group can assist in coordinating the workforce. This collaboration is confirmed by one interviewed franchisee. The coordinator role of the franchise group is further highlighted through its handling of purchasing agreements. The franchise group also takes on an analyst role by investigating current market needs and searching for business development opportunities. In addition, the candidate brings up the recruiting role of the franchise group, i.e. bringing in new companies to its brand.

Installer

From the interviews with the franchise group and one of its franchisees, the role of the installer does not appear to differ from the traditional supply chain. Hence, the installer has multiple roles, which include acting as a service provider, integrator and communicator.

4.2.2.2 Offered services

Franchise group

One service that the franchise group provides to the user is co-development of the user's heat solution, which is often a modification of a consultant's initial solution proposal. In addition, the franchise group offers comprehensive service deals to larger customers after expired warranty on the heat pump. To facilitate the user's daily operations, the franchise group provides education to the user in this area. Connected to this, an installer mention that the group also offers education to its franchisees.

Installer

The franchise group candidate mentions that the installers perform services such as installation and controlling, but also services included in the warranty, e.g. maintenance and operations services. These aftermarket services are performed by the installers once or twice per year.

4.2.2.3 Relations and interactions

The franchise group has a close collaboration with a Swedish interest group on the heat pump market. Another collaboration mentioned by the candidate is with consultants, which assist the franchise group with calculations and the development of environmentally friendly solutions. The franchise group also interacts with vocational universities and collaborates with finance companies to provide leasing and amortisation alternatives, for users who cannot afford the investment.

Franchise group - Producer

The franchise group has a close collaboration with its main producers, focusing on finding environmentally friendly solutions. The franchise is the largest cooperation of its kind in Sweden, and the candidate considers all its relationships with producers to be good. An interviewed franchisee, on the other hand, emphasizes that it does not have significant contact with any Swedish producer.

Franchise group - User

The users that the franchise group mainly interacts with are hotel chains, real estate companies and food companies. The candidate describes a good dialogue between the franchise group and its contracted customers. In addition, the candidate mentions that since the franchise group possess a lot of competence, the users have high faith in them.

4.2.3 The integrator's supply chain

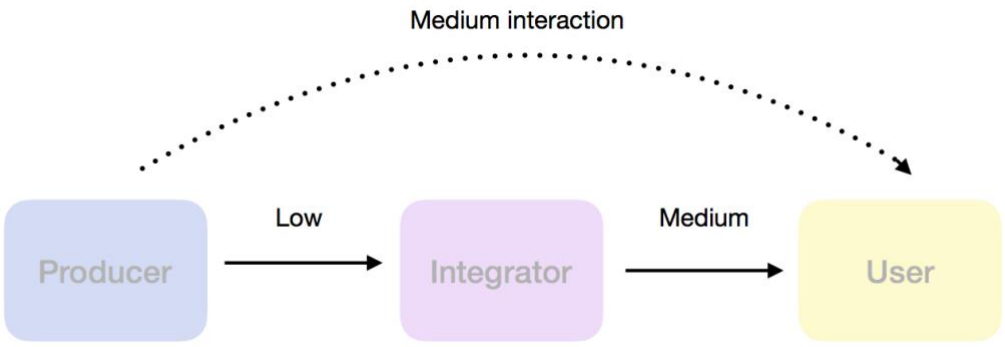


Figure 4.3: The integrator's supply chain

In the integrator's supply chain, a producer manufacturers and assembles the heat pump and then delivers it to the integrator. From the integrator, the heat pump is delivered to the user where it is installed and optimized, without using any subcontractors. In the study, only one candidate qualifies as an integrating company. The interviewed candidate mentions that it possesses all relevant competences in-house and therefore can execute the project alone. Moreover, the candidate states that the integrator acquires other companies in order to obtain certain competences that are required to deliver a complete solution to the user. In this supply chain, the user can be private house owners, housing societies, and public or private real estate companies. The integrator's supply chain is illustrated in Figure 4.3 above.

4.2.3.1 Roles

Producer

The role of the producer is very similar to the traditional supply chain. However, in this case, the wholesaler is often not included, and thus the producer's role is expanded to deliver the product as well as providing the integrator with valuable knowledge about the different products.

Integrator

The integrator's role, however, is far more comprehensive since it takes on full responsibility of the user's heating and cooling facility, without hiring any subcontractors. This implies that the integrator could complement the heat pump with other heating or cooling systems, such as solar energy or ventilation systems. The interviewee explains that the role of the integrator is to remove the old heating system, to plan and design the new project, deliver the heat pump, perform drilling if necessary, install and optimize the product, monitor and steer the system, as well as to perform different services. Moreover, the integrator wants an active role after the heat pump is installed, thus it focuses a lot on its aftermarket services. According to the integrator candidate, the goal is to take on full responsibility of the heat solution, including financing or leasing of the heat pump, against a monthly fee.

4.2.3.2 Offered services

Producer

The majority of services included in this supply chain are delivered by the integrator. However, the producers still contribute with advisory services, expertise and education towards the integrator. Moreover, the producer offers the end user an app for controlling and steering of the heat pump. This service is directed towards small private customers and is charged by a monthly or yearly fee. However, the candidate emphasizes that in the future, the integrating company wants control of the application service.

Integrator

The services that the integrator offers to the user demands a high interaction. Firstly, the candidate mentions advisory services to users, as well as planning and designing of the heat pump system. In addition, the integrator offers the customer financial services in terms of payment plans for the heat pump systems. This is currently achieved in collaboration with finance companies. After installation of the system, the integrator can provide the user with monitoring and controlling services, as well as maintenance.

4.2.3.3 Relations and interactions

Integrator - Producer

The interviewed candidate describes the company as independent to any supplier, i.e. it is not dependant on a certain brand. Moreover, the candidate categorizes its relationship with the producer as quite basic since the producer do not offer much other than the product itself.

Integrator - User

Looking at the relationship between the integrator and the user, they have several interaction points both during the project, but also after, in terms of service delivery. In addition, the interviewee emphasizes that the interaction with its customers is the company's main concern, and that it strives for a bigger part of the aftermarket. However, the company's installers currently have a more traditional focus, and the candidate claims that the company needs to reconsider how it looks after its customers. In connection to this, the interviewee mentions the difficulties in creating a strong collective brand towards the user, since the integrator acquires existing installers, which are well established on their local markets.

4.2.4 The heat solution supply chain

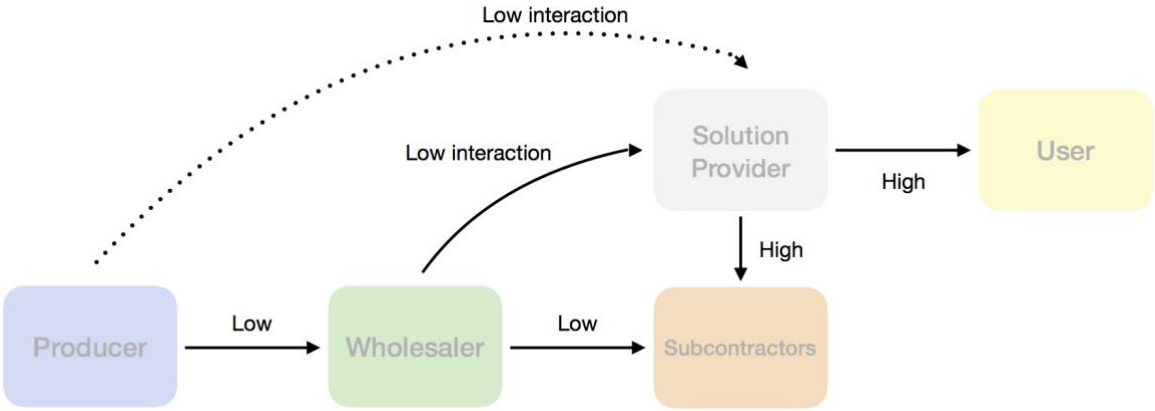


Figure 4.4: The heat solution supply chain

In the heat solution supply chain, the heat pump is delivered from the producer to the wholesaler, as described in the traditional supply chain. In some cases, the heat pump is bought directly from the producer. Thereafter, either the solution provider or one of the subcontractors handles the purchase. However, it is always the solution provider that takes full responsibility of the heat pump system and its delivery to the user. Both energy- and plumbing companies with expanded energy focus can function as a solution provider. The solution provider's main customers, i.e. the users, are house owners, housing societies, real estate companies, commercial facilities, industrial facilities, construction companies and municipalities. The heat solution supply chain is illustrated in Figure 4.4 above.

4.2.4.1 Roles

Solution provider

The solution provider's main role is to deliver a complete heat solution to the user. All four candidates categorized as solution providers emphasize that they take on full functional responsibility of a heat

solution that combines different technologies. One candidate mentions the functional responsibility in terms of planning, purchasing, designing and investing in the heat pump. Another candidate describes that the company offers control functions, drilling, installation of electricity, and ventilation for the heat system and thus provide full responsibility of it. The same candidate also highlights that the company sometimes takes on a consulting role. In addition, the solution provider can have the role of a service organisation, offering product supporting services on the aftermarket. All four candidates confirm that they provide service packages to users. The service organisation is either integrated in the company or outsourced, but with a close collaboration.

The different technologies that are combined with the heat pump vary. Two actors bring up solar power as a component in their heat solutions. However, the focus of the solution provider is on the final heating system to the user, not on any specific technology. Two candidates confirm this in their interviews; one of them describes the company offer as a decrease of the user's operating costs connected to its energy use. Depending on who the user is, the solution provider's role can shift. For example, one candidate describes different customer segments in its business. The first segment consists of housing societies, companies and municipalities. To this segment, the solution provider offers large, integrated heat systems and thus has a more comprehensive role. To the second segment – house owners, the solution provider only offers a heat pump installation.

4.2.4.2 Offered services

Solution provider

All four solution providers offer operating and maintenance services to the user on the aftermarket. These types of services are either included in the initial offering or contracted separately. One candidate mentions that the company's subcontractors also can offer operating and maintenance services directly to the user. In addition to this, two candidates emphasize that they have an on-call service for the user, which is charged per call-out. One of these candidates outsources the on-call service to a service organisation. Moreover, two candidates bring up product warranty as a service that they provide. The warranty is passed on from the producer or the subcontractors offer it in connection to the installation.

To focus on performance instead of input in the value proposition, is emphasized by three candidates. They mention advanced services such as efficiency guarantees with custom-made heat pumps, selling consumption through geo-energy solutions, or reducing the user's heat/energy consumption with their offered systems. These services are only offered in a business-to-business context. Further, a candidate highlights the importance of having a flexible business model, and another candidate says that the exact services offered in each project differ. The solution provider can also offer leasing of heat pumps in connection to decreasing the user's energy consumption. In this case, the solution provider takes on the investment and the functional responsibility of the user's heat system. The user then pays a monthly fee for its heat with a shorter commitment than the solutions provider: 5 versus 25 years. This service is confirmed by one of the candidates. The same candidate mentions another financial alternative offered to the user: co-investment in the heat system. Hence, the user pays a lower fee by owning some parts of the system, for example the drill-holes, but the solution provider still has full functional responsibility of it.

Producer

Besides warranty, the candidates consider services offered by the producer to be quite limited. One candidate mentions that the producer offers calculation aids and education. The last service is bought

to train the solution provider's technicians. Another candidate brings up consultation and marketing as services provided by the producer.

4.2.4.3 Relations and interactions

Solution provider - Producer
Three of the candidates claim that they are brand independent, and choose the producer or wholesaler that best fits the individual user's needs. One of these solution providers still describes its relationships with producers as healthy, since the producers strive for a good cooperation. Another solution provider explains that it does not need to have a close relationship with the producers. The reason behind this is that the solution provider is much further ahead in design and configuration of the system. Its service organisation, on the other hand, is dependent on the producer when dealing with service projects and warranty issues. The solution provider that is brand loyal buys its heat pumps almost exclusively from one producer. The solution provider describes this relationship as a partnership.

Solution provider - Subcontractor
It is important for the solution provider to have a good relationship with its subcontractors, since it is dependent on them to deliver a well-functioning solution to the user. One candidate says that it tries to have a close relationship with its subcontractors, another describes the relationship as good and trust giving, and a third defines it as a close collaboration. In some cases, one subcontractor can take on several posts, e.g. drilling, piping, electricity installation and controlling. One candidate confirms this. In addition, the same candidate explains that if the solution provider has many subcontractors, there are also higher demands regarding contracts. Another solution provider has its favourite subcontractor in each technical area that it tries to select in projects whenever possible. The candidate also points out that these favourite subcontractors work very well together.

Solution provider - User
The solution provider strives to have a very close relationship with the user. Two candidates confirm this. A third candidate says that the relationship with the user must be good. Further, it is important for the solution provider to interact with the user on the aftermarket. The candidates mention these interactions in terms of on-call services, being in charge of system control, continuous maintenance, and system monitoring. Three candidates also emphasize that they want to be part of the user's development work, e.g. by designing a heat system that can be expanded with other heating technologies.

Besides producer, wholesaler, subcontractors and user, the solution provider can also interact with consultants, finance companies and interest groups.

4.2.5 Summary of the supply chains

The described supply chains are summarized in Table 4.3 below, where their structures and main characteristics are emphasized. The supply chains have reached different levels of servitization, and have been arranged accordingly in the table from left to right. Allocated responsibility towards the customer seems to result in less advanced services. Hence, when one actor takes on a comprehensive role in the supply chain, more advanced services can be delivered to the user. The total number of actors in the supply chain does not seem to affect the level of services offered, as long as the actor with the comprehensive role is closest to the customer. Thus, a customer-oriented approach could further enable that more advanced services are developed.

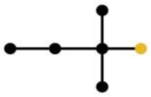
	Traditional	Franchise	Integrator	Heat solution
Actors				
Roles	• Specialised roles • Allocated responsibility towards customer	• Specialised roles • Allocated responsibility - with coordinator	• One actor with comprehensive responsibility • In-house competences	• One actor with comprehensive responsibility • Outsourced competences
Services	• Basic services • Product focus	• Basic services • Product/customer focus	• More advanced services • Customer focus	• Advanced services • Customer/process focus

Table 4.3: Summary of supply chains

4.3 Future trends within the market

In order to get a better understanding of the development of the heat pump market, a few questions regarding future trends were asked during the interviews. These trends function as a guidance to the third research question of the study: *what future pathways are possible for the heat pump market concerning servitization?*

When discussing trends for the upcoming 5 years, all producers focus on how product functionality will develop. Three of them mention the advancement of **smart heat pumps that communicate** with other parts of the heating system, which in turn will decrease the user's costs. For example, that the heat pump uses electricity when it is cheapest. However, one producer emphasizes that new product functionality should never be implemented at the expense of decreased robustness, since it is essential that the heat pump works smoothly. Moreover, two producers bring up the trend of higher user requirements regarding comfort, resulting in an **increased demand of combined heat/cooling solutions**. Hence, they argue that this trend could create a competitive advantage for heat pumps against district heating. Two solution providers highlight digitalisation of the product as an enabler for further **user availability**, i.e. that the user easily can steer and monitor its heat pump through the mobile application. This trend mostly concerns private house owners. Also, it is mentioned that the user will put more value on **heat solutions integrated to other parts of the home**. Another solution provider brings up the trend of e-commerce and that there exists a possibility of one actor grabbing all shares through e-commerce of heat pumps. In that case, the installers' role would be so limited that the customer only would choose them from a recommended list. Three interviewees mention trends regarding environmental goals and requirements, especially on the real estate side, which will favour **sustainable heat pump solutions**, e.g. the recycling of air in apartments. One installer believes in a total disruption of the heat pump market within a 10-year period, due to the development of superior and more sustainable techniques.

One discussion about future trends concerns what the user will value most when purchasing a heat pump. The integrator emphasizes **value in use** in addition to the purchase, and that it will not be essential for the user to own the heat pump. The customer needs a heating solution and it should be simple for him or her to use it. Two solution providers think that **security** will continue to be the main priority for the user in a future scenario. The franchise group and one installer mention an increased user demand of monitoring and steering heat consumption through different analysis tools. In connection to this, increased environmental awareness is brought up as a driving force besides economical aspects. One user also sees a higher demand on optimizing and monitoring the operations of the heat pump. Another user, a public real estate company, highlights future **plug-and-play solutions** for heat pumps as important, i.e. that it should be easy to connect the heat pump's system into the facility owner's general control system. A third user confirms this, and also emphasizes that heat pumps today do not have optimal systems for overall control, e.g. the app. Most heat pumps have closed, standardised control systems, that are difficult to expand. In addition, there exist a risk today of warranty issues if the heat pump's own control system is altered with.

Regarding increased overall solutions including installation, maintenance, operations and updates of the heat pump in the future, there are diverse opinions amongst the interviewees. One producer is sceptical to this type of solution, mostly because of the economic issues, i.e. to find a financial solution that fits both provider and customer. Another producer thinks that total solutions, including the production of heat pumps, is a distant possibility considering the magnitude of customisation required. He argues that it is more feasible that actors on the installer level of the supply chain will put more focus on this type of offering. Two other producers believe that **one actor will take the main responsibility towards the user**, and that it will especially attract large customers. Two interviewees, an installer and a subcontractor, confirm this. The integrator and the solution providers strongly believe in an increase in overall solutions. One of them argues that the reason behind this is a **higher user awareness and knowledge, which result in higher solution requirements**. This is mainly applicable to large users, e.g. real estate companies. The franchise group discusses that it is easier for the user to have one supplier, but today it is cheaper to hire several suppliers and instead manage some parts in-house. The district heating company emphasizes the importance of an overall solution perspective, perhaps by combining different technologies. However, many users, housing societies in particular, do not put enough effort in these types of issues, according to the interviewee. Almost all interviewees except the integrator believe in a future trend of **improved analysing tools** for the customer to adapt its heat consumption. The integrator highlights that users' main concern is to decrease their heating costs with the solution, and that they are not generally interested in these types of tools.

The trend of increased servitization on the heat pump market, i.e. selling a comfortable indoor climate instead of a product, is viewed with both scepticism and excitement by the interviewees. Two producers argue that this trend would create the same lock-in effect for users as with district heating, since the service would be offered as a subscription. Another argument against increased servitization made by producers is how the supplier would make the offering both profitable for itself and attractive to the customer. However, three interviewed producers believe that **selling heat as a service** in some form will take part in a future scenario of the market. The wholesaler also discusses the servitization scenario in combination with smarter heat pumps that can warn the supplier about future malfunctions, thus **enabling better preventive maintenance**. The integrator thinks that this type of service would be highly valued by the user, and that the main barrier today is to find financial companies that can support the investment. Four interviewees: one solution provider, two installers and a subcontractor,

emphasize that selling heat as a service is possible to larger customers, e.g. housing societies and real estate owners. However, they believe that for private users, e.g. house owners, the effort to **analyse each customer's needs is not financially viable.** One solution provider highlights that in this scenario, the supplier must be careful to promise certain indoor temperatures since it requires deep knowledge about the construction of the building. He argues that it is **better to promise the customer a certain product efficiency** and sell heat consumption instead.

5. Analysis - From product to service focus

In this chapter, collected data from the theoretical framework and findings are used in order to analyse the current level of servitization within the heat pump market, as well as future pathways for its development. Thus, the aim of this chapter is to answer the following research questions of the thesis:

> *What level of servitization can be observed on the heat pump market connected to the identified supply chains?*
>
> *What future pathways are possible for the heat pump market concerning servitization?*

5.1 Level of servitization

The identified services on the heat pump market have been categorised according to the framework developed by Coreynen et al. (2017), called the servitization pyramid, see Figure 5.1 below. The framework aims to facilitate in determining the current level of servitization within the heat pump market. In the servitization pyramid, services can either support the product or the customer's own processes. Services that support the customer's processes are considered to be more advanced than product related services. Moreover, the framework present three levels of value propositions that offered services entail. These value propositions are either based on input, performance or a certain result/output, where result-oriented services are categorised as the highest level.

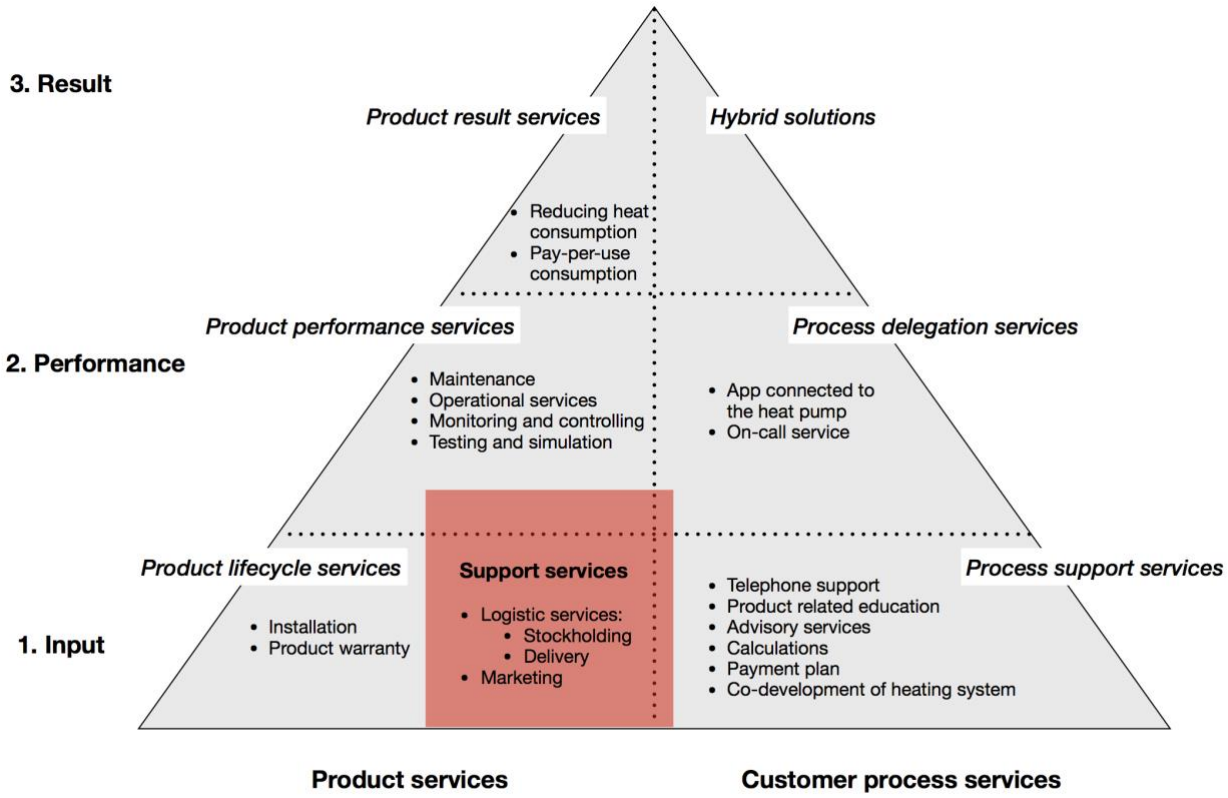


Figure 5.1: The servitization pyramid applied to the heat pump market

Besides the authors' own categorisation in chapter 2.2, i.e. level of value proposition and chosen service focus, the framework has been expanded to include support services. These services do not directly support product function, nor the customer's own business processes. Instead, support services act as enablers for services that in turn support product function or, to some extent, customers' processes. Logistic services are identified as support services since they include stockholding and delivery of heat pumps, which help both the producer and installer to manage product distribution. Marketing is also categorised as a support service because of its ability to increase product/service awareness, and thus more product and customer process services are likely to occur as a consequence.

On the heat pump market today, more advanced services, i.e. services categorised as either performance or result oriented, mainly support the product. This can be visualised in the servitization pyramid (Figure 5.1), where the number of product-related services on level two and three, largely exceed the number of customer process services. However, on the first level of the pyramid, with more basic service offerings, there are many services that support customer processes. Hence, when the complexity of services increases, the actors' focus shifts from the customer to the product. Rapaccini et al. (2014), confirm that in manufacturing contexts, the product is central in both the company's value proposition and in its delivery of services. This might explain the general product focus of the heat pump market, and why few advanced services are developed from the customer's own processes.

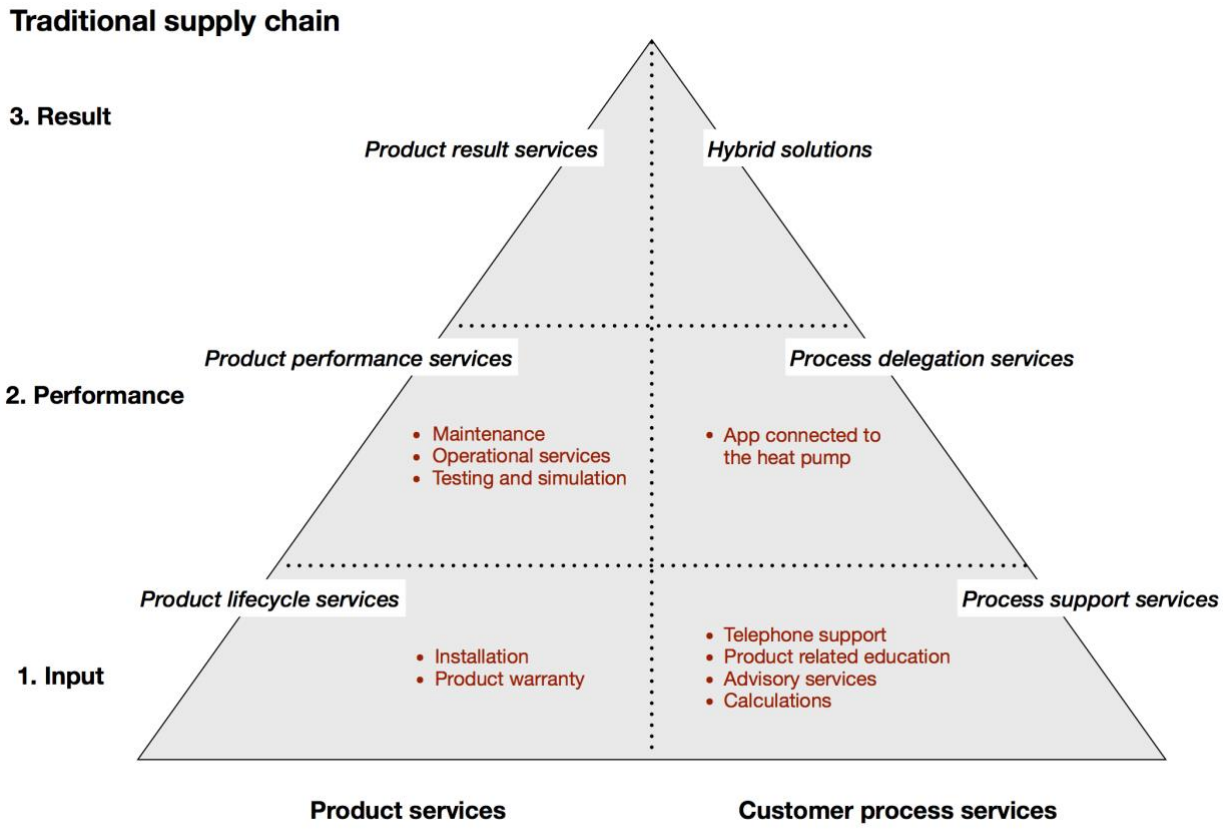


Figure 5.2: Level of servitization in the traditional supply chain

In order to get a better understanding of the current level of servitization in the heat pump market, the servitization pyramid has been applied to the four supply chains. In the traditional supply chain, see Figure 5.2, several of the identified services are categorised as product services, i.e. services that support the product itself or its function. However, looking at the first level of the value proposition, input-based, there are services that support the customer's processes. According to Coreynen et al. (2017), input-based services are the lowest level of value proposition and imply that the company promises to perform a deed or an input. Thus, these services are categorised as quite simple. Moving up one step in the pyramid, services shift towards supporting the product instead of the customer's processes. Dohrmann et al. (2015) argue that product related services carry a lower risk for the company compared to more advanced services, which could explain the current focus in the supply chain. At the same time, these services do not have the same potential to affect the company's competitive advantage (Dohrmann et al., 2015).

The most advanced service that is found in the traditional supply chain, is the app directed towards the user. This service is categorised as a process delegation service since it focuses on monitoring and controlling of the heat pump and thus provides product convenience for the customer (Coreynen et al., 2017). However, according to the collected data, all interviewed users are discontented with the functioning of the app, due to its inability to communicate with other systems in the facility and adapt to the user's processes. Hence, if the app would develop into a service that both supports the customer's own business process *and* delivers a result, i.e. has large customization, it is possible for the app to reach the highest level of servitization. As described by the interviewed producers, the app can today control, steer and monitor a heat pump, which corresponds to the first two levels of smart connected products: monitoring and control (Porter & Heppelmann, 2014). However, if the app's functions are further developed, it can reach the higher levels of optimization and autonomy, by learning user behaviour through analysis of Big Data.

Moreover, the traditional supply chain could be seen as using an industrial pathway to servitization. This pathway is seen as an inside-out process and implies that the manufacturing company is focused on improving its own processes and capabilities to create solutions (Coreynen et al., 2017). This knowledge is then used to offer services towards their customers, e.g. telephone support, education, advisory services or applications. The industrial pathway is referred to as the first path in the model presented by Coreynen et al. (2017) and implies first level services and integration with the customer.

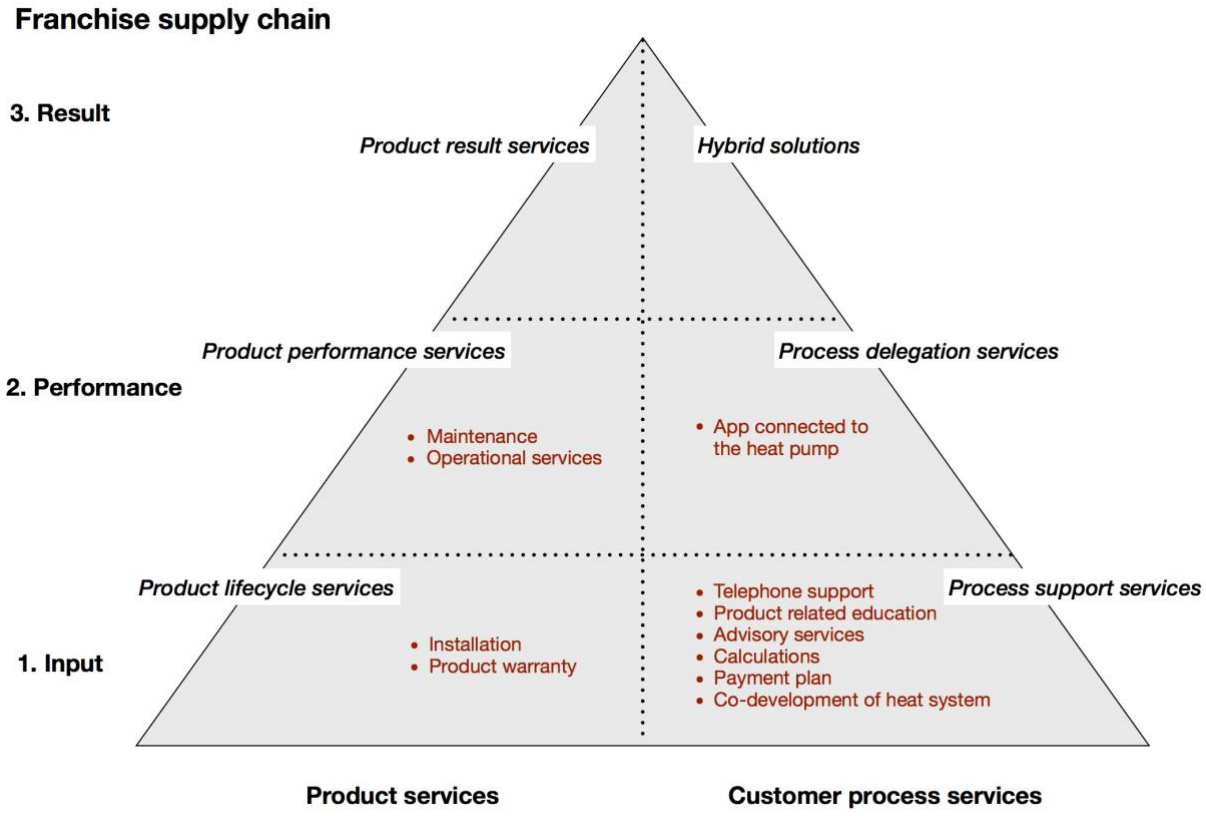


Figure 5.3: Level of servitization in the franchise supply chain

In the franchise supply chain, see Figure 5.3, the service focus is on the customer's processes. These services are almost exclusively offered with an input-based value proposition, i.e. categorised on the first level of the servitization pyramid. Of all four supply chains, the franchise supply chain has the most identified services that support customer's processes, mainly delivered by the franchise group. Besides different service deals that support product convenience for the user, the franchise group also offers product related education, payment plans and co-development of the heat system. The last-mentioned service is often offered as a modified solution of a previous consultancy proposal. Hence, it is categorised as a consulting service on the first level of the supply chain.

The franchise group mentions that it investigates current market needs and searches for business development opportunities. According to Alvarez et al. (2015), observing and responding to customer needs are essential factors in the servitization transformation of companies. This implies that the franchise supply chain, if the actors are willing to change their internal structures and processes (Olah et al. 2017) when responding to market needs, has prerequisites to develop more advanced services that support customer processes.

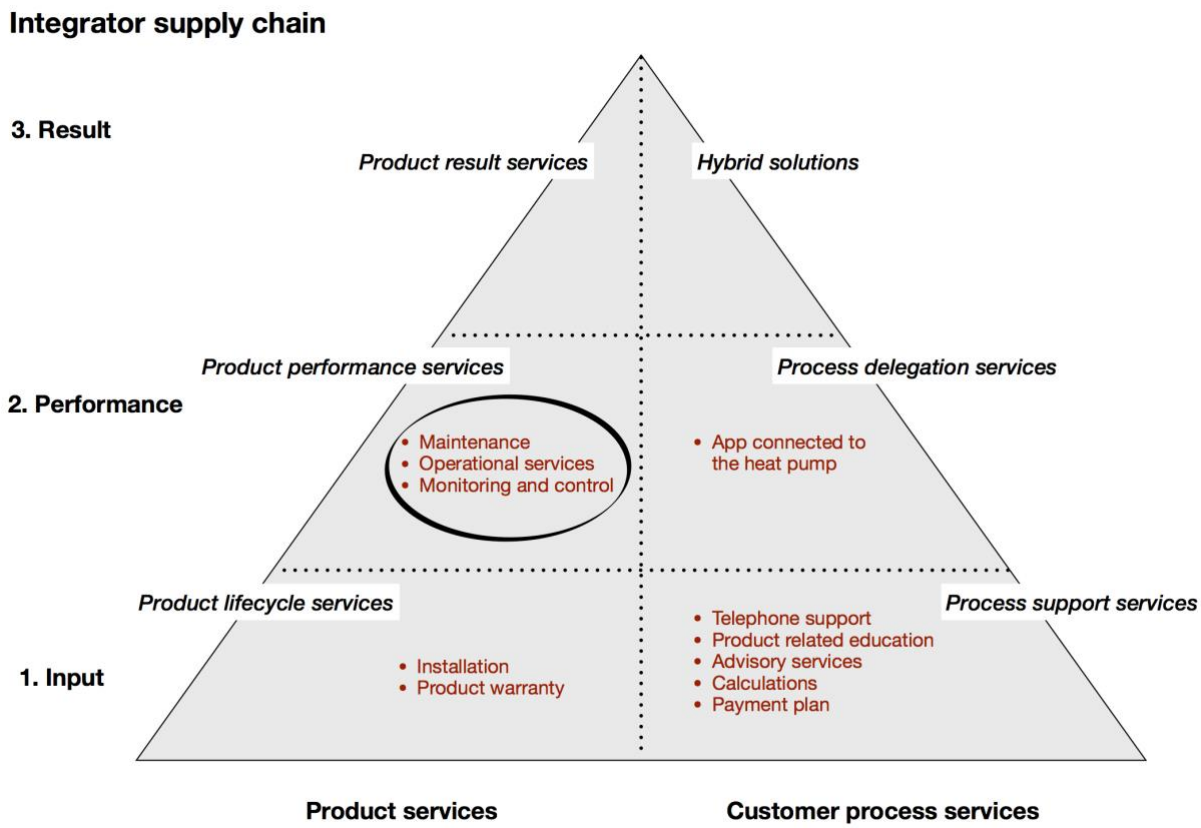


Figure 5.4: Level of servitization in the integrator supply chain

In the integrator supply chain, see Figure 5.4, the categorization of services is quite similar to the traditional supply chain. However, maintenance, operational services, and monitoring and control are included in a service package that is delivered to the customer in order to ensure maximal efficiency of the heat pump. Moreover, the integrator offers several customer oriented services in the first level of the value proposition, which indicates that these services have a larger potential of affecting the company's competitive advantage, than services focused on the heat pump itself (Dohrmann et al., 2015).

From the interview, it is clear that the integrator has a large customer focus in terms of facilitating the usage of the heat pump, and that several of its services aim to support the customer's processes and create a strong relationship. However, the most advanced service in the supply chain, the app, still belongs to the producer, which the interviewed candidate acknowledges as a problem. Apart from this, the servitization potential of the integrator supply chain could be considered as high. Partly because it has a customer-centric approach and partly, because its future ambitions involve result oriented value propositions such as subscription-services and more advanced applications (Olah et al., 2017; Coreynen et al., 2017). Today, the integrator focuses on its internal processes and competences. This is verified from the interview, where the candidate mentions that the company is taking over installers in order to acquire needed competences. In other words, the integrator partly has a sourcing strategy where it delivers its services directly to the customer, without using external parties. The vertical integration strategy of the integrator is contradictory to Wynstra's et al. (2015) paper on service triads, which emphasizes outsourcing and specialisation amongst firms as a current trend.

When delivering services connected to product capabilities, it is important that the whole workforce adapts their roles towards relationship builders rather than merely delivering a product or a service (Dohrmann et al., 2015). The interviewed integrator mentions that the company's installers still have a very traditional view of the heat pump market and therefore do not see their role as someone who should look after the customer. In other words, it is not enough that only the managers of a company possess a customer-centric approach. It must be communicated and adapted throughout the entire organisation, especially to the front-end employees i.e. the installers. This might further explain why the integrator supply chain is not reaching a higher level of servitization today, and it could be a barrier for future development.

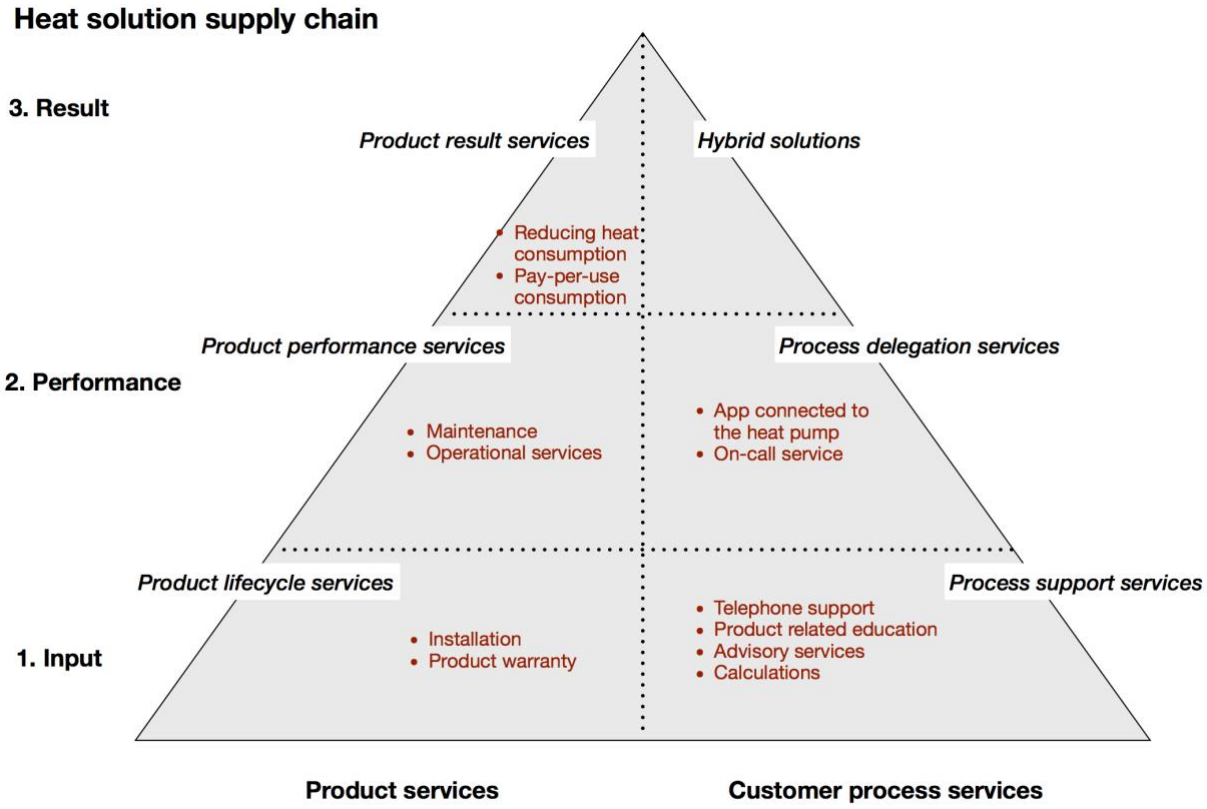


Figure 5.5: Level of servitization in the heat solution supply chain

The heat solution supply chain has the furthest development in servitization amongst the identified supply chains, since its actors provide services on the highest level of the pyramid, see Figure 5.5. Solution providers offer users result-based services in terms of reduced heat consumption and pay-per-use consumption through customised heat systems. These services are categorised as product result services because of their ability to deliver a functional result. In the case of reducing the user's heat consumption, the solution provider takes on the functional responsibility of the entire heat system, hence it is possible for the actor to guarantee a certain output. In addition, since the solution provider takes on part of the investment, it also wants to deliver a cost-efficient heat system to the user. The desire to reduce associated costs connected to service delivery is confirmed by Rapaccini et al. (2014) in the offering of advanced services, i.e. customer support services or process-related services. Moreover, the service of pay-per-use consumption is achieved through a geo-energy solution where the user itself decides the output. Therefore, this service is also categorised on the highest level of the servitization pyramid. Rapaccini et al. (2014) describe pay-per-use services as new revenue generating

mechanisms, which can advance from a rich information exchange between supplier and buyer about the customer's value creation processes. Hence, due to its assumed relationship strategy, the prerequisites for the solution provider to develop hybrid solutions, i.e. result-based services supporting the customer's own business processes (Coreynen et al., 2017), could be considered as high.

Even though the heat solution supply chain reaches the highest level of servitization, the focus is limited to product function on the result level. Hence, there are development opportunities for the solution provider, especially regarding services to the end user. Today, the most advanced services are exclusively offered in business-to-business environments, e.g. to real estate owners. On the customer process side, the highest level of service is currently the on-call service, offered by the solution provider. The on-call service is categorised as a process delegation service since it enables an outsourcing of the service organisation, and thus provides product convenience for the customer.

The heat solution supply chain uses the second pathway introduced by Coreynen et al. (2017) to increased service offerings, called commercial servitization. The pathway is enabled by an alignment of the company's and customer's own value creation process, where the goal is to understand and help customers reach their goals. The solution provider has adapted this through its customised, result-based solutions. Sometimes, it even takes over the customer's value creation processes by taking on the investment of the system and its functional result. Moreover, the solution provider has its focus on product capability, which is essential to capture the full potential of advanced services, according to Dohrmann et al. (2015). The authors emphasize that companies should increase product standardisation and instead customise services to differentiate. The solution provider fulfils this by purchasing heat pumps solely based on price and customer requirements, and instead focuses on creating a comprehensive system with associated services and customisation.

5.1.2 Actors, services and interactions

In order to analyse relationships and interactions between different actors within the heat pump market, Table 5.1 below has been created and illustrates all services that each actor offer. The services are categorised as either product support services, customer support services or process-related services, according to Rapaccini et al. (2014). To enhance the table's visibility, provided services are marked with red and receiving actors are marked with black.

	Product support services	Customer support services	Process-related services
Producer	Warranty to user Telephone support to installer and user	Product education and Advisory services to installer, integrator, and solution provider Calculations to solution provider App to user	
Installer	Installation to user Maintenance to user	Advisory services to user Operational services to user	
Subcontractor	Drilling to user	Advisory services to user and installer	Testing and simulation to installer and user
Franchise group		Co-development of heating system to user Education to installer and user Services deal to user Payment plan to user	
Integrator	Installation to user Maintenance to user Warranty to user	Monitoring and controlling services to user Operational services to user Payment plan to user Advisory services to user	
Solution provider	Maintenance to user Warranty to user	Operational services to user On-call service to user	Leasing or co-investment to user Pay-per-use-consumption to user

Table 5.1: Services provided by each actor within the heat pump market

Producer

Starting with the heat pump producers, their offered services have been categorised as either product supporting (PS) services or customer supporting (CS) services. Providing CS services demands a higher degree of relationship, which includes more customer interactions (Rapaccini et al., 2014). Here, several of the producers' offered services are directed towards the installer, which indicates that the producers have a stronger relationship with them than with other actors. This further goes in line with the collected data, where all producers mention the installer as a very important actor in their supply chain. Moreover, one CS service is directed towards the user, i.e. the app, which implies that the producer is making an attempt to enhance the relationship with its users. However, CS services are built upon customer interactions and customer related information in order to be delivered effectively, which the app does not seem to consider (Rapaccini et al., 2014). Many users complain that the steering system connected to the heat pump, is not compatible with their current system and therefore needs to be complemented by a steering supplier. Hence, the deficiency in this service could affect the producers' relationship with their users in a negative manner.

Installer and Subcontractor

Looking at the installers, all their offered services are directed towards the user. However, half the services are categorised as PS services, which indicate a low-intensity relationship with little customization and complexity (Rapaccini et al., 2014). The other half are categorised as CS services, but these are directed towards larger users such as commercial or communal facilities. Thus, the

installers seem to have different degrees of relationship with different users, but they never reach the highest level of servitization and the corresponding collaborative relationships, according to Rapaccini et al. (2014). In connection to the installer, the subcontractor offers only a few services. However, it provides one service that is categorised as a process-related (PR) service, i.e. the highest level of servitization. This service aims to improve specific processes connected to the product, which means that the subcontractor must possess great knowledge of both the product and its individual users' needs (Rapaccini et al., 2014). When delivering this service, the subcontractor develops a high degree of information exchange with either the installer or the user in order to maximize customer value.

Franchise group

Another actor on the heat pump market is the franchise group, who delivers almost all its services to the user. Moreover, all services offered by the franchise group are categorised as CS services, which suggests that its relationship with the user is of a cooperative nature where customer related information is exchanged (Rapaccini et al., 2014). Further, the franchise group offers service in terms of education to its franchisees, i.e. installers, which also is categorised as a CS service. However, since the franchisees are part of the franchise group, who in turn handles some of their processes, e.g. purchasing deals, it could be assumed that these parties have an even stronger relationship than what the CS service indicates.

Integrator and Solution provider

The actors that take a comprehensive role in the market, i.e. the integrator and the solution provider, have a more customer oriented focus than the other actors. In other words, they strive to offer more services to increase interaction with their customers. The integrator offers several services to its customer, where some are categorised as CS services and are delivered in terms of service deals. However, even though the integrator offers customer supporting services, the interviewed candidate acknowledges that the company needs to spread customer awareness to its installers in order to develop the relationship even further. With more customer interaction and information exchange, more advanced services could be developed (Rapaccini et al., 2014), which is emphasized as a goal for the organisation. The solution providers are the actors that have developed the most advanced services observed within the heat pump market today. Two candidates describe that they offer services that involves responding to a specific business need and therefore are focused on improving processes related to the heat pump. Thus, these services are categorised as PR services, which implies a strong, long-term relationship and a large information exchange with the user, in order to optimize service delivery (Rapaccini et al., 2014). Offering these advanced services imply a greater risk for the provider in terms of successful delivery, but also entail opportunities for increased competitive advantage (Dohrmann et al., 2015).

5.1.2.1 Supply chain archetypes

All four identified supply chains within the heat pump market involve different network constellations, or archetypes, where specialisation and outsourcing of the business are observed. Contrary to a linear supply chain, these constellations implicate direct contact between all concerned parties (Wynstra et al., 2015). From the offered services and corresponding relationships analysed in the previous sections, five actor constellations, see Figure 5.6, have been selected for further analysis. Analysing each constellation allows for an increased understanding of the actors' main opportunities and threats regarding future exploitation in their supply chains. Moreover, these constellations can further facilitate in explaining how the current market structure and its level of servitization, affect different actors. The focus will be on the constellations' service exchange and interactions, with

guidance from Wynstra's et al. (2015) paper on service triads. Here, the link between two actors in the constellation is defined by the services provided, with focus on the user. In other words, a dotted line to the user implies that some services can be offered, but that the main service exchange occurs within the straight lines in the constellation.

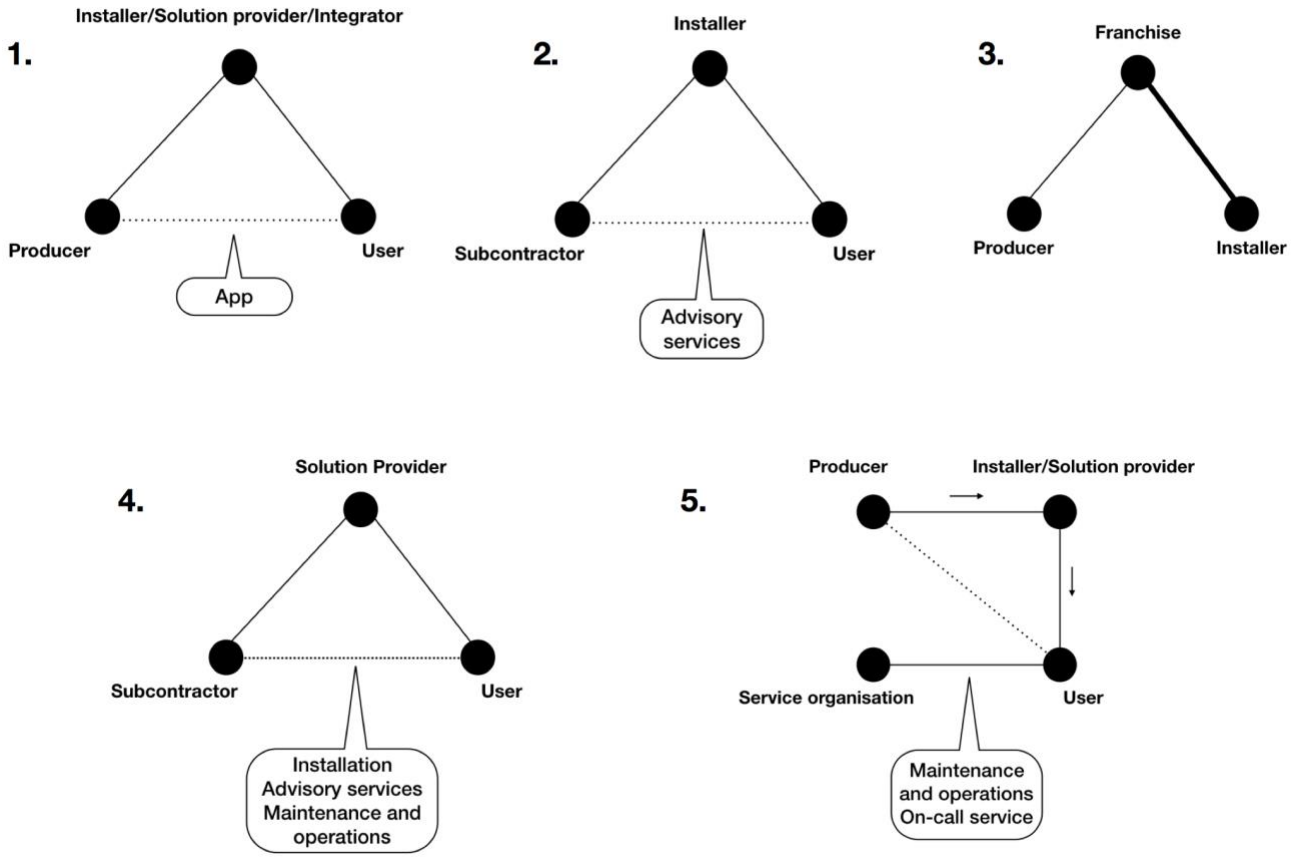


Figure 5.6: Supply chain archetypes on the heat pump market

Wynstra et al. (2015) explain that in a service triad, all actors have direct contact with each other. However, in some cases, the services connecting two actors are never mobilized. This can be applied to the on-call service in constellation 5, where the user only interacts with the service organisation or solution provider if it has a problem with the heat pump. Moreover, when the producer insures the heat pump and offers it as an extended warranty to the user, contact is only initiated in case of product issues, if a service deal is not included. According to the interviewees, service deals are more common for larger facilities since they often need to be controlled on a yearly basis.

Loss of broker position

In case of service outsourcing, the broker position of the outsourcing organisation might decay when the supplier interacts directly with the customer, which in turn can lead to information losses for the organisation (Wynstra et al., 2015). In constellation 2 and 4, there exist a risk that the user develops a strong relationship with the subcontractors in the exchange of advisory services, installation and maintenance and operations services. Hence, when the user is in need of additional services, it might turn to a subcontractor instead of the installer or solution provider. Moreover, in the exchange of these services a lot of user information is revealed, which the installer or solution provider misses out on.

This, in turn can lead to a more difficult development of CS services, since they need customer related information to be successfully delivered (Rapaccini et al., 2014).

An even bigger risk of losing benefits associated with the broker position is seen in constellation 1. Here, the producer has created a connection to the user though the app service. The large amount of customer process information that is contained in the app makes it possible for the producer to create more advanced and better service offerings towards the user. Hence, if the producer starts acting on the data, it could develop a strong relationship with the user, making services offered by other actors more or less obsolete. In addition, since the Swedish producers are few with large market shares, they stand a good chance to gather a lot of user data and grab a large share of the after-sales services. On the other hand, the installers, who operates in a fragmented and competitive market, are not as crucial to the end user. Thus, the risk of losing power connected to the aftermarket could be seen as especially high for them. The integrator has already identified the risks associated with the app and wants to cut off the interaction between the producer and user by offering the app instead.

Beneficial broker position

A special broker position appears in constellation 3 where the franchise group has direct contact with both the producer and installer, who in turn have no service exchange, according to the interviewed franchisee. This implies information benefits for the franchise group (Wynstra et al., 2015), however, since the installers are part of the same brand, there exist no competition between these two. Instead, the broker position gives the franchise group a position of power against the producer. Partly because the franchise includes a large number of installers, who are important in the distribution of the product brand, and partly because the producer have no contact with the installers. Moreover, in constellation 3, there is a risk that the franchise group becomes obsolete in case of an increased interaction between the producer and the installer. However, due to the current circumstances on the market, this risk is considered as low.

Managing outsourcing of services

To better control performance, the outsourcing organisation should invest in communication with both the supplier and customer since this will limit opportunistic behaviour (Wynstra et al., 2015). The producer adapts this in constellation 1 through a close relationship with the installers and through services to the end user in terms of telephone support and, partly, the app. The communication strategy is also applicable to the solution provider in constellation 4, where the interviewed solution providers emphasize collaboration with their subcontractors in addition to the customised services offered to the user. A risk that needs to be managed is that the customer often perceives the supplier of the outsourced services to be the same as the outsourcing organisation (Wynstra et al., 2015). Since a heat pump is a relatively large investment for the user, a lot of focus is put on the product brand. Therefore, issues connected to the product are often associated with the producer. Hence, the producer puts emphasis on making the user satisfied by offering telephone support, and advisory services or product-related education to the installer. Outsourcing of services is also an important issue for the solution provider, since it wants to take full responsibility of the heat solution against the customer. The integrator, on the other hand, manages this risk by acquiring competences and having its installers in-house. Moreover, the integrator recognizes the producer's communication strategy towards the user, and thus attempts to make the user remember its own brand instead of the product brand, through an excellent customer experience.

Contracts and initiating parties of service outsourcing

Different actors in the triad can initiate service outsourcing and, depending on who the initiating party is, different contracts are likely to be set up (Wynstra et al. 2015). In constellation 5, it is sometimes the user who chose a service organisation instead of turning to the installer, hence this constellation could be customer-initiated. Outsourcing of services in constellation 2,4 and 5 is often initiated by the installer or solution provider, depending on how they have chosen to organise the business and what competences they possess in-house. However, in some cases, the outsourcing of services is customer-initiated, either because the user wants certain expertise or is required by law to take the first and cheapest offer provided. One solution provider mentions that having many subcontractors, i.e. high service outsourcing, create higher demands regarding contracts. In other words, to outsource several services to one actor could be preferable for the outsourcing organisation. This is confirmed by one installer who claims that it is financially beneficial for the user to hire a single company for both delivery and installation of the heat pump. Several contracts regarding warranty to the user could appear in constellation 1 if the installer offers a warranty for the installation in addition to the product warranty from the producer.

5.1.2.2 Aftermarket services

According to Wagner et al. (2017), aftermarkets gain further importance for companies in terms of revenues, profits, differentiation and customer value creation. However, on the heat pump market, there is no evident actor occupying the aftermarket position, which is contradictory to previous literature. One possible explanation brought forward on the April workshop is that customers' ability to procure services today is quite low, due to bad experiences. An interview example that strengthens this theory is the user complaints about current control systems, or apps, connected to the heat pump. In addition, two private users emphasize difficulties in receiving advisory and repair services, even with a valid insurance, since no involved party takes responsibility for it. Hence, the importance of after-sales can be a matter of time for the heat pump market. When a well-functioning solution is being acknowledgeable, the customer demand of aftermarket services will most likely increase.

Another explanation to the low interest of aftermarket services is that up until recently, the market has experienced a high product demand. In other words, the market competitiveness has been quite low, and increased competition is a key reason for companies to include after-sales services in the product offering (Kallenberg, 2003). However, the interviewees discuss past trends in terms of a high maturity level on the villa segment, a consolidation of the market, and new players entering the market, e.g. energy companies. These trends imply intensified market competitiveness, which in turn could stimulate the development of after-sales services. Another key reason for including after-sales services is the relevance of after-sales service markets (Kallenberg, 2003). The actors on the heat pump market have not fully acknowledged this relevance so far, especially in the traditional supply chain where the main focus is on technical aspects of the product instead.

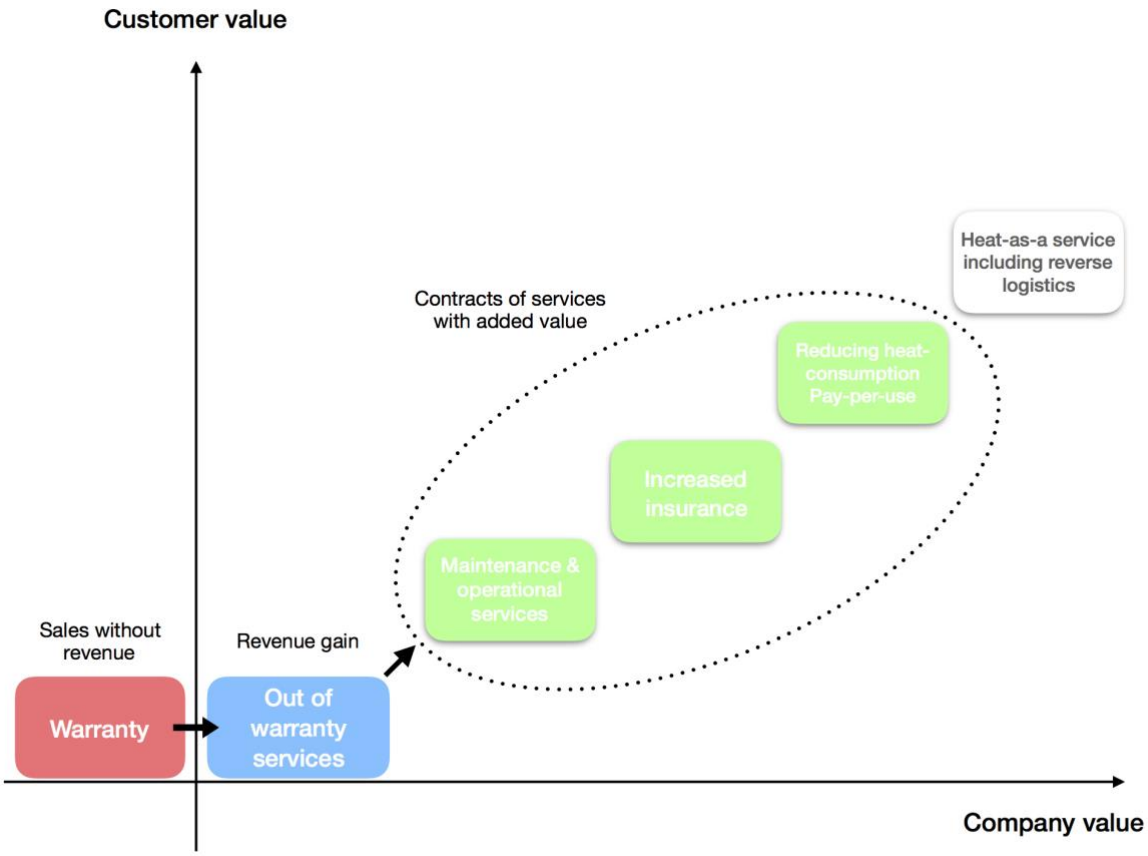


Figure 5.7: Aftermarket services and contracts within the heat pump market

In Figure 5.7, the evolution of after-sales (Ren & Gregory, 2009) is applied to the heat pump market. The cost centre and the break-and-fix services in the original framework have been translated to warranty and out-of-warranty services, since this distinction was primarily made in the interviews. Moreover, the main focus in the interviews was on warranty services, either in terms of customer-initiated repair or supplier-initiated maintenance for the warranty to be valid. For out-of-warranty services, the first level contract, i.e. preventive maintenance, is often customer requested and includes a system check once or twice per year. This contract is mainly adaptable to larger heat pump facilities in need of more frequent preventive maintenance compared to e.g. villa owners. Further, second level contracts, i.e. maintenance with included cost for labour and materials, are brought up in the interviews as service deals with yearly subscriptions. A frequently mentioned contract form is the extended warranty, or increased insurance, which could be categorized as maintenance with included cost.

Lastly, it is only the solution provider who offers the third level contract, i.e. maintenance based on performance, in terms of reduced heat consumption and pay-per-use. This contract form does not appear to be common within the heat pump market, especially not for smaller users, e.g. villa owners. However, for larger facilities, the solution provider sometimes takes the performance-based-maintenance contract one step further by taking responsibility for the entire system's performance. In cases where the supplier takes responsibility of the product or system, a circular economy should be considered, which includes accountability for reverse logistics and waste management (Dohrmann et al., 2015). Hence, it is possible to extend the framework brought forward by Ren and Gregory (2009) with contracts of reverse logistics and waste management. Two actors, the integrator and one solution

provider, mention that they remove the old heating system or upgrade the heat pump when necessary, which are applicable to circular economy services. However, from the interviews, none of the actors has its main focus on circular economy when discussing aftermarket services.

5.2 Future pathways for increased servitization on the market

From previous analysis, collected data and theoretical framework, three future pathways to increased servitization on the heat pump market, have been developed. These are described together with barriers and driving forces and result in a possible future scenario of climate-as-a-service.

5.2.1 Pathway one: Increased service focus

The first identified pathway for the heat pump market is increased service focus, in which **current services are improved and more advanced services are developed**. In other words, all services provided today do not need to reach a higher level of servitization, since these function as a platform for the company to develop new, more advanced, services (Szász & Seer, 2018). However, current services can become more customer-oriented to enhance customer satisfaction on the market. In order to achieve this improvement, the actors must follow a commercial servitization where they use customer data to capture their customers' needs in service delivery (Coreynen et al., 2017). Today, users complain about the heat pump applications and request more plug-and-play solutions. In addition, users struggle to receive appropriate assistance when needing to repair the heat pump. Hence, there exist improvement possibilities for the actors by changing current services to better **fit the customers' value creation processes**.

Since the heat pump market does not reach the highest level of servitization according to the servitization pyramid (Coreynen et al., 2017), and since a lot of focus is put on services supporting the product, there also exist possibilities for the actors to develop more advanced services. One such possibility is to shift from preventive maintenance or increased insurance contracts to **maintenance based on performance or result**, which will increase both customer and company value (Ren & Gregory, 2009). Moreover, the actors must acknowledge the **relevance of after-sales service markets** and extend their focus to out-of-warranty services. In connection to this, it becomes interesting to speculate about which actor that will take the main responsibility for the heat pump's lifecycle. None of the actors focus on **circular economy** in the interviews, however, the solution provider emphasizes similar services by taking on responsibility for the entire system's performance. Further, the integrator is a possible candidate due to its position in the supply chain and ambition to offer heat-as-a-service to the user, which make it beneficial to recycle materials (Szász & Seer, 2018). The reuse of materials is also interesting to the producer, and the literature frequently refers to the manufacturer in circular economy contexts. Hence, the producer could be the actor that takes responsibility for the heat pump's lifecycle. However, the interviewed producers argue that due to their distance to the user, it is more feasible that actors on the installer level of the supply chain will take on these types of solutions.

Driving forces to increased service focus, including reverse logistics, can be **stricter environmental standards** and sustainability pressures from stakeholders (Dohrmann et al., 2015; Szász & Seer, 2018). These forces are brought up in the interviews in terms of higher environmental awareness from customers, as well as European directives and long-term goals regarding renewable energy. Hence, more advanced services, which also create a competitive edge in sustainability performance, are likely to occur on the future heat pump market. This can be achieved by e.g. offering a contract with **heat-as-a-service including reverse logistics.** In that case, the supplier must consider all costs throughout

the lifetime of the product, which in turn is beneficial from a sustainability perspective (Szász & Seer, 2018). Contracts that **phase out product ownership** is already witnessed and successfully implemented in other manufacturing contexts, e.g. paper printers who are offered as a pay-per-use service to customers (Sharma & Singh, 2017). On the heat pump market today, two solution providers have similar offerings in terms of leasing and pay-per-use-consumption.

One barrier to increased service focus on the heat pump market is customers' bad experiences with previous services, which in turn prevent them from requesting new ones. Coreynen et al. (2017) also bring up customer scepticism to pay for performance instead of acquiring a product, as a barrier to develop more advanced services. The authors propose a **cultural change amongst customers**, where they not only focus on owning a product, to overcome this barrier. If the actors on the heat pump market improve the quality of current service offerings, the shift in culture might be achieved. In addition, customer scepticism to procure services in B2B contexts can originate from a **fear to share valuable information** about the firm to outside actors (Coreynen et al., 2017). This is partly confirmed in the interviews, where it is mentioned that the user often wants to operate the heat pump by itself and thus do not request operational services. Another barrier for companies to deliver more advanced services is to **find solutions that entail continuous profit streams** (Lütjen et al., 2017), which is discussed by the interviewees when providing heat-as-a-service. The authors emphasize that the customer must be integrated into the development process of services to overcome the barrier. The solution providers have already adapted this in terms of **continuous customer interaction** on the aftermarket, being part of the customer's development work and offer different services based on specific customer needs.

5.2.2 Pathway two: Digital development

From the collected data, several candidates mention smart connected heat pumps and the development of an app service, as trends during the past years. Moreover, according to the analysis of the current level of servitization, the app might have potential to evolve towards a hybrid solution. A **technical advancement**, together with increased service focus, can lay the foundation for new and more advanced services. This implies that a pathway of value servitization should be followed, were companies have the potential to **integrate their customer's processes** with their own processes even further (Coreynen et al., 2017). According to the authors, this pathway can be reached through new digital products that have a disruptive impact on the value chain, customers' processes and the relationship between the provider and the customer. Thus, enhanced digital development can be seen as a major driving force for increased servitization and new business possibilities. However, in order to create a competitive advantage through smart connected products, manufacturing companies need to **rethink and retool their internal processes** (Porter & Heppelmann, 2014). This re-organisation can be seen as a barrier in reaching increased level of servitization on the heat pump market today. When discussing more advanced services, e.g. selling a comfortable indoor climate, several interviewees are sceptical. They mention profitability issues and unappreciated lock-in effects for users. According to Coreynen et al. (2017), manufacturing companies often have a large focus on tangible features and little faith in the economic benefits that services entail. Moreover, only one candidate, a solution provider, brings up the need of having a **flexible business model** in order to meet customer needs, which is essential in overcoming these strategic issues (Lütjen et al., 2017) of increased servitization through smart connected products.

Connected to smart heat pumps, **integrated heat solutions** are mentioned several times during the data collection. Smart products create a connectivity to other products (Porter & Heppelmann, 2014),

which implies that several different heat or cooling techniques can be integrated into one system. Some interviewed candidates mention solar panels connected to heat pumps as a way to increase the efficiency. With digital development, the possibility to integrate different technologies can most likely be improved, which both can affect the efficiency of the heating system, as well as the customer satisfaction. Moreover, some candidates emphasise that increased technical development can enable **increased user friendliness**. This implies that the user easy can steer, monitor and understand its heat pump through the mobile app. In order to achieve increased customization, manufacturing companies need to develop their technologies and system integration capabilities (Olah et al., 2017). According to the authors, technologies that can collect and analyse large amounts of data, e.g. Big Data, have an important role in achieving customized solutions. In addition, **analysis of collected data together with new service development**, can enhance circular economy, i.e. reverse logistics and waste management, which can increase sustainability within the supply chains (Dohrmann et al., 2015). However, today, the customer data that heat pumps generate are not acted on in a preventive or predictive manner, e.g. that the heat pump adapts to specific user patterns and that the provider ensures a secure heat/cooling delivery. This could be seen as a barrier for further development of both the heat pump as well as connected services. The problem is emphasised by an interviewed candidate as well, who mention that there is a **large risk that external actors start acting on current data**. Hence, current actors must acknowledge the value and potential of available data in order to develop both the heat pump and its connected services. Moreover, to maximize value for the customer, digital solutions should be co-created. Hence, the user must be integrated in the development process of digital and customized solutions regarding heating systems (Lütjen et al., 2017).

5.2.3 Pathway three: Consolidation of the market

Another possible pathway for the heat pump market is a **consolidation of the market,** both regarding the total number of actors operating and the number of actors in the supply chain. The market is already facing a decline in growth rate and number of entities sold (Sköldberg & Rydén, 2014), leading to **increased competition** amongst the actors. This is confirmed in the interviews where it is emphasized that the **high maturity level** has forced actors to find other customer segments, i.e. larger properties and facilities. Moreover, the interviewees discuss a noticeable consolidation of the market, especially on the producer level, as a result of acquisitions and competition from international brands.

On the installer level, **energy companies have started to enter the market**. They take on a comprehensive role on the market by offering new financial services and integrated solutions, e.g. combining the heat pump with ventilation, district heating, or solar panels. The interviewees believe that the users will put more value on heat solutions integrated to other parts of the home. Moreover, it is mentioned in the interviews that it is easier and more financial beneficial for the user to only have one supplier. Hence, smaller players **must collaborate** with these companies to not be out-competed. In addition, the district heating company emphasizes the importance of **an overall solution perspective**, which can indicate increased collaboration between the heat pump and district heating market.

Another driving force for companies to collaborate is sustainability pressures from both users and international regulations, since **cooperation enables pooling of resources and dematerialization** (Sharma & Singh, 2017). However, there exist different sourcing strategies amongst the actors that take on large roles in the supply chain, i.e. the integrator and the solution provider. The integrator manages all processes but production in-house, while the solution provider has collaboration with subcontractors to perform certain services. The best sourcing strategy to successfully deliver services

can be discussed. Wynstra et al. (2015) highlight the trend of vertically integrated companies being replaced due to increased specialisation and outsourcing of services. On the other hand, a cooperative buyer-supplier relationship is needed to provide more advanced services (Rapaccini et al., 2014), which probably is easier to sustain inside an organisation. Regardless of the sourcing strategy, a trend noticed in the interviews is the change in companies' initial concepts in order to make it more comfortable for the customer.

5.2.4 Future scenario: Climate-as-a-service?

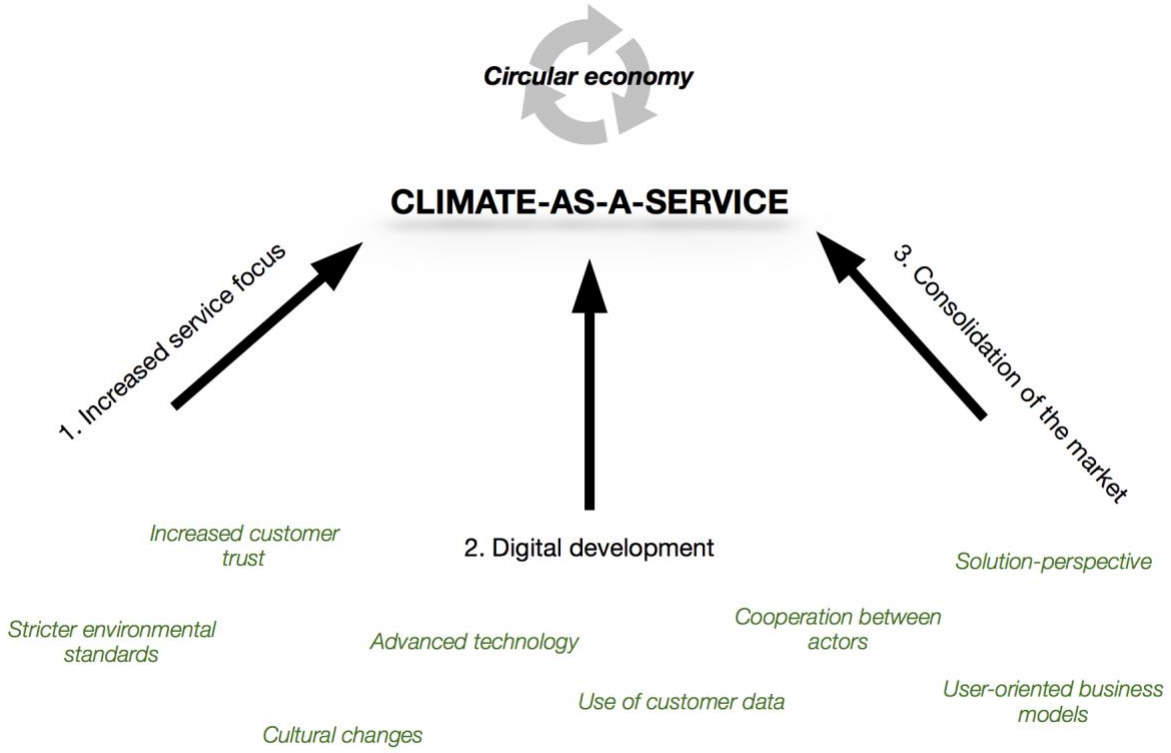


Figure 5.8: A future scenario of climate-as-a-service

Combining previously mentioned pathways could result in a future scenario where heat and coolness is sold as a service, rather than a product. **Selling climate-as-a-service** should involve a smart connected product at the heart of the home, e.g. a heat pump. This device would collect data from the user in order to customize both heating and cooling within the home. For example, the device would learn routines and daily patterns of the user and adjust heating accordingly. Moreover, services such as maintenance, operations or fix-ups of the heat pump would be preventive, i.e. the heat pump would send an alarm to the service provider in advance allowing it to adjust the device, without the user noticing. In addition, the heat pump should be able to talk to complementing heating or electric devices in order to maximize the system's efficiency and thus lower costs. Providing a service like this could enable a seamless experience of a customized climate for the user. However, to reach a scenario like this, several changes and developments must occur, see Figure 5.8. First, a **technical advancement** of the heat pump is necessary. Moreover, **data that the device produce must be analysed and used** in a preventive and actionable manner. This further allows for increased customization and efficiency of current systems and services. Connected to this, an improvement regarding how current services are delivered, is required. Today, several users mention struggles regarding service experience and a willingness to perform aftermarket services by themselves. Thus, it

is important to **reconnect with the users and enhance their trust** regarding service delivery. When this is achieved, more advanced services can be delivered, since they are based on the customer's needs and user-pattern.

Enhanced service focus together with smart connected products could lead to new business models that **reduce the demand of ownership**, i.e. product-as-a-service models (Porter & Heppelmann, 2014). When the ownership is shifting from the user to the provider, incentives for a **circular economy** are boosted, which results in an increased sustainable performance (Sharma & Singh, 2017; Szász & Seer, 2018). This in terms of recycling through reverse logistics, pooling of resources and material, and increased efficiency by combining different technologies. However, in order to maximize sustainability in the supply chains, **cooperation between actors** within, as well as outside, the heat pump market is needed. Moreover, **stricter environmental standards** and demands from different stakeholders will further drive increased sustainability and development of more advanced services. Providing climate-as-a-service will further be enabled when companies experience **cultural changes and an increased faith in service advantages**. In connection to this, the mind-set of providing companies must shift from product to **solution focus**, which is pushed forward by increased service development.

5.2.5 Discussion of market limitations - Heat Market Sweden

On the conference with Heat Market Sweden in May, current market limitations regarding providing climate-as-a-service were discussed. Several participants mentioned the profitability aspect of a business model including leasing of heat pumps, both for suppliers and customers. The concept was benchmarked to the car industry, where the leasing period is much shorter, and thus more profitable, for the customer than acquiring the product. Moreover, when leasing a complete heat solution, there are a lot more factors that affect the monthly cost compared to e.g. leasing a car. Hence, it becomes complicated for the supplier to calculate a fair subscription cost for such a system, and it also becomes difficult for the customer to recognise the profitability of leasing. In addition, the participants pointed out that customers today do not demand these types of services. Further, they brought up legal concerns of leasing a product that is permanently attached to the customer's lot. Some parts of the system are even impossible to collect in case of bankruptcy, e.g. the drill holes, resulting in major risk-taking for the supplier. Another issue connected to bankruptcy is the potential conflict between the supplier and bank regarding who has the legal right to the heat pump.

Since the provision of climate-as-a-service is closely related to smart homes in general, the participants emphasised the importance of collaborating with different actors to ensure a successful delivery. In connection to this, there is a risk that an external actor enters the market and takes the role as coordinator between current actors, enabling these integrated solutions. The participants also discussed several requirements for future suppliers of climate-as-a-service on the heat pump market. One requirement is a technical advancement where integrated techniques can communicate with each other and adapt to customer behaviour. Moreover, the suppliers must structure, analyse and, most importantly, act upon gathered data through advanced analytics. Another requirement is a shift in suppliers' mind-set, since they today have difficulties in visualising abstract offerings and thus develop advanced services. Outside the organisation, suppliers need to study their current ecosystem and investigate the best structure for increased communication and collaboration, perhaps by adopting a platform strategy. Lastly, the suppliers must learn more about customers' driving forces and needs in order to provide customised heating and cooling solutions. Related to this, a distinction between customer segments is necessary to be able to differentiate the service offerings.

6. Conclusion

The Swedish heat pump market is starting to reach a higher level of maturity due to saturated customer segments and increased competition on the market. Thus, the concept of servitization is relevant to investigate in this context, since servitized solutions are a way to sustain a competitive advantage. However, as industries experience an increased level of servitization, the rules of the game shift. This implies that markets and its actors will undergo changes, in terms of emerging structures and new roles, as well as new players entering.

When investigating the Swedish heat pump market, four main supply chains are identified. These include different actors occupying various roles, resulting in that different services are exchanged in their interactions. The most common supply chain, the traditional supply chain, involves actors with specialised roles that have allocated responsibility towards the user. Offered services are categorised as basic, with a strong product focus. The second supply chain, the franchise supply chain, has a similar structure as the traditional but also contains a franchise group, which acts as a coordinator for the installers. Due to the franchise group, the services provided in this supply chain are slightly more customer-oriented, i.e. focused on supporting the customer's processes instead of the product. In the last two supply chains, one actor has large responsibility, and thus takes on a more comprehensive role when delivering products and services. These are referred to as the integrator and the heat solution supply chain, and involve more advanced services with increased customer focus. When one actor takes on a comprehensive role in the supply chain, more advanced services are delivered to the user. However, the total number of actors in the supply chain does not seem to affect the level of services offered, as long as the actor with the comprehensive role is closest to the customer.

Overall, the heat pump market does not currently reach the highest level of servitization. In other words, no result-oriented service that supports the customer's own processes, i.e. a hybrid solution, is observed. The heat solution supply chain has services that promise a certain result, but these are centred around the product's capabilities rather than the customer's processes. In general, when services on the heat pump market reach a higher level of servitization, focus shift from the customer to the product. The current servitization level can be a result of customers' low ability to procure services together with the suppliers' traditional culture, where services are mainly seen as a complement to the product. Most often, the service providers on the heat pump market develop services based on their own processes, instead of proceeding from the customer's needs. Moreover, since the market has previously experienced a high product demand, the relevance of services might not have been fully acknowledged, and thus prioritised.

Based on the status of the heat pump market today, three future pathways concerning increased servitization are identified. These are recognised as an increased service focus, digital development and a consolidation of the market. In conclusion, there is a possibility that the three pathways result in a future scenario of delivering climate-as-a-service, with the heat pump as the main heating/cooling device. The service would involve a smart heat pump connected to other systems and energy devices in the home, resulting in a customised climate solution. Moreover, by integrating the supplier's and user's processes, and acting upon available customer data, more advanced services and applications are possible. Using smart connected heat pumps can further enable new business models where a shift in ownership occur, e.g. leasing of heat pumps. Connected to this, a circular economy approach including reverse logistics and pooling of resources, is promoted. However, in order to reach this scenario, the heat pump market must overcome several barriers. Firstly, service providers need to

reorganise their internal processes and tools for service development, as well as change their current mind-set regarding customer-oriented services. Further, service providers should search for solutions that entail continuous profit streams by using, and acting upon, customer data. Lastly, customers must also undergo a change in their ability to procure more advanced services, i.e. to increase their trust in service delivery and allow for integrated processes.

6.1 Future research

In order to provide more tangible possibilities regarding advanced services within the heat market, further research is necessary. This research involves a deeper investigation of customer behaviour and customer needs, where different customer segments are separately considered in terms of service offerings. In connection to this, it is important to understand how companies with diverging, versus homogeneous, customer segments should consider their service development. When diverging customer segments occur, modularity based operations could facilitate the development of customised service offerings, i.e. that standardised packages are combined into different solutions. Thus, services based on modularity is another possible subject for future research. Lastly, legal aspects regarding leasing of heat pumps should be further investigated, as well as the profitability of such a business model, in order to confirm the credibility of the service.

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Appendices

Appendix 1 - Interview templates

Intervjumall - Leverantör

Intervjun kommer att genomföras av Erica Hansson och Anna Lindesson, som skriver examensarbetet ihop med Profu och Chalmers Tekniska Högskola.

Syfte
Skapa en ökad förståelse för den svenska värmepumpsmarknadens aktörer samt hur de interagerar. Gruppen som intervjuas innefattar olika typer av leverantörer på värmepumpsmarknaden idag, exempelvis tillverkare, grossister, återförsäljare och installatörer. Intervjuunderlagen kommer att användas för att besvara examensarbetets frågeställning i den slutgiltiga rapporten. Intervjun förväntas pågå i 30-60 minuter.

Examensarbetet utförs som en del av det pågående forskningsprojektet "Värmemarknad Sverige". Projektet är ett samarbete mellan fler än 40 företag på den svenska marknaden och leds av konsult- och forskningsföretaget Profu.

Anonymitet
Får företagets namn nämnas i rapporten?
Tillåter du att vi nämner dig vid namn i rapporten eller föredrar du anonymitet?

Inspelning
Tillåter du att vi spelar in detta samtal för att underlätta rapportskrivningen?

Få förståelse för den intervjuades bakgrund, yrke och roll på företaget:

1. Berätta kort om dig själv och din roll på företaget.
2. Vad har du för erfarenhet inom värmemarknaden?

Få en överblick av värdekedjan utifrån företagets perspektiv:

1. Hur skulle ni rita upp er värdekedja i form av leverantörer och kunder?
2. Är detta en typisk formation eller kan den se annorlunda ut?

Få förståelse för företagets erbjudande:

1. Gällande värmepumpar, vad erbjuder ni era kunder?
    1.1. Garanti?
2. Hur levererar ni erbjudandet?
3. Vilka tjänster erbjuder ni i association till värmepumpar?
    3.1. Underhåll?
    3.2. Drift?
    3.3. Varför/varför inte?
    3.4. Kostnader associerade med underhåll och drift?
4. Vad efterfrågar era kunder i erbjudandet?

Få förståelse för företagets relationer med andra aktörer:

1. Vilka är era leverantörer?
    1.1. Vad erbjuder de er?
2. Beskriv er relation med era leverantörer.
3. Vilka är era kunder?
4. Beskriv er relation med era kunder.
5. Har ni några samarbeten med andra aktörer på värmemarknaden?

Få förståelse för företagets kundinsikt:

1. Varför väljer kunden värmepump?
2. Varför väljer kunden ert företag?
3. Vad tror ni att användaren värdesätter mest vid köp av värmepump?

Få förståelse för företagets konkurrenter:

1. Vilka är era största konkurrenter?
2. Hur skiljer sig ert erbjudande från deras i termer av produkt och tjänst?

Få förståelse för trender på värmepumpsmarknaden:

1. Vilka trender har ni identifierat på värmepumpsmarknaden de senaste 5 åren?
    1.1. Kopplat till tjänstefiering?
    1.2. Har nya aktörer tagit sig in på marknaden?
    1.3. Har nya samarbeten formats på marknaden?
    1.4. Har ni sett någon form av konsolidering bland leverantörerna? Dvs. att mindre slås ut/köps upp av de större.
2. Vilka trender tror ni vi kommer se de kommande 5 åren?
    2.1. Vad tror ni att användaren kommer att värdesätta mest i framtiden vid köp av värmepump?
        2.1.1. Helhetslösningar med installation, underhåll, drift samt uppdatering av värmepump.
        2.1.2. Tydligare analysverktyg för att kunna anpassa värmeförbrukningen i hemmet.
        2.1.3. Övergång från produkt till tjänst. Kunden köper tjänsten att ha 20 grader i hemmet.

Intervjumall - Användare

Intervjun kommer att genomföras av Erica Hansson och Anna Lindesson, som skriver examensarbetet ihop med Profu och Chalmers Tekniska Högskola.

Syfte
Skapa en ökad förståelse för den svenska värmepumpsmarknadens aktörer samt hur de interagerar. Gruppen som intervjuas innefattar olika fastighetsägare av flerbostadshus och representerar i detta sammanhang användare. Intervjuunderlagen kommer att användas för att besvara examensarbetets frågeställning i den slutgiltiga rapporten. Intervjun förväntas pågå i 30-60 minuter.

Examensarbetet utförs som en del av det pågående forskningsprojektet "Värmemarknad Sverige". Projektet är ett samarbete mellan fler än 40 företag på den svenska marknaden och leds av konsult- och forskningsföretaget Profu.

Anonymitet
Får företagets namn nämnas i rapporten?
Tillåter du att vi nämner dig vid namn i rapporten eller föredrar du anonymitet?

Inspelning
Tillåter du att vi spelar in detta samtal för att underlätta rapportskrivningen?

Få förståelse för den intervjuades bakgrund, yrke och roll på företaget:

1. Berätta kort om dig själv och din roll på företaget.
2. Vad har du för erfarenhet inom värmemarknaden?

Få förståelse för användarens val av värmeförsörjning:

1. Vilken typ av värmepump har ni?
2. Vem har ni köpt den av?
    2.1. Varför valde ni denna installatör/återförsäljare?
    2.2. Övervägde ni någon annan installatör/återförsäljare?
3. Vad värdesätter ni mest vid köp av värmepump?

Få förståelse för användarens relationer med andra aktörer:

1. Beskriv er relation med era leverantörer.
2. Har ni några samarbeten med andra aktörer på värmemarknaden?

Få förståelse för utbud och efterfrågan av tjänster:

1. Vilka tjänster blev ni erbjudna i samband med köpet?
    1.1. Av vilka aktörer?
2. Vem sköter underhåll av värmepumpen?
    2.1. Associerade kostnader?
3. Hur fungerar drift av värmepumpen?
    3.1. Associerade kostnader?
4. Efterfrågar ni någon tjänst idag som inte erbjuds av nuvarande aktörer?

Få förståelse för trender på värmepumpsmarknaden:

1. Vilka trender har ni identifierat på värmepumpsmarknaden de senaste 5 åren?

1.1. Har utbudet av kringtjänster förändrats?
1.2. Har nya aktörer tagit sig in på marknaden?
1.3. Har nya samarbeten formats på marknaden?

2. Vad tror ni att användare av värmepumpar kommer att efterfråga/prioritera i ett framtida scenario?

Intervjumall - Fjärrvärmeleverantör

Intervjun kommer att genomföras av Erica Hansson och Anna Lindesson, som skriver examensarbetet ihop med Profu och Chalmers Tekniska Högskola.

Syfte
Skapa en ökad förståelse för den svenska värmepumpsmarknadens aktörer samt hur de interagerar. Gruppen som intervjuas innefattar olika typer av leverantörer på värmepumpsmarknaden idag, exempelvis tillverkare, grossister, återförsäljare och installatörer. Intervjuunderlagen kommer att användas för att besvara examensarbetets frågeställning i den slutgiltiga rapporten. Intervjun förväntas pågå i 30-60 minuter.

Examensarbetet utförs som en del av det pågående forskningsprojektet "Värmemarknad Sverige". Projektet är ett samarbete mellan fler än 40 företag på den svenska marknaden och leds av konsult- och forskningsföretaget Profu.

Anonymitet
Får företagets namn nämnas i rapporten?
Tillåter du att vi nämner dig vid namn i rapporten eller föredrar du anonymitet?

Inspelning
Tillåter du att vi spelar in detta samtal för att underlätta rapportskrivningen?

Få förståelse för den intervjuades bakgrund, yrke och roll på företaget:

1. Berätta kort om dig själv och din roll på företaget.
2. Vad har du för erfarenhet inom värmemarknaden?

Få en överblick av värmepumpmarknadens värdekedja utifrån personens perspektiv:

1. Hur skulle ni rita upp värdekedjan i form av olika aktörer?
2. Är detta en typisk formation eller kan den se annorlunda ut?

Få förståelse för erbjudandet av värmepumpar på marknaden:

1. Vad brukar ingå i erbjudandet när kunden köper en värmepump?
    1.1. Garanti?
2. Vilka tjänster har ni identifierat i association till värmepumpsförsäljning?
    2.1. Underhåll?
    2.2. Drift?
    2.3. Varför/varför inte?
    2.4. Kostnader associerade med underhåll och drift?
3. Vad efterfrågar kunden i erbjudandet?

Få förståelse för relationer mellan olika aktörer:

1. Vilka olika interaktioner ser ni mellan aktörerna på värmepumpsmarknaden?
    1.1. Vilka relationer anser ni är viktigast att vårda?
2. Vilka typer av samarbeten mellan aktörer har ni identifierat på värmemarknaden?

Få förståelse för kunden:

1. Varför väljer kunden värmepump?

1.1. Vad tror ni att användaren värdesätter mest vid köp av värmepump?

Få förståelse för marknadens möjligheter och utmaningar:

1. Vad ser ni för möjligheter på värmepumpsmarknaden idag?
2. Vad ser ni för utmaningar eller förbättringsmöjligheter?
3. Hur ser ni på graden av tjänstefiering idag?
    3.1. Var ligger fokus i erbjudandet?

Få förståelse för trender på värmepumpsmarknaden:

1. Vilka trender har ni identifierat på värmepumpsmarknaden de senaste 5 åren?
    1.1. Kopplat till tjänstefiering?
    1.2. Har nya aktörer tagit sig in på marknaden?
    1.3. Har nya samarbeten formats på marknaden?
    1.4. Har ni sett någon form av konsolidering bland leverantörerna? Dvs. att mindre slås ut/köps upp av de större.
2. Vilka trender tror ni vi kommer se de kommande 5 åren?
    2.1. Vad tror ni att användaren kommer att värdesätta mest i framtiden vid köp av värmepump?
        2.1.1. Helhetslösningar med installation, underhåll, drift samt uppdatering av värmepump.
        2.1.2. Tydligare analysverktyg för att kunna anpassa värmeförbrukningen i hemmet.
        2.1.3. Övergång från produkt till tjänst. Kunden köper tjänsten att ha 20 grader i hemmet.

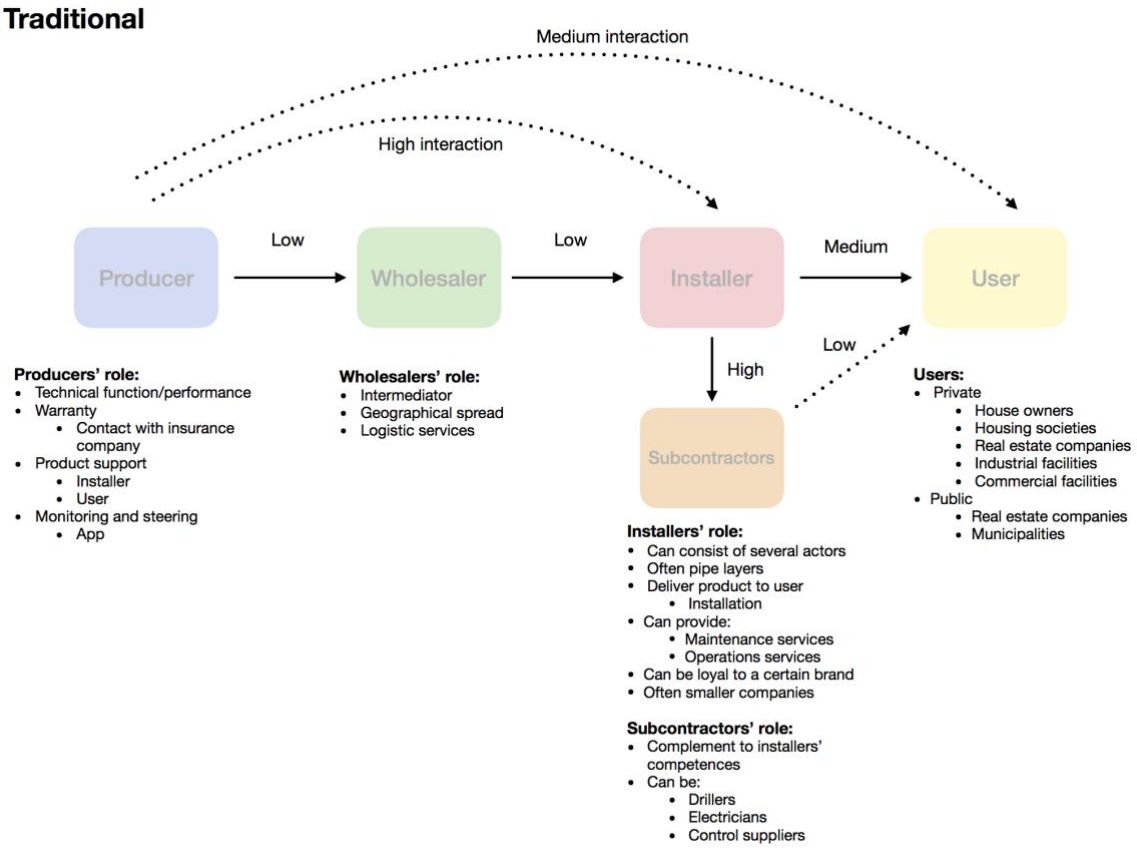
Appendix 2 - Validation of interview templates

	RQ1	RQ2	RQ3
Frågor - Leverantör			
Få en överblick av värdekedjan utifrån företagets perspektiv:			
Hur skulle ni rita upp er värdekedja i form av leverantörer och kunder?	■		
Är detta en typisk formation eller kan den se annorlunda ut?	■		
Få förståelse för företagets erbjudande:			
Gällande värmepumpar, vad erbjuder ni era kunder?	■	■	
Hur levererar ni erbjudandet?	■	■	
Vilka tjänster erbjuder ni i association till värmepumpar?		■	
Vad efterfrågar era kunder i erbjudandet?			■
Få förståelse för företagets relationer med andra aktörer:			
Vilka är era leverantörer?	■		
Vad erbjuder de er?	■	■	
Beskriv er relation med era leverantörer.	■		
Vilka är era kunder?	■		
Beskriv er relation med era kunder.	■		
Har ni några samarbeten med andra aktörer på värmemarknaden?	■		■
Få förståelse för företagets kundinsikt:			
Varför väljer kunden värmepump?			■
Varför väljer kunden ert företag?	■		
Vad tror ni att användaren värdesätter mest vid köp av värmepump?		■	
Få förståelse för företagets konkurrenter:			
Vilka är era största konkurrenter?	■		
Hur skiljer sig ert erbjudande från deras i termer av produkt och tjänst?	■	■	
Få förståelse för trender på värmepumpsmarknaden:			
Vilka trender har ni identifierat på värmepumpsmarknaden de senaste 5 åren?		■	
Kopplat till tjänstefiering?		■	
Har nya aktörer tagit sig in på marknaden?	■		
Har nya samarbeten formats på marknaden?	■		
Har ni sett någon form av konsolidering bland leverantörerna?	■		
Vilka trender tror ni vi kommer se de kommande 5 åren?			■
Vad tror ni att användaren kommer att värdesätta mest i framtiden vid köp av värmepump?			■
RQ1 Who are the actors in the different supply chains, and what roles do they have?			
RQ2 What degree of servitization can be observed within the different supply chains, and how does this affect their structures?			
RQ3 What are future possible scenarios for the heat pump market concerning servitization?			

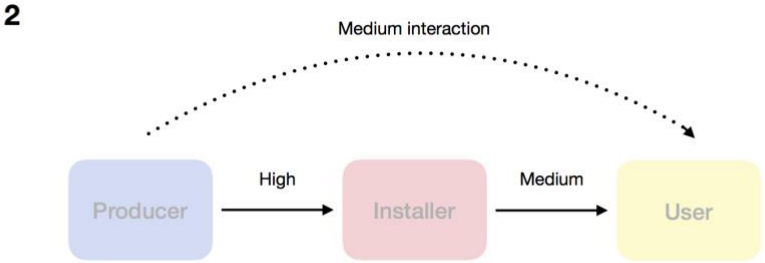
	RQ1	RQ2	RQ3
Frågor - Användare			
Få förståelse för användarens val av värmeförsörjning:			
Vem har ni köpt er värmepump av?			
Varför valde ni denna installatör/återförsäljare?			
Övervägde ni någon annan installatör/återförsäljare?			
Vad värdesätter ni mest vid köp av värmepump?			
Få förståelse för användarens relationer med andra aktörer:			
Beskriv er relation med era leverantörer.			
Har ni några samarbeten med andra aktörer på värmemarknaden?			
Få förståelse för utbud och efterfrågan av tjänster:			
Vilka tjänster blev ni erbjudna i samband med köpet?			
Av vilka aktörer?			
Vem sköter underhåll av värmepumpen?			
Associerade kostnader?			
Hur fungerar drift av värmepumpen?			
Associerade kostnader?			
Efterfrågar ni någon tjänst idag som inte erbjuds av nuvarande aktörer?			
Få förståelse för trender på värmepumpsmarknaden:			
Vilka trender har ni identifierat på värmepumpsmarknaden de senaste 5 åren?			
Har utbudet av kringtjänster förändrats?			
Har nya aktörer tagit sig in på marknaden?			
Har nya samarbeten formats på marknaden?			
Vad tror ni att användare av värmepumpar kommer att efterfråga/prioritera i ett framtida scenario?			
RQ1 Who are the actors in the different supply chains, and what roles do they have?			
RQ2 What degree of servitization can be observed within the different supply chains, and how does this affect their structures?			
RQ3 What are future possible scenarios for the heat pump market concerning servitization?			

Appendix 3 - Identified supply chains

Below, all identified supply chains within the heat pump market is presented.



Traditional - 2



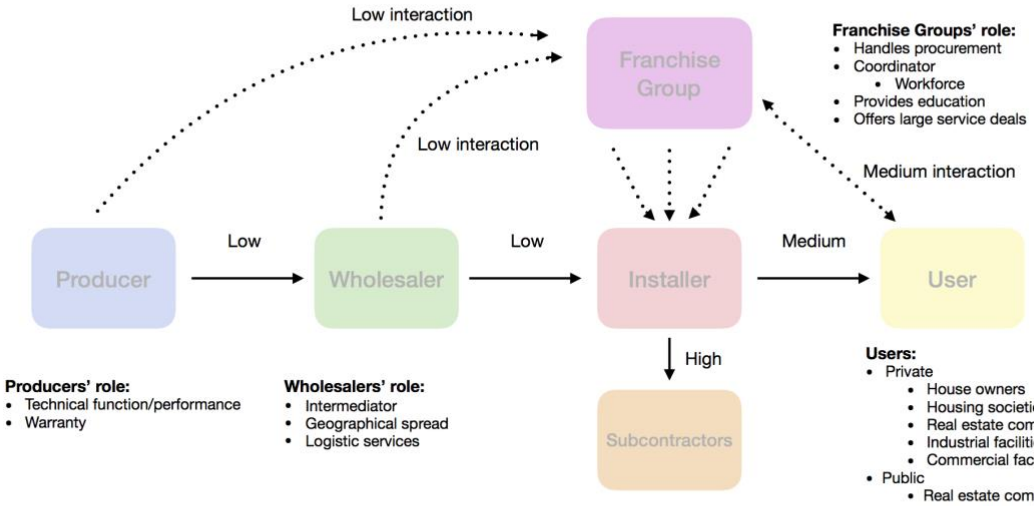
Producers' role:
- Technical function/performance
- Warranty
  - Contact with insurance company
- Product support
  - Installer
  - User
- Monitoring and steering
  - App

Installers' role:
- Often pipe layers
- Functioning as a retailer
- Deliver product to user
  - Installation
- Often provide:
  - Planning of project
  - Service deals
    - Maintenance
    - Operations
- Can be loyal to a certain brand

Subcontractors' role:
- Complement to installers' competences
- Can be:
  - Drillers
  - Electricians
  - Control suppliers

Users:
- Private
  - House owners
  - Housing societies
  - Real estate companies
  - Industrial facilities
  - Commercial facilities
- Public
  - Real estate companies
  - Municipalities

Franchise



Franchise Groups' role:
- Handles procurement
- Coordinator
  - Workforce
- Provides education
- Offers large service deals

Producers' role:
- Technical function/performance
- Warranty

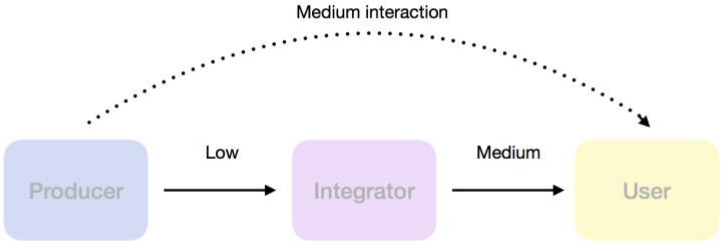
Wholesalers' role:
- Intermediator
- Geographical spread
- Logistic services

Users:
- Private
  - House owners
  - Housing societies
  - Real estate companies
  - Industrial facilities
  - Commercial facilities
- Public
  - Real estate companies

Installers' role:
- Often pipe layers
- Deliver product to user
  - Installation
- Often provide:
  - Planning of project
  - Service deals
    - Maintenance
    - Operations

Subcontractors' role:
- Complement to installers' competences
- Can be:
  - Drillers
  - Electricians
  - Control suppliers

Integrator

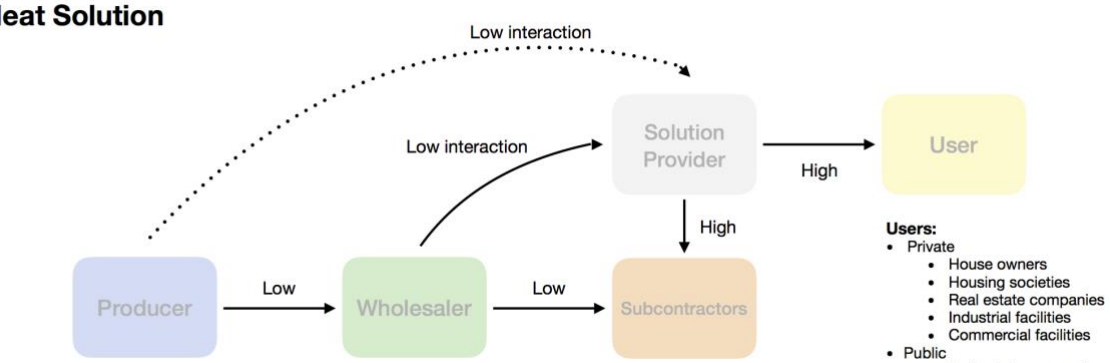


Producers' role:
- Technical function/performance
- Warranty
  - Contact with insurance company
- Product support
  - Integrator
- Monitoring and steering
  - App

Integrators' role:
- Overall responsibility against all other parties
- Have almost all competences in-house
- Communicators
- Planning of project
- Advisory services
- Deliver product
  - Installation
- Service deals:
  - Maintenance
  - Operations
- Financial services
  - Payment plan
- Not brand loyal

Users:
- Private
  - House owners
  - Housing societies
  - Real estate companies
- Public
  - Real estate companies

Heat Solution



Producers' role:
- Technical function/performance
- Warranty
  - Contact with insurance company
- Product support
  - Installer
  - Solution provider
- Monitoring and steering
  - App

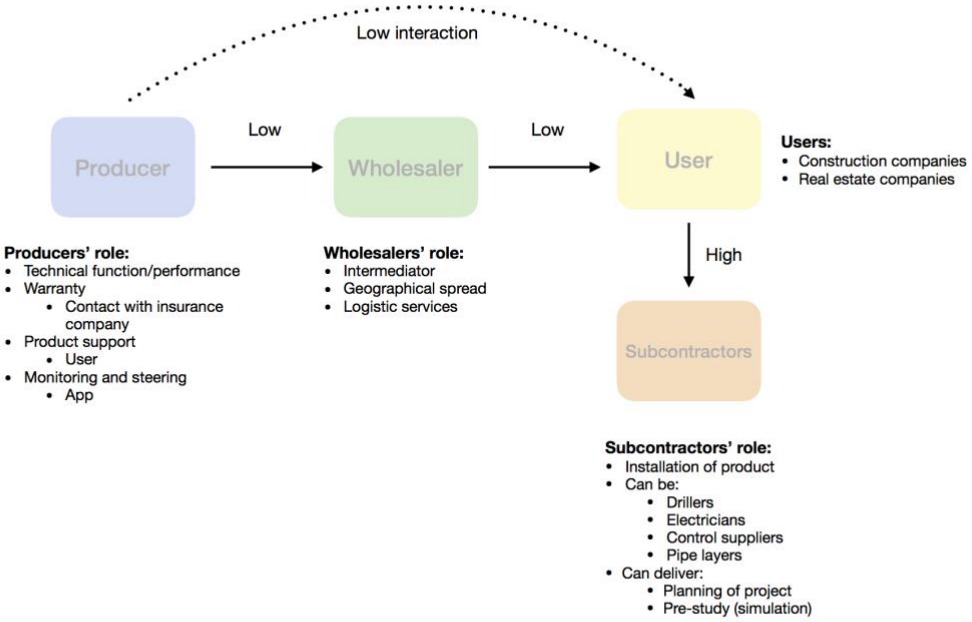
Wholesalers' role:
- Intermediator
- Geographical spread
- Logistic services

Solution providers' role:
- Overall responsibility against all other parties
- Often provide a complete heat/energy solution together with heat pump
- Communicators
- Deliver product
  - Installation
- Planning of project
- Advisory services
- Service deals:
  - Maintenance
  - Operations
- Financial services
  - Leasing of heat pumps
  - Co-investment
- Not brand loyal

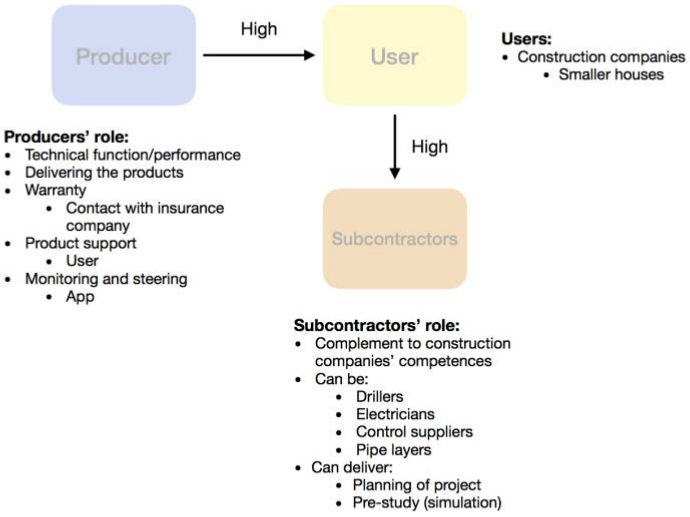
Subcontractors' role:
- Complement to Solution Providers' competences
- Can be:
  - Installers
  - Drillers
  - Electricians
  - Control suppliers

Users:
- Private
  - House owners
  - Housing societies
  - Real estate companies
  - Industrial facilities
  - Commercial facilities
- Public
  - Real estate companies
  - Municipalities

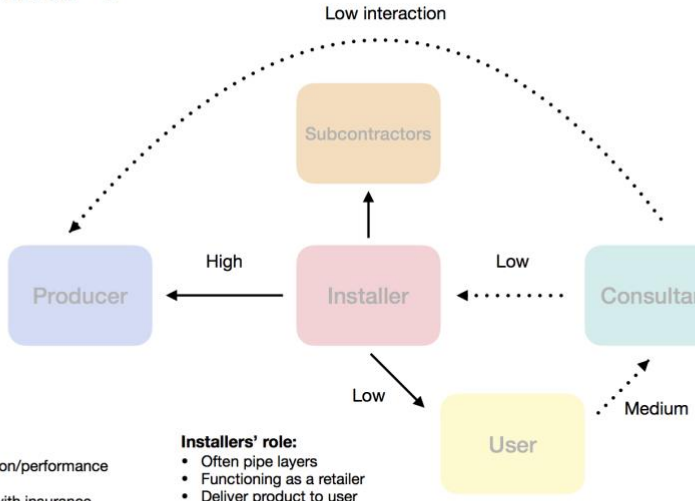
Construction Companies



House Manufacturers



Consultancy Involved - 1



Consultants' role:
- Project planning
- Advisory services
- Calculations
- Contact with user

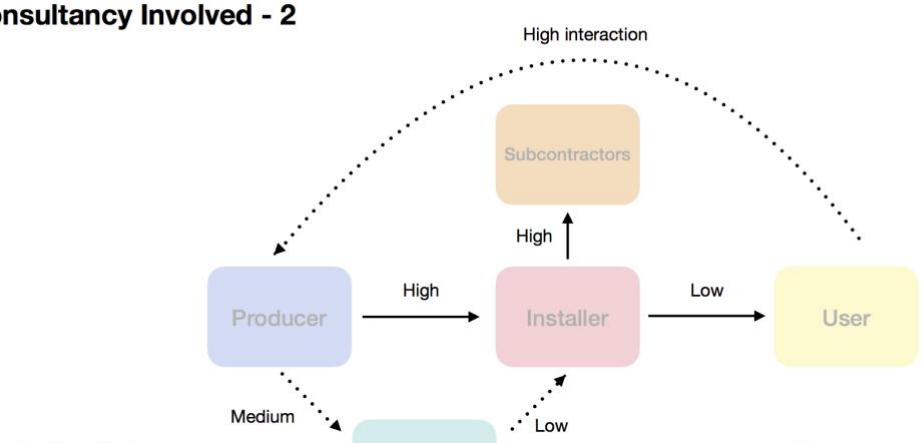
Producers' role:
- Technical function/performance
- Warranty
  - Contact with insurance company
- Product support
  - Installer
  - Consultant
- Monitoring and steering
  - App

Installers' role:
- Often pipe layers
- Functioning as a retailer
- Deliver product to user
  - Installation
- Can provide:
  - Planning of project
  - Service deals
    - Maintenance
    - Operations
- Loyal to a certain brand

Users:
- Construction companies
- Real estate companies
- Industrial facilities
- Commercial facilities
- Public real estate companies
- Municipalities

Subcontractors' role:
- Complement to installers' competences
- Can be:
  - Drillers
  - Electricians
  - Control suppliers

Consultancy Involved - 2



Producers' role:
- Technical function/performance
- Warranty
  - Contact with insurance company
- Product support
  - Installer
  - Consultant
- Monitoring and steering
  - App

Consultants' role:
- Project planning
- Advisory services
- Calculations
- Contact with producer

Installers' role:
- Often pipe layers
- Functioning as a retailer
- Deliver product to user
  - Installation
- Can provide:
  - Planning of project
  - Service deals
    - Maintenance
    - Operations
- Loyal to a certain brand

Users:
- Can be:
  - Construction companies
  - Real estate companies
  - Industrial facilities
  - Commercial facilities
  - Public real estate companies
  - Municipalities
- Initiate contact with specific producer
  - Brand loyal

Subcontractors' role:
- Complement to installers' competences
- Can be:
  - Drillers
  - Electricians
  - Control suppliers