Value Creation in Ecosystem Business Models

A Case Study of Ecosystem Dependencies in a Smart Energy Company

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Abstract

As a result of increased complexity across all industries due to digitalization, firms can no longer specialize in every area, creating a need for inter-firm cooperation. This has resulted in the rise of an ecosystem focus in firms' business models. This inter-firm cooperation in ecosystems presents strong external dependencies, which firms need to understand and manage. However, business model theory is ill-equipped to address the implications of ecosystem dependencies for value creation, prompting the need for viewing business model and ecosystem literature in combination. It is well established in the ecosystem literature that a firm's value creation depends on interactions with external firms, however the different actors' relation to the value proposition varies, and this is insufficiently described in the literature.

This thesis extends existing literature concerning value creation in business models by investigating how it is affected by ecosystem dependencies and how these dependencies can be handled. Through a 17 week research project, we have collaborated with an electricity provider and examined how it creates value in an ecosystem of technology-providing actors. Our focus has been on examining the firm's dependencies to external actors in order for the value proposition in the business model to come about. Based on analyzing our empirical findings, and a discussion with related academic literature, we contribute with a conceptualization of a two-fold model of an ecosystem. Our two-fold model encapsulates how different ecosystem actors differ in their relations to the value proposition, and hence require varying degrees of cooperation with the focal firm. By positioning each ecosystem actor across the inner and outer ecosystem of our two-fold model, firms can strengthen their value proposition and ensure that their resources are optimized. In addition to being relevant to researchers, our two-fold ecosystem model is relevant to practitioners concerned with handling ecosystem dependencies for value creation in business models.

Keywords: Business models, business ecosystems, ecosystem dependencies, value creation

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Abbreviations

AMS: Advanced Metering System

API: Application Programming Interface

BMML: Business Model Modeling Language

DSO: Distribution System Operator

EV: Electrical Vehicle

HAN: Home Area Network

IoT: Internet of Things

TSO: Transmission System Operator

1 Introduction

Investigating the role of external actors in business model value creation is becoming increasingly important as a result of technological development. Digitalization creates new opportunities for firms, but also increases the complexity in business environments. This denotes that firms no longer can specialize in every area, resulting in a need for cooperation and connectedness between organizations and individuals in order to exploit complementarities (Rai & Tang, 2014; Zott et al., 2011). Further, companies are shifting from only offering products, to offering products as services. This entails that their goal is no longer solely to make a sale, but to attain customer satisfaction over time (Porter & Heppelmann, 2015). In addition, digitalization is shifting the focus in business models from offering discrete products to systems of related, interconnected products. This often requires partnerships to fill product gaps and broaden the customer value proposition (Porter & Heppelmann, 2015). The rise of interconnections across firms highlight the importance of an ecosystem focus for firm's value creation and represent an increasingly relevant context for business model research.

Value creation is a well-established concept in both business model and business ecosystem literature, and describes the process of combining the resources and activities that form a firm's value proposition. In business model theory, these resources and activities mainly originate from the firm itself, but can also derive from its key partners (Morris et al., 2005; Osterwalder & Pigneur, 2010; Shafer et al., 2005). In the ecosystem literature, value creation is viewed as a collectively task supported by a set of loosely interconnected firms that interact and affect each other through their activities (Adner, 2017; Jacobides et al., 2018; Moore, 1996). Theory describes these firms to have a "shared fate", as they are dependent on each other in order to create value for their customers (Jacobides et al., 2018; Moore, 1993). In addition, value creation in ecosystem literature also involves creating value for the ecosystem actors (Moore, 1993). Hence, both business model and ecosystem literature acknowledge external companies' role in value creation. By combining the two literature streams of business models and business ecosystems, we propose the term *ecosystem business model* to encapsulate business models where cooperation in ecosystems is the foundation for value creation, and consequently how the value proposition comes about. Although combining business model and business ecosystem theory contributes to understanding value creation in

ecosystem business models, it is not sufficient to grasp the complexity this entails. Even though it is well established in the ecosystem literature that a firm's value proposition depends on interactions with external firms (Adner, 2017; Jacobides et al., 2018; Moore, 1996), it lacks describing how the interactions with each individual ecosystem actor play out in regards to value creation. This represents a gap in the literature.

This thesis extends existing literature concerning value creation in business ecosystems and business models by addressing the questions: (1) *How is value creation in business models affected by ecosystem dependencies?*, and (2) *What are the mechanisms for handling these dependencies?*

In order to answer the research questions we conducted a case study of the smart energy company, SmartEl (pseudonym), its business model and surrounding ecosystem of partners and customers. The energy sector in Norway is a prime example of a traditional industry that is undergoing fundamental changes due to technological development, resulting in the rise of new, technology- and customer-oriented business models. SmartEl offers both smart energy management to residential consumers and flexibility to the grid operators, and is a first-mover in Europe within these business areas. Both value propositions are enabled by integrations to external firms' Internet of Things (IoT) products. Through a 17 week research project, we examined SmartEl's business model and its ecosystem dependencies to its technology-providing actors. Our findings were further analyzed with Adner's (2017) ecosystem-as-structure lens, which enabled us to critically investigate the role of ecosystem actors in delivering the value proposition of the focal firm.

Based on our empirical findings and existing business model and ecosystem literature, we present a conceptualization of a two-fold ecosystem model, and discuss how firms can optimize their use of resources by being aware of where to position different ecosystem actors in the model. The conceptualization portrays an ideal ecosystem where the ecosystem actors are positioned across an inner and outer ecosystem based on whether or not the focal firm needs to cooperate closely with the given actor in order for the value proposition to take place. From this study we make both theoretical and practical contributions. We make a theoretical contribution by proposing our two-fold ecosystem model as a representation of the different relations ecosystem actors have to the value proposition, and we view this as an extension to the already established ecosystem theory. Additionally, the two-fold ecosystem

model makes both a theoretical and a practical contribution by serving as a guidance to firms for prioritizing resources when ensuring a strong value proposition, and creating value for all ecosystem actors. Moreover, our empirical insights support the ecosystem literature in addressing ecosystem dependencies for value creation, and provide insight into an approach for handling these dependencies.

The thesis is structured as follows. Firstly, we present the backdrop of our case study by introducing the Norwegian energy sector, the smart energy trends in the industry and our case company, SmartEl. Then, we review relevant literature of business models and business ecosystems, and present the need to view these theories in combination in order to grasp external dependencies in business model value creation. When it comes to the data collection in our single case study, it is a result of both document analysis, a field study and interviews with representatives from the case company and its customers. Further, we expose our findings that reveal SmartEl's ecosystem focused business model, the challenges with ecosystem dependencies and how SmartEl manages these dependencies. With Adner's (2017) ecosystem-as-structure as a lense, we analyze our empirical findings. We identify two central aspects of SmartEl's ecosystem business model, the value proposition's dependency to external actors and SmartEl's position in the ecosystem as the focal firm, with the responsibilities this involves. We further discuss our findings and analysis using both business model and ecosystem literature. Contributing to the ecosystem literature, we propose a two-fold model that conceptualizes how different ecosystem actors have different relations to the value proposition. We conclude that focal firms need to identify with whom it is necessary to cooperate closely, and consequently which actors should be positioned across the inner and outer ecosystem.

2 Background

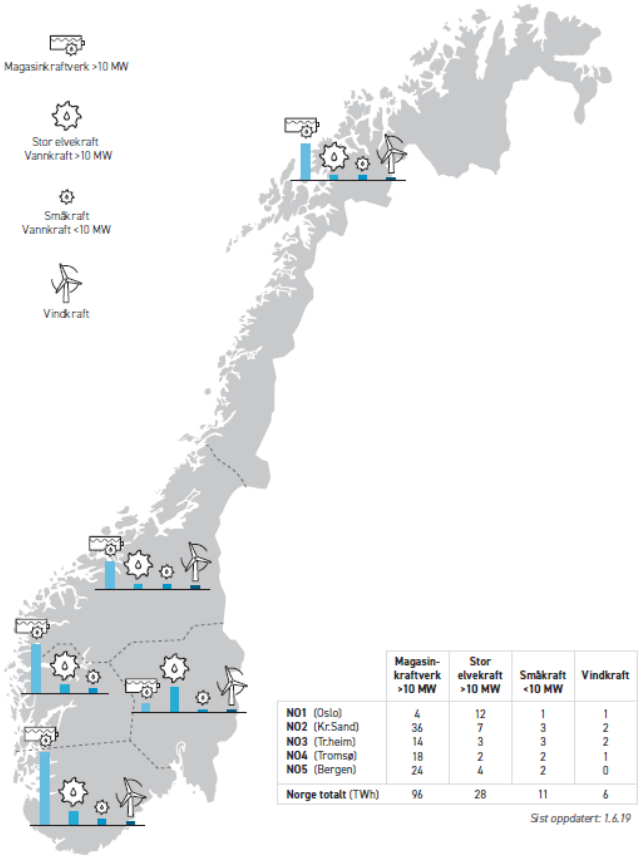
The energy sector is the backdrop for our case study, and we will first establish an understanding of the Norwegian energy sector. Understanding the complexity and challenges in the energy sector is important to grasp how technology can be utilized for smarter production and consumption of energy. Further we will introduce our case company in order to convey its central position as a first mover within smart energy management and in the emerging flexibility market.

2.1 The Norwegian energy sector

The Norwegian Energy Market was liberalized and deregulated through the Norwegian Energy Act that entered into force in 1991 (NVE, 2021a). This entails that electricity production and trading is market-based, while grid operations are strictly regulated, creating a natural governmental monopoly for transmission and distribution (Energifakta Norge, 2021). Norwegian public authorities also have a central role in power production through their 90% ownership in the national electric power production capacity (Energifakta Norge, 2019). In 2020, Norway produced 154 TWh of electricity, almost exclusively from renewable energy production, mainly hydropower (SSB, 2022). Hydropower differs from other forms of renewable energy production due to its flexibility and high storage capacity. In the years to come, Norway's planned further investments in renewable energy are increasingly focused on wind and solar power, which are non flexible power sources. This implies that the energy either has to be consumed right away, or be stored with solutions such as batteries or hydrogen. This increases the complexity of the energy market and requires digital solutions in order to achieve overview and control.

The European energy markets are connected with interconnected power grids, optimizing capacity and production resources across borders (Energifakta Norge, 2021). The leading European electricity trading platform, Nord Pool, operates in 16 European countries with both day-ahead and intraday prices for each hour (Nord Pool, 2022). Along with Sweden, Denmark and Finland, Norway is a part of the Nordic power market. The local Transmission System Operator (TSO) in each Nordic country, divides the country into bidding areas, where prices differ between them. The Norwegian energy market is divided into five price zones, NO1-NO5 (Energifakta Norge, 2021). Generally, prices are higher in the southern regions in

Norway because of their dense population, less rain and lower storage capacity in hydropower compared to the northern regions. In addition, there is a lack of capacity on the transmission grids between the regions.



	Magasin-kraftverk >10 MW	Stor elvekraft >10 MW	Småkraft <10 MW	Vindkraft
NO1 (Oslo)	4	12	1	1
NO2 (Kr.Sand)	36	7	3	2
NO3 (Trheim)	14	3	3	2
NO4 (Tromsø)	18	2	2	1
NO5 (Bergen)	24	4	2	0
Norge totalt (TWh)	96	28	11	6

Sist oppdatert: 1.6.19

Figure 1: Overview of the five Norwegian bidding areas and their power production (Energifakta Norge, 2021)

Norwegian electricity providers are responsible for buying electricity on behalf of their customers, and need to try to predict the customers' consumption beforehand because the electricity is more expensive the closer to consumption the electricity is bought. In Norway, there are several electricity providers, and the consumers are free to pick their own provider. Traditionally, Norwegian electricity providers have offered a substantial amount of different electricity agreements, with several pricing model varieties of fixed price and spot price, increasing the complexity for consumers. While the spot price is based on the market price for the given hour the electricity is consumed, fixed price agreements offer one fixed hourly price during a longer period, for instance a year. Some actors also offer cheaper electricity agreements for new customers, but automatically raise the price after some time (Hovland, 2020). Most providers also surcharge their customers per KWh electricity they consume, meaning their profit increases the more energy their customers consume.

Norwegian society in the coming years will be characterized by electrification across all industries, especially in petroleum, data centers and new industries. In addition, no country in the world has as many electrical vehicles (EVs) per capita as Norway, and the number is rising. Statnett predicts the Norwegian energy consumption growth to reach 19 TWh by the end of 2026, and also that the power production will not be able to increase at the same pace. Consequently, Norway's current yearly power surplus of about 15 TWh is predicted to be reduced to approximately 3 TWh by 2026, and the southern regions will have a power shortage (Statnett, 2021). The electrification both across industries and among private consumers poses a threat to the electricity grid that already is under-scaled for today's consumption. To avoid having to upgrade the transmission and distribution grid more than necessary, it is vital to use energy smarter.

In 2016, Norway started rolling out smart electricity meters (AMS) to be installed in all Norwegian homes, and it was completed by 2019. The AMS meters enabled more precise readings and outage detections. Norwegian consumers formerly had to manually report their electricity consumption to their energy company yearly, or monthly if they had a spot price electricity agreement. Because of the lack of information regarding when the electricity was consumed, the former spot price electricity agreements were based on a weighted average spot price each month. Today, the AMS meters automatically report each household's hourly consumption. This enables precise billing using the hourly Nord Pool spot price and gives the utility companies insight regarding the peak load hours during a day (NVE, 2019). Through the Home Area Network (HAN) port on the AMS meters, the consumers have the opportunity to give a third party actor access through a smart gadget that gives real time insight to power consumption. Installing such gadgets also enable integrations with IoT products that can be used for smart energy management (NVE, 2021b).

In 2020, the power prices in Norway were at an all time low due to high temperatures and a reduction in international trade. When 2021 offered low levels of rain, low temperatures and a European gas shortage, this resulted in historical high prices (Energi Norge, 2022). After getting paid for consuming energy in certain hours in 2020, this came as a surprise to most consumers. In 2021 there was also planned a new grid fee model that rewards consumers for spreading their energy consumption among several hours, reducing peak loads. This was however postponed due to the already high energy prices. When Russia in 2022 invaded Ukraine, the European energy capacity was again put to the test due to the lack of gas, further

increasing the electricity prices. Going forward, Statnett has predicted that the coming energy prices will be lower than they were in 2021, but higher than the average in the last decade. Statnett also predicts that the prices will vary more during the week and for each hour during the day (Statnett, 2021).

As we have seen, the energy sector is a complex industry where Norway is connected with other European countries, entailing that Norwegian energy prices are affected by the European energy situation as well. In addition, the planned further development of power production in Norway will not be sufficient for the increased demand for energy in the coming years, and the power grids are already under-scaled for today's consumption. This will result in higher and more varying energy prices in the future, which can incentivize smarter energy consumption, enabling new business opportunities. The introduction of the AMS is a step in the right direction for digitalizing the traditional energy sector, and is the enabling foundation for firms to offer smart energy management through utilizing technology. This way, the energy sector can make the most out of its capacity while lowering the consumer's energy bills. This opens up the market for smart energy trends which we now will describe more in detail.

2.2 Smart energy trends in the energy sector

As a consequence of technological advancement, the energy sector is evolving rapidly. Even though we have consumed energy for a long time, it has not been connected to smartness until now. The power grid is shifting from its hierarchical structure toward a decentralized grid with bidirectional information flows, the so-called smart grid (Farhangi, 2010). This digitalization and decentralization threaten traditional business operations in the energy sector and give rise to new competitors (Paukstadt & Becker, 2021). Smart products and services are no longer utilized for process automation alone, but can also be used for creating completely new business models (Fichman et al., 2014; Teece, 2010).

The recent development of IoTs in combination with the new smart meters has resulted in an increased interest among consumers for smart energy management. Smart energy can be defined as "the use of ICTs [information and communication technology] in energy generation, storage, transmission, and consumption, aiming at increasing efficiency,

encouraging eco-friendly behavior, and decreasing the emission of GHG [greenhouse gases]" (Kranz et al., 2015, p. 8). This facilitates consumers to automatically control their energy consumption in line with the energy prices.

In recent years, the cost of power production technologies, especially photovoltaics, also known as solar power, has been drastically reduced and thereby has caused an upswing in so-called prosumers. Prosumers are residential electricity consumers that also produce their own energy, and can sell their power surplus back to the grid (Rodríguez-Molina et al., 2014). The new possibilities that come with technology, however, also increase the complexity of the energy market and require further utilization of technology to handle these complexities. Technologies such as machine learning must be used by electricity providers to predict both how much electricity their customers will use and produce, in order to buy the correct amount of energy from the trading platforms.

Another aspect that has changed in the industry due to technology is balancing the power grid. Traditionally, transmission and distribution system operators (TSO and DSO) had agreements with big companies and had to inform them when there was a need to balance the power grids, making them manually reduce their electricity consumption. New consumer technologies such as smart EV chargers enable granular flexibility. The flexibility is provided through an aggregator that remotely can control several integrated IoTs. The aggregator role can typically be held by an electricity provider with an advanced customer base and therefore has access to a large share of EVs or other smart electrical products that can be turned off remotely. Through flexibility marketplaces such as the Nodes platform, aggregators can sell flexibility to the TSOs and DSOs. This unfolds business opportunities that in the future can provide new revenue streams both for aggregators, IoT manufacturers and consumers.

As shown, the energy sector is undergoing a significant digitalization. In order to handle the challenges the industry faces, utilizing technology is essential. Technology has enabled solutions such as consumers producing their own energy, smarter energy consumption, and balancing the grid.

2.3 The case company SmartEl

One of the companies that has been a first mover within offering technology to solve many of the challenges in the energy sector is our case company, SmartEl. SmartEl is an electricity provider, but identifies itself first and foremost as a technology company. Although SmartEl offers electricity agreements to residential consumers, its value propositions are smart energy management to consumers and flexibility to the grid operators. Both these value propositions are enabled by technology.

SmartEl was founded in 2016 by two Scandinavian technology enthusiasts in the energy sector. When the founders previously worked with the introduction of AMS, they observed the challenges and possibilities in the industry, and wanted to digitalize, decarbonize, decentralize and democratize the traditional energy sector. SmartEl offers both electricity agreements and smart energy management for residential customers in Norway, Sweden and Germany. The SmartEl app is also launched in France, the Netherlands, Spain, Finland and Denmark as a first step in its plan of expanding to these markets as well.

While traditional electricity providers' profit increases the more electricity their customers consume, SmartEl's mission is to empower customers and help them lower their energy bills through smart energy management. In contrast to the traditional electricity providers, SmartEl does not surcharge the customers per KWh energy consumed. This is because an important aspect of SmartEl's business model is having the same interests as the customers and the common goal of reducing their power consumption. The customers pay a monthly subscription fee of approximately 4 EUR per month in addition to the hourly spot price for their consumption.

In its online store, SmartEl sells IoT products for smart energy management. The firm has an inhouse hardware development department where it produces its own smart meter dongle that gets information from the HAN port regarding the customers real time electricity consumption. Through the SmartEl app, the customers get a full overview of their energy consumption at any given moment. In addition, SmartEl resells other companies' IoT products, offering products within five segments: EV-charging, heating, smart home, lights and inverters for photovoltaics. By installing these IoT products in their home, customers can optimize their energy consumption in line with the hourly energy prices. Through SmartEl's

smart energy management, the customers' energy bills can be reduced by 20 percent compared to traditional electricity providers.

In addition to providing electricity and smart energy management for residential customers, SmartEl also offers flexibility for the power grid operators in Sweden, and is running a pilot for this in Norway as well. SmartEl operates as an aggregator that sells flexibility through the marketplace, Nodes. The flexibility is provided by SmartEl through their customers with smart EV chargers. When the DSOs experience bottlenecks or an unbalance in their power grid, they can buy flexibility from the Nodes platform. As the market is still under development, SmartEl does not profit from trading flexibility yet, but rather uses the income to reduce the customers' EV charging cost. In the future, the need for flexibility will grow across all of Europe, which can result in significant revenue streams for SmartEl and its partners.

Since its founding, SmartEl has received attention in both Scandinavian and international media. In particular due to its introduction of a new customer-centric business model in the energy sector, but also because of the company's massive growth. In 2021, SmartEl surpassed 200,000 customers, 150 employees and a turnover of approximately 85 million EUR. By 2022, its customer base was doubled, it had expanded to 180 employees and reached a turnover of 300 million EUR. Despite its rapid growth, SmartEl does not employ sales personnel, but rather grows organically through the word of mouth of its pleased customers. The company offers a referral bonus where every customer that recruits a new SmartEl customer receives a voucher of approximately 50 EUR each for themselves and the recruited customer to use in the online store.

As we have seen, SmartEl is a successful first mover within smart energy by responding to many of the challenges in the energy sector with digital solutions. Through its value propositions of smart energy management for residential consumers and flexibility for the grid operators, consumers can lower their electricity bills, and grid operators can make full use of the capacity they have, avoiding having to upgrade the grids more than necessary. However, SmartEl's value propositions are dependent on integrations to other companies' IoT devices for both residential smart energy management and flexibility for grid operators. To grasp the role of ecosystem dependencies in business models we turn to literature on business models and business ecosystems.

3 Related Literature

The theoretical context for our thesis is business models and business ecosystems in combination. We firstly develop an understanding of business models, its logic and building blocks. Secondly, we present research on business ecosystems and highlight Adner's (2017) activity-centric view of ecosystems. Lastly, we view ecosystem and business model literature in combination and describe our term, *ecosystem business models*, forming our understanding of how ecosystem dependencies affect value creation in business models.

3.1 Business models

Business models can be seen as simplified models representing how a company creates, delivers and captures value, and thus are a template of a company's business logic. They are used as a tool to describe how a company generates profit from its business activities and help to make these activities and the corresponding components visible, analyzable, and manageable (Osterwalder, 2004; Teece, 2010). Business models are important because the performance of a firm does not only depend on the characteristics of the products/services it offers, but also on its business model(s) for commercializing these products/services (John et al., 2017). As stated by Chesbrough (2010), "a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model" (Chesbrough, 2010, p. 355).

In order to make business models more tangible and concrete, several researchers have attempted to conceptualize business models and their components with theoretical frameworks and modeling languages (John et al., 2017; Zott et al., 2011). Business model modeling languages (BMML) aim to visualize the core logic of a business model and its elements (John et al., 2017), and can be used to understand and communicate business models (Osterwalder et al., 2005) and generate new business model ideas (Chesbrough, 2010). The business model concept is interdisciplinary in character (Chesbrough & Rosenbloom, 2002) and in line with this, several BMMLs have emerged from a variety of disciplines, such as strategy (e.g., Casadesus-Masanell & Ricart, 2010), computer science (e.g., Gordijn & Akkermans, 2003) and information systems (e.g., Samavi et al., 2009). The most acknowledged BMML, Osterwalder's Business Model Canvas has had a tremendous impact on business model research and practice (John et al., 2017). Even though the different

business model conceptualizations differ when it comes to the components of a business model, they mostly agree on the elements: value proposition, value creation, value delivery and value capture (Peters et al., 2015; Shafer et al., 2005; Zott et al., 2011). These common dimensions are often regarded as the overarching and constituting building blocks of a business model (Osterwalder et al., 2005; Peters et al., 2015).

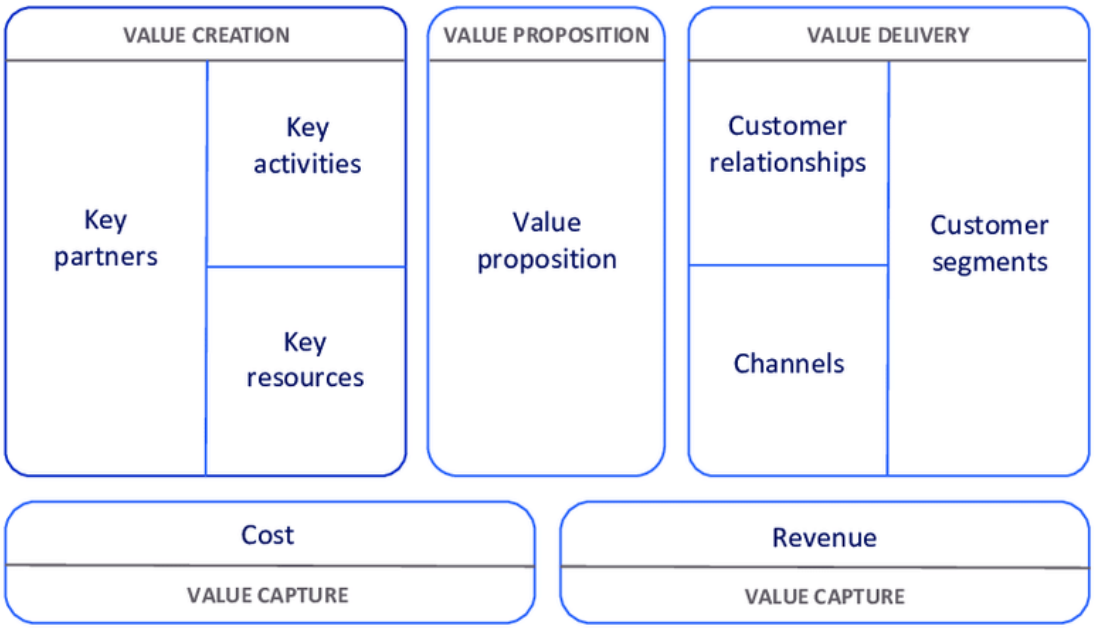


Figure 2: Business Model Canvas, adapted by Guldmann from Osterwalder and Pigneur (2010) and Richardson (2008) (Guldmann, 2019)

The foundation of a business model is the value proposition, and it describes a company's offerings to its customers. The offering consists of products or services that address the customers' needs (Osterwalder, 2004). Traditionally, a company's value proposition solely consisted of products, but due to digitalization, there has been a shift towards offering products as services. This entails that it is no longer sufficient for a company to simply make a sale, it now needs to attain customer satisfaction over time (Porter & Heppelmann, 2015). The value proposition comes about through the value creation dimension which involves the process of combining activities and resources. These resources and activities generally originate from the firm itself, but can also come from key partners such as suppliers, manufacturers and retailers (Morris et al., 2005; Osterwalder & Pigneur, 2010; Shafer et al., 2005). Further, the value delivery dimension outlines the architecture and set of components that is required to deliver value to the customers. This involves customer segment, customer

channels and customer relationships. Lastly, the value capturing dimension describes how a company earns profits from the set of activities by defining the revenue streams and cost structure for the business model (Chesbrough, 2007; Osterwalder, 2004; Teece, 2010). Here we have introduced all four dimensions in business models, but for our further focus we have chosen the value creation dimension as our focal point. This is because value creation is crucial for a firm to achieve the value proposition, which is the core of any business model.

When a firm's value creation involves third parties' activities, it needs to identify the required value chain (Chesbrough & Rosenbloom, 2002), or value network (Christensen & Rosenbloom, 1995) to deliver its offering. The value chain consists of a linear set of business activities involved in a firm's creation of a product or service, and is divided into the discrete activities of design, production, marketing, and distribution (Porter, 1985). While value chain refers to a sequential flow, a network implies multidimensional connectedness (Turati & Dino Ruta, 2001). The linear structure of the value chain has shaped prior business model literature's understanding of value creation. However, due to globalization and digitalization, business models have become more complex and less linear (Peppard & Rylander, 2006), and the importance of external resources for a company's value creation is growing as IT-enabled business models increase interconnections across firms (Rai & Tang, 2014). Several researchers have also suggested that the relationships between firms is where the locus of value creation is found (e.g., Dyer, 1997; Foss & Saebi, 2017). Zott and Amit (2008) therefore suggests adopting a broader view of organizations that also incorporates the firm's ecosystem of partners, customers and suppliers, in order to fully understand how value creation unfolds between ecosystem actors (Zott & Amit, 2008). As such, looking more into business ecosystems and their particularities strengthens our understanding of ecosystem dependencies' influence on value creation.

3.2 Business ecosystems

Inspired by biology, the term ecosystem views a system of actors that interact and depend on each others' activities, but are not hierarchically managed (Jacobides et al., 2018). The term has been of increasing interest in recent years within several disciplines.

One stream of ecosystem literature is business ecosystems which focus on firms and the environment around them. Business ecosystems view the ecosystem as an economic community supported by a network of organizations, institutions and individuals that collectively create value for the customer through working cooperatively as well as competitively (Moore, 1996). In this view the participants of the ecosystem are loosely interconnected actors that affect each other through their activities and efforts. As business ecosystems are dependent on each of its participants' performances in order to materialize value, the literature describes the actors in them to have a "shared fate" (Jacobides et al., 2018; Moore, 1996). The actors can include stakeholders such as suppliers, lead producers and competitors that all have in common that they are "dependent on each other for their mutual effectiveness and survival" (Iansiti & Levien, 2004, p. 4). By collaborating over time, Moore states that the ecosystem participants will "co-evolve their capabilities and roles, and tend to align themselves with the direction set by one or more central companies." (Moore, 1996, p. 26).

Adner (2017) seeks to further conceptualize the ecosystem literature by distinguishing between two general views: *ecosystem-as-affiliation* and *ecosystem-as-structure* (Adner, 2017). He characterizes the existing ecosystem literature (e.g., Autio & Thomas, 2014; Iansiti & Levien, 2004; Moore, 1996) as being focused on ecosystems as affiliations, which he defines as "communities of associated actors defined by their networks and platform affiliations" (Adner, 2017, p. 40). Adner (2017) argues that these actor-focused views of ecosystems propose a conceptual whitespace, and therefore coined the term ecosystem-as-structure to encompass the central position of the value proposition in an ecosystem. In contrast to ecosystems as affiliation, this approach is activity-centric and views ecosystems as "configurations of activity defined by a value proposition" (Adner, 2017, p. 40). Based on this view, Adner defines ecosystems as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p. 42). The definition emphasizes that ecosystems emerge by

starting with a value proposition and then identifying the set of actors that need to interact in order for the proposition to come about.

Adner's structural approach to ecosystems is highlighted through four key elements: activities, actors, positions and links (Adner, 2017). Firstly, activities describe the actions that need to be realized in order for the value proposition to materialize. The actors are thus the participants of the ecosystem that undertake the activities. Furthermore, Adner defines positions as specifications of "where in the flow of activities across the system actors are located and characterize who hands off to whom" (Adner, 2017, p. 43). Lastly, links describe transfers between actors. These transfers can contain content such as matériel, information, influence and funds (Adner, 2017). Together these four elements describe how value collectively is created through configurations of activities and actors.

A central premise of Adner's (2017) ecosystem view is alignment structure which involves mutual agreement between the ecosystem participants regarding their positions in the ecosystem (Adner, 2017). The most significant position in the ecosystem is labeled the *focal firm,* also referred to as keystone or ecosystem leader in the business ecosystem literature (Adner, 2017; Mäkinen & Dedehayir, 2012). The focal firm is the initiator of the ecosystem and plays the role of regulating the overall function of it. Its responsibilities involve setting the ecosystem vision and designing the alignment structure and strategies for how to achieve it together with its participants (Adner, 2017; Autio & Thomas, 2014; Hellström et al., 2015). The focal firm also needs to ensure that the ecosystem jointly creates and delivers value for the customers through stable and predictable operations. Finally, to attain a well-functioning ecosystem, ensuring that it creates value for all of its participants is a central part of the focal firm's responsibility (Moore, 1993). By ensuring that participants benefit from the ecosystem, the focal firm can incentivize them to shape their business models in order to strengthen the joint value proposition (Hellström et al., 2015).

An important implication of being an actor in a broader ecosystem is that success now depends not just on the company's own efforts, but on its collaborators' efforts as well. Using Adner (2017)'s view, the value proposition is the cornerstone of the establishment of an ecosystem, and this value proposition depends on the participation of the ecosystem actors (Adner, 2017). Succeeding with an ecosystem focused business model therefore requires that the company sees, understands and manages its dependence (Adner, 2013). Consequently it is

important to understand the implications ecosystem dependencies have for value creation in business models.

3.3 Ecosystem business models

Technological advancements increase the complexity in businesses' environments, and entail that firms no longer can specialize in every area, but need to cooperate with firms with complementarities (Rai & Tang, 2014; Zott et al., 2011). In addition, customer offerings are shifting from a focus on discrete products to systems of related, interconnected products, which often require partnerships to fill product gaps (Porter & Heppelmann, 2015). This has resulted in the rise in cooperation among firms.

When viewing the business model literature, it becomes clear that the external focus in business model ontology is emerging, but mainly addresses networks, not ecosystems (e.g., Casadesus-Masanell & Ricart, 2010; Chesbrough & Rosenbloom, 2002; Osterwalder, 2004; Peters et al., 2015; Rai & Tang, 2014; Samavi et al., 2009; Shafer et al., 2005; Zott & Amit, 2008). The concepts of networks and ecosystems share some similarities as they both consist of communities of organizations that interact by exploiting complementary resources, technologies or market access, which can result in improved performance for the organizations involved (Shipilov & Gawer, 2020).

Networks and ecosystems also have some differences. One main difference is related to how the organizations and individuals are bound together. Ecosystems are groups of organizations that are not hierarchically managed (Jacobides et al., 2018), while the interorganizational cooperation in networks are structured and formalized through mutually binding contracts (Shipilov & Gawer, 2020). Further, networks and ecosystems differ in their view of interdependence. Networks are outlined with a focus on actor ties, rather than a value proposition. According to Adner (2017), the network perspective is often an incomplete perspective in terms of value creation because actor ties solely communicate information flows, but do not reveal the purpose behind the interaction between the actors. In contrast, the value proposition is the cornerstone of the establishment of an ecosystem, and this value proposition depends on the participation of the ecosystem actors (Adner, 2017). We therefore

argue that an ecosystem perspective is advantageous when viewing value creation in business models.

Because of the need for an ecosystem focus when exploring business models for firms that are highly dependent on external actors, we urge utilizing two lenses when exploring external dependencies' effect on value creation. Hence, viewing business ecosystems and business model literature in combination. We propose the term *ecosystem business models* to encapsulate business models where cooperation in ecosystems is the foundation for value creation, and consequently how the value proposition comes about.

4 Method

The empirical research of this thesis is based on a 17 weeks long qualitative research study and follows the case study method as described by Robert K. Yin (2018). The thesis is a single case study with a Scandinavian smart energy provider, SmartEl, as the case study object. Choosing a single case study was natural because the case company is in the forefront of customer-centric business models for smart energy management in Europe. We have chosen to apply an inductive research approach, as we waited until we had collected data through document analysis, interviews and observations, before detecting themes and patterns to further investigate. Inductive research was beneficial for our study because of the bottom-up approach. What initially drew us to the case company was its interesting business model and rapid growth. Through the data collection it became clear that an ecosystem focus was a central part of the case company's business model, which resulted in a further exploration of the research subject ecosystems as well.

4.1 Data collection

In this section we present the different forms of data collection activities conducted during this master project. We will highlight our three main data gathering activities and argue for their relevance in regard to our master thesis. All three activities have had different roles in building our understanding and they supplement each other. For instance, the initial document analysis was the basis for our insight into SmartEl's business model and ecosystem, and contributed to forming the interview guides, and hence the further direction of our research.

4.1.1 Document analysis

When we started our study, we wanted to collect as much data as we could from open sources before moving further with data collection. There is a large amount of public information available about the case company, and our study uses a range of these informative sources. These sources include both reviews concerning the case study object in magazines, newspaper articles, published papers and podcast episodes, but also statements from the company in form of company reports and presentations, and the company's webpage. In addition, several of the podcast episodes contain interviews with SmartEl's founders and key personnel and could therefore also be seen as a source for the company's own statements. All of these were sources to our document analysis which was a very important tool to become

familiar with our case. It helped us build an understanding of SmartEl's business model and the ecosystem around it. The analysis was also an important part of the preparation for our interviews which included sketching models of SmartEls business model and ecosystem. These models were used actively in the interview phase.

Table 1: Overview of data sources

Data sources	**Quantity**	**Minutes: average**	**Main contributions**	**Information about**
Web and newspaper articles	30		Commentators, SmartEl (founders)	Business model, organization, services, IoT-products, partnerships
Company reports and presentations	3		SmartEl	Business model, organization, IoT-integration, partnerships
Company webpage	12		SmartEl	Business model, services, IoT-products and integrations, partnerships
Podcasts	14	40	CEO, CPO, commentators	Business model, services, IoT-products
Videos	4	35	CEO, partners	Business model, IoT-products, partnerships

The information available online about the case company and its business model was valuable background information, but was mostly of a positive character. In order to get more fine-grained details about its business model and insights to its challenges, we decided to perform interviews with central employees in the company and some of its customers.

4.1.2 Interviews

The data for this study is additionally collected through interviews and meetings with key representatives from the case company and a few selected customers. In total we conducted five interviews with representatives from SmartEl, and two interviews with SmartEl customers. As we seek to understand SmartEl's customer-oriented ecosystem, it was important for us to include customers in the data collection and gather their perspectives on SmartEl and its ecosystem.

For the interviews we chose to adapt the semistructured interview approach as it allows for flexibility. It provides a balance between a rigid structure with a prepared interview guide, and the freedom to ask follow-up questions (Adams, 2015). This is suitable for this type of case study, as it allows us to explore the case company, its business model and ecosystem in-depth. All of the interviews were conducted between February and March 2022, and all quotations in our findings come from our interviews. The interviews were conducted in Norwegian, and the quotations were translated into english. The translated quotations were later sent to the informants for approval.

Interviews with SmartEl

Early in our communication with SmartEl, we were put in touch with a contact person by whom we had an initial interview with. Our purpose was to get an overview of the organization, get answers to some introductory questions, discuss relevant interviewees and plan our visit to the company's headquarters. This was very useful as the person steered the communication between us and the company, and booked all of our meetings and interviews. In addition, he followed us up through the project period by sending us information and answering our questions.

Our choice of interviewees from SmartEl were based on attaining a variance of perspectives in order to fully understand our case. As our study seeks to understand both SmartEl and the ecosystem around SmartEl, we wanted to interview representatives with in-depth competence

within SmartEl's business segments, as well as representatives with an overall insight of SmartEls business model and operational activities. Most of our interviewees held manager positions and served different business units. One of the interviewees had a top management position and gave us a good overview of SmartEl and its business model. Further, we interviewed representatives with more specific competence. This included competence within hardware development and IoT, customer experience and marketing, as well as business development and partnerships.

Table 2: Overview of interviews with SmartEl employees

Role	**Time in the company**	**Date**	**Duration**
Trainee	0.5 years	03.02.2022	60 minutes
Hardware Engineer	3.5 years	28.02.2022	60 minutes
C-level Norway	4.5 years	28.02.2022	55 minutes
C-level Customer Experience	0.5 years	29.02.2022	30 minutes
C-level Partnerships	2 years	29.02.2022	50 minutes

Interviews with customers

Additionally, we conducted two interviews with SmartEl customers. This was mainly to get an external perspective on SmartEl and its activities and operations. Through the interviews we wanted to understand the customers' view on SmartEl's business model and value propositions. This also included an understanding of how customers understand and value SmartEls products and services. In addition, the customer interviews were important for our study in order to get insights about challenges and areas of improvement related to SmartEl's offers.

We found both of our interviewees on online sources, one of them on LinkedIn, and the other one from a technology blog. Both of our interviewees had technical competence and a good overview of the energy sector. Although this was not a requirement for our interviews, it proved to be valuable as they both had knowledge about and used a wide range of SmartEl's

products and services. This made them highly qualified to answer our questions about SmartEl's business model, technology and value propositions.

Table 3: Overview of interviews with SmartEl customers

Time as a SmartEl customer	**Date**	**Duration**
6 years	15.02.2022	50 minutes
3 years	24.03.2022	40 minutes

4.1.3 Field study

To enrich our understanding of SmartEl, we spent three days at SmartEl's headquarters. In addition to conducting our interviews with representatives from the company, we got to meet the whole organization and observe how they worked. By spending time in SmartEls office we got an unique opportunity to experience the work culture. Furthermore, the visit was valuable as we got easy access to people who could answer our questions and discuss different concepts with us. However, we experienced some limitations in our data gathering due to high confidentiality. We were for instance not allowed to participate in meetings and experienced that some people were having reservations about being interviewed.

4.2 Data analysis

The data analysis of this thesis has been a parallel process of engaging in both the research literature and empirical data. We read related research concerning our topic of interest, which initially was smart energy business models, but later became value creation in business model and business ecosystem literature. In the process we have utilized theoretical and empirical material alternately to gain our understanding, and from there worked iteratively to form our contribution. Several steps have been taken on the journey from doing data collection, via identifying our findings, to what we present as our contribution, the two-fold ecosystem model. We divide these steps into two parts: (1) understanding SmartEl's business model and ecosystem and (2) forming our contribution.

4.2.1 Understanding SmartEl's business model and ecosystem

As our thesis seeked to understand SmartEls business model and the ecosystem around it, we found it important to get an overview of this early on. The first step in this process was to analyze the data we had gathered from documents and other types of public data sources. This was done by looking through the documents and searching for information concerning SmartEls activities and offerings, and how these affected its customers, partners and the energy market in general. We used our gathered information in making a Business Model Canvas based on our understanding of SmartEl's business model. We mapped out SmartEl's customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners and cost structures.

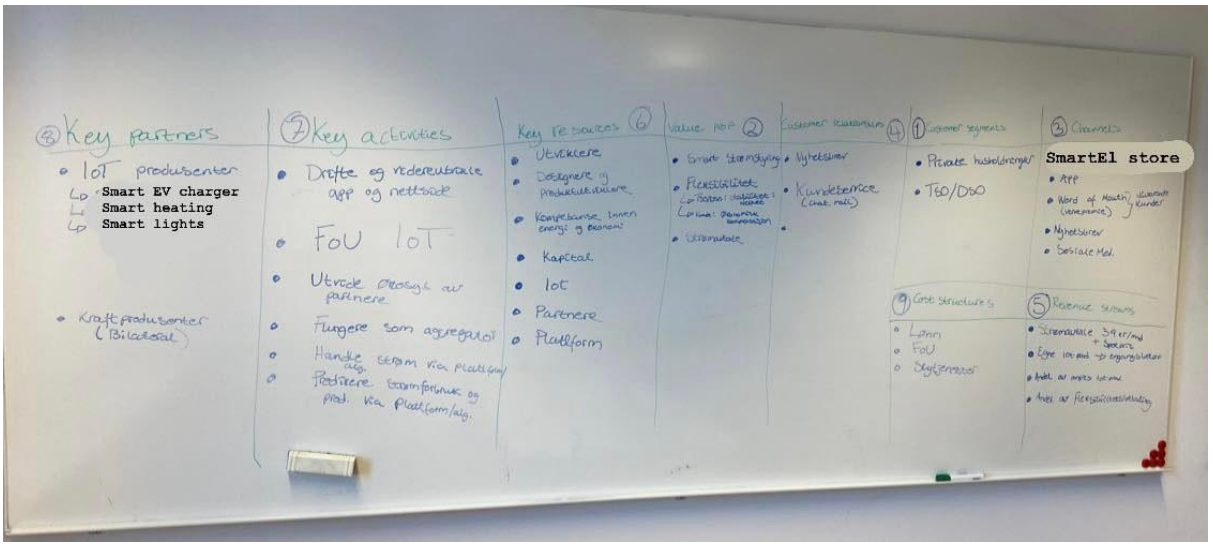


Figure 3: Business Model Canvas of SmartEl

After having mapped out our Business Model Canvas, it became evident that SmartEl's partners were one of its key resources and essential for SmartEl to be able to deliver value propositions to the customers. We found that the Business Model Canvas was not sufficient in describing the importance of the ecosystem surrounding SmartEl, because the different parties involved were not sufficiently weighted. We then encountered the Ecosystem Pie Model and read the online documentation before trying to map out this model as well.

Figure 4: Martine with the Ecosystem Pie Model of SmartEl

We started to sketch on the whiteboard, but soon realized the complexity of the model. To make the model more flexible for changes, we decided to finish it using the online modeling tool, Miro.

Figure 5: Ecosystem Pie Model of SmartEl's Ecosystem

However we still found the model very complex without the complexity giving an increased value to our case study. While the model gave us a useful overview of each actor's contribution to SmartEls ecosystem, understanding how the ecosystem is connected and who provides value to whom, was still rather unclear. We therefore decided to map out the ecosystem in a simpler way focusing on the actors in the ecosystem and the relations between them. Based on the understanding of the ecosystem that we had gathered through our document analysis, we categorized the relations between the actors as value propositions, revenue streams and data streams. In the model below, the red, green and blue lines represent value propositions, revenue streams, and data streams respectively.

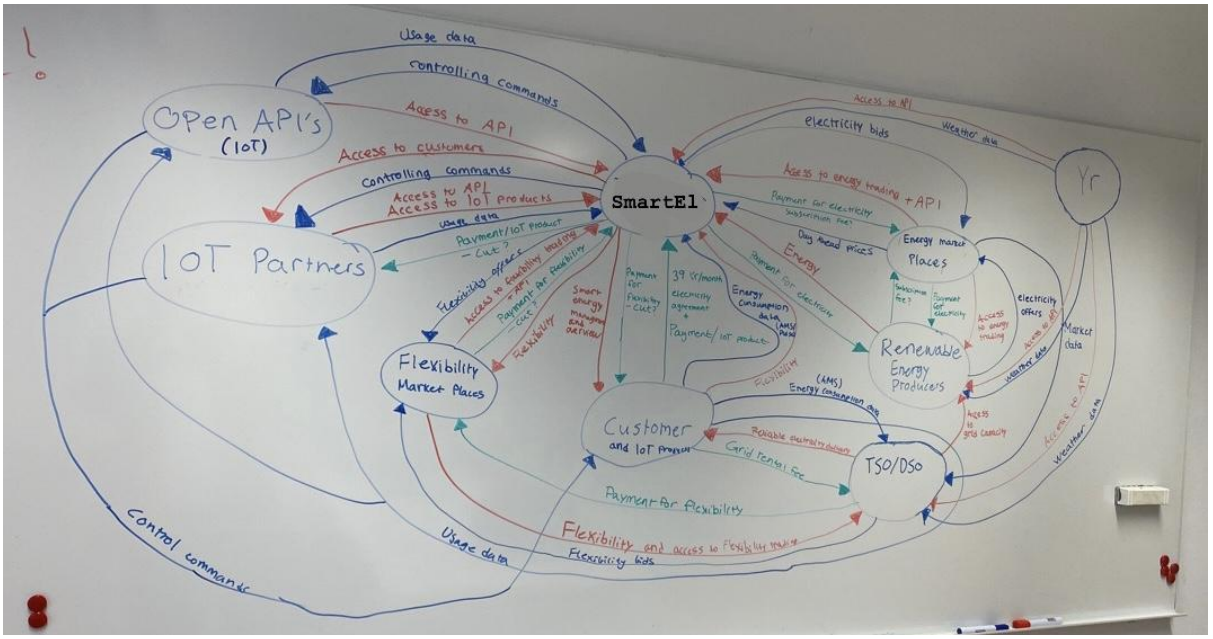


Figure 6: Overview of SmartEl's Ecosystem

When working further with the model, we decided to focus on the part of the ecosystem that is most central in delivering value to the customer and that sets SmartEl apart from other actors. This was because we wanted to focus on the actors that were central in the business model, and avoid information overload by including unnecessary actors. All energy companies in Norway buy their electricity at energy market places such as Nord Pool and have bilateral agreements with power producers, so this is not a central part of the ecosystem in terms of delivering value to the customers. Neither does weather data deliver particular value to the customers, it is primarily used by SmartEl to predict its customer's energy consumption to buy precise amounts of energy, and thereby reduce costs. We therefore made a new, digital model of the core of the ecosystem using the online tool draw.io, where we excluded energy market places, renewable energy producers and weather data providers.

To verify our understanding, we brought our digitized model to SmartEl. After discussing the model with several of our interviewees, we got our understanding and most of our assumptions confirmed. One of the interviewees even asked us to send him the model for his own use. Some small adjustments were made to the final model based on the feedback from the interviews.

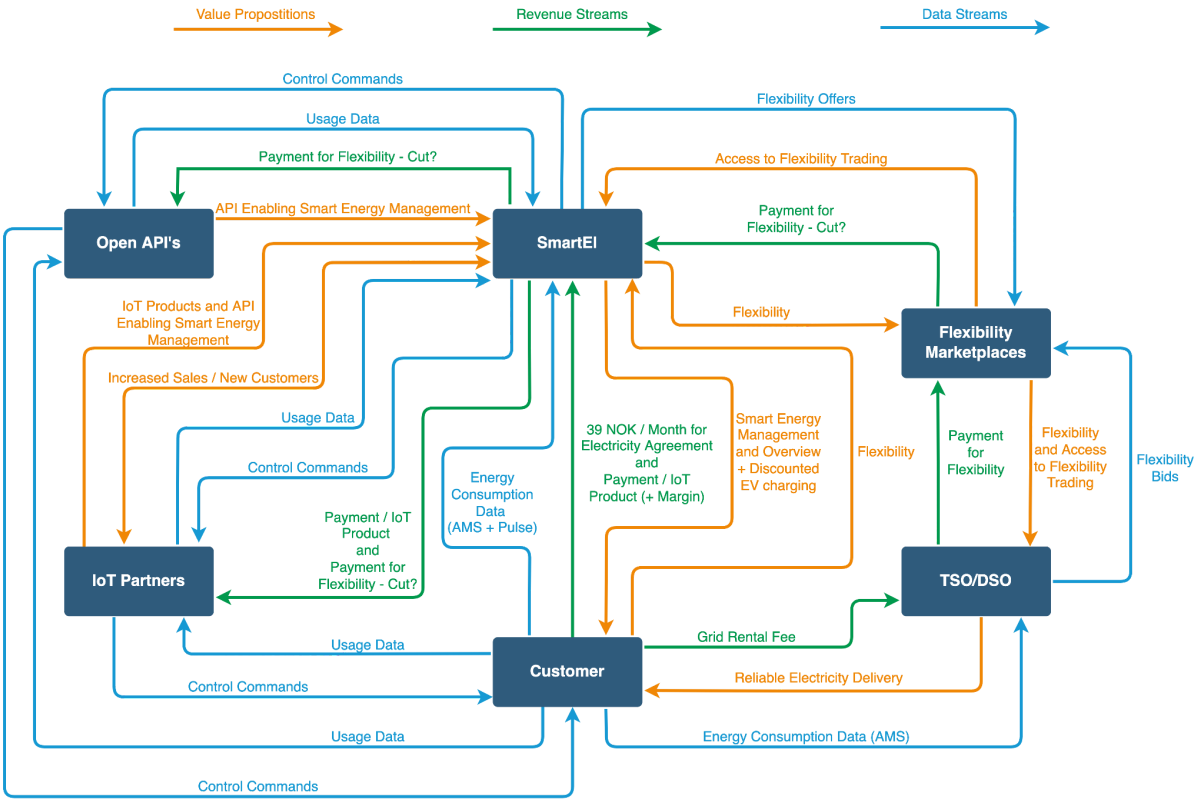


Figure 7: Final overview of SmartEl's Ecosystem

Through this process, we slowly built our understanding of SmartEls ecosystem and business model. It took time to build the full picture due to the complexity of the energy market and the company.

4.2.2 Forming our contribution

In addition to obtaining an understanding of SmartEls ecosystem, we used our interview data to define our findings and form our contribution. We started this process by systematically reading through our interview transcripts and marking sentences and paragraphs that we found to be relevant for our area of interest: business models and ecosystems. We were interested in SmartEl's business model, and how it was enabled by the surrounding ecosystem. We therefore wanted to focus on the parts of the ecosystem that were central for value creation, hence the relationships and links between SmartEl, its IoT partners and customers. From there we looked for sentences that described the different actors and their activities, and marked sentences that described different challenges in SmartEls business model, both technical and strategical.

After having marked out sentences of interest, we categorized them according to different themes: types of partnerships, requirements and processes for initiating partnerships, dependencies and synergies in the ecosystem, and ecosystem challenges. Furthermore, we mapped out which elements we saw as particularly interesting and listed them up. By using our list of sentences, we discussed contexts and grouped the sentences to create our potential findings.

When looking at the current business model literature we tried to portray SmartEl's business model with existing business model frameworks such as the Business Model Canvas. We found it hard to convey the importance of SmartEl's ecosystem as a part of its business model. Because the value created in the links to external actors are so central for SmartEl, we discovered a need for an increased ecosystem focus in business model literature in order for theory to portray practice. Therefore, we decided to view the two literature streams in combination. In many ways, the business ecosystem literature fulfilled the lack of external view of value creation in business model theory. However, when our findings pointed out how the roles of different ecosystem actors vary in relation to the value proposition, we identified a gap in the literature. This led us to our contribution of the two-fold ecosystem model which is presented and discussed in Chapter 7.

Summarized, the empirical research for this study is based on a single case study of the smart energy supplier, SmartEl. The use of several forms of data gathering methods, including document analysis, interviews and field study, has provided us with rich empirical insights concerning SmartEl, its business model and its ecosystem of partners. The analysis of our empirical data has been a parallel process of engaging in both the research literature and empirical data. The process has consisted of several steps, involving building up an understanding of SmartEl's ecosystem based on our document analysis, and systematically reading, coding and analyzing our interviews. All the methods for data analysis applied in this process informed our research and resulted in our contribution of the two-fold ecosystem model. In the following chapter, we present the findings from the described research process.

5 Findings

In this chapter we describe SmartEl's business model by focusing on how the firm operates and creates value for its customers. We have divided our findings into three sections, where the first one explains the ecosystem focus in SmartEl's business model and how it is highlighted through its different partnerships. Further, the second section presents the complexity and different challenges SmartEl encounters as a result of its dependencies to external firms. Lastly, the third section describes three measures SmartEl undertakes in order to manage the dependencies.

5.1 Ecosystem focused business model

SmartEl's partnerships with IoT producers highlights the ecosystem focus of its business model. SmartEl has a digital platform and technology that enables smart energy management and flexibility, however, it needs integrations to IoT devices in order to deliver this value fully. Except for the smart meter dongle, which SmartEl develops itself, all of the integrated IoT devices are produced by external firms and require access. Without these accesses, SmartEl would not be able to deliver smart energy management or flexibility to its customers, and mainly function as a sales link between the customers and the energy market.

When selling products in the SmartEl Store, the self-produced smart meter dongle has a much higher margin than reselling other companies' products. However, when needing a solution for a new type of product, SmartEl always looks to the market to investigate possibilities to integrate an already existing product. As one of the hardware engineers in SmartEl said:

> We first check if there exists a solution in the market that we can use, and if so, we integrate that product rather than make it on our own. In most cases you don't have to reinvent the wheel.

SmartEl's ecosystem is however not open for just anyone to join. In general, it only initiates partnerships with companies that align with SmartEl's values which includes empowering the customers to use less electricity through digitalizing, decarbonizing, decentralizing and democratizing the energy sector. The goal for any partnership is to mutually benefit from the ecosystem. Because of the mutual value SmartEl and partners achieve through the

partnership, neither SmartEl nor the partners pay each other for integrating their technologies. When seeking new potential partners, a representative from SmartEl said:

> We try to find partners that align with our values, where we can achieve a win-win-win from our partnership. A win for SmartEl, a win for the partner and a win for the customer. [...] In Norway, about 70% of electricity goes to heating a home, okay, then we need products that help the customer control their heating in a smart way. The EV penetration in the Norwegian market is high relative to the population, okay smart EV charging makes sense. We have thought about the market, what makes sense for the customers, what are value propositions? So the partners are carefully selected.

While SmartEl in the beginning initiated partnerships with other small companies with similar interest, it is now in a stage where it receives many requests from interested partners. It has a partner landing page where companies can apply, and these requests are screened and mostly declined. Because of SmartEl's fast growth, it can no longer run after every opportunity, but has to be strategic with its time and resources. It experiences a shift in balance of power between them and potential partners. SmartEl has now registered that big companies want an integration and that they in return are willing to help the company expand to new markets. A representative from SmartEl explained:

> Now we are the ones running after the large German car manufacturers, but at one point, they will come to us. And that is starting to happen now. It often happens that a car manufacturer contacts us because many of its customers ask for an integration to SmartEl. And they contact us and ask "why are we not on the platform? We need that integration". Then I say yes, but then you have to help us into Europe. So we have come to the point where big brands with presence in Norway begin to work for us to land integrations and partnerships.

SmartEl also gets a lot of requests from its customers concerning desirable integrations and partnerships. All of these requests are saved and used when deciding which partnerships to pursue. Companies or products with a lot of requests are prioritized for further exploration. When asked whether customers come with many request for integrations, a representative said:

> Yes! A German car manufacturer for instance, thousands of requests. Support tags all the requests in our intercom, and then it goes directly to a product board which is where we pick which suggestions to move forward with. So we have a system for it. Many times a customer contacts us with a request for an integration, but then we see in Intercom that almost no one else has asked, and that makes it less relevant.

Lately, many energy companies have surfaced with a similar business model as SmartEl by not surcharging the customers per KWh electricity, and offering forms of smart energy management. A representative from SmartEl explained how even though the basic concept in its business model is imitable, a similar ecosystem is hard to build:

> Some things are easy to copy. It is easy to say that you are an honest energy company that wishes to fight against the immoral energy market. What differentiates us from those new competitors is the ecosystem we have built around us. We have spent six years investing in that technology. In the flexibility market for instance, we have positioned ourselves so that we are a part of the whole value chain, from the technology in the consumers homes, to selling flexibility in the market. And that is not easy to copy or try to build.

As we see, SmartEl's ecosystem of partners are vital for differentiating from its competitors and achieving a competitive advantage. By building its ecosystem step by step, SmartEl has attained to establish a wide range of partnerships that together deliver value to its customers. However, having these dependencies to other companies also introduces some challenges for SmartEl.

5.2 Challenges with ecosystem dependencies

SmartEl's ecosystem focused business model makes them dependent on other actors in order to deliver value to the customers. These dependencies introduce several challenges for SmartEl concerning attracting potential ecosystem partners and technical issues.

5.2.1 Attracting potential ecosystem partners

As SmartEl's value propositions are based on integrations with IoT products, it depends on initiating partnerships with IoT producers. Communicating the value of its ecosystem to potential partners is therefore an important task. However, when the potential partners are large and global companies, this can be challenging. First of all, SmartEl experiences it as difficult to get in touch with the right people to initiate meetings with these companies. When there is an imbalance of power it can be hard to get them to prioritize SmartEl, which in their view is a small and unknown company. Secondly, these large companies do not always understand the value of becoming a part of the ecosystem. The companies often want to get paid for giving SmartEl access to their APIs, as they believe that they deliver more value to SmartEl than they receive. One of the representatives from SmartEl explained this challenge:

> I recently received an offer from a potential partner, what did he say? That we had to pay 20 000 EUR just to set up the API integration. So it depends on the balance of power between us and the producers. Many of them do not understand why they should be on our platform. We have to work on convincing them and that is a very demanding and time consuming job.

The imbalance of power between SmartEl and the large IoT producers also presents challenges regarding different views on data and data ownership. SmartEl has stated that it will never sell the customer's data because they believe it belongs to the customer. However, there is a possibility that they will share data with some partners in the future, given that they have the customer's consent and that it gives the customer an increased value. This often differs from the IoT producers' way of perceiving data ownership, which mainly view data as a resource they can profit from. In addition, the lack of clear data regulations in the landscape introduce further complexity. A SmartEl representative explained this complex challenge:

> There are large investments in building APIs and making strategies for how to monetize from data, especially in the car industry. And no one has taken that data sharing battle at an EU level. Here we have a large dilemma moving forward. How should we do it? We believe that this is the customer's data. The car industry believes that it's their data, not the customer's. Several of them want to get paid, quite large sums. So then we have to persuade them and say no. Because the second we start with

> a service where the customers have to pay extra to integrate their car, and then they buy an inverter and have to pay for that integration as well, and for the EV charger. That's not sustainable, neither for us, the partners or the customers. We have drawn a firm line saying that the customers should not need to pay extra for integrations, and we will just have to see what the outcome will be. There will be massive changes in the industry moving forward.

As explained in this section, SmartEl is dependent on other actors in order to create value for the customers. Attracting potential partners to its ecosystem is therefore a central challenge. This involves communicating the value of participating in the ecosystem, and is especially challenging when there is an imbalance of power between SmartEl and the potential partner.

5.2.2 Technical issues

SmartEl's dependencies to external actors also introduce some technical issues. One of these issues is related to coordination of scaling between SmartEl and its partners. As SmartEls business model is dependent on its integrations to IoT companies' APIs, SmartEls growth is dependent on these companies' resource allocation and timing. To avoid bottlenecks and technical issues, SmartEl and its partners have to scale at the same pace. This means that when SmartEl experiences growth in new customers, its partners have to scale up their systems to tackle the upcoming traffic on their APIs. However, this is not always easy to achieve. Many of SmartEls most important partnerships are with relatively new companies that have limited capacity and not necessarily can scale up fast and easily. This has earlier led to technical issues that affect SmartEls offering to its customers. A representative from SmartEl expressed the technical issues it had with one of its partners:

> It had technical issues last year, a lot of issues. It went down for a week. Its cloud system did not manage the increased number of users. So it was a nightmare, because it affects us, both us and our customers.

SmartEl's central position in the ecosystem and the responsibilities that come with it represents another challenge. SmartEl resells its partners' products through the SmartEl Store and has many integrations with APIs from different IoT producers. As a consequence, SmartEl is very dependent on the quality and operating time of these. As SmartEl is the

company that offers services through integrations with other products and delivers it to its customers, it has the role as the trusted party to the customers. This role is challenging to possess when partners and other integrated IoT are experiencing difficulties with their products or have technical issues that affect SmartEls services. Although the problem lies outside of SmartEl, the customers experience it as a problem originating from them. SmartEl therefore has to handle the customer complaints, even though they are not able to fix the problem for them. One of the representatives gave us an example of how challenging these technical issues can be:

> There are a lot of things that can go wrong, but what has specifically been the biggest problem was probably a year ago when our smart charger partner had a lot of problems with its backend. Then all of the chargers went down and we had no way of getting them to work again. So, then we just had to wait for our partner to manage to get the backend working and to get the chargers up and running again.

Further increasing the complexity, there is also a major lack of standardization of the technologies and APIs SmartEl depends on in its offerings. This applies both to regular IoT integrations and integrations to smart meters. The data is often of varying quality, for instance, not all smart meters operate with timestamps. Further, the ones including timestamps often vary in frequency. As a result of a lacking standard in many countries, the data the different meters include, also differ between producers. This entails that SmartEl needs to customize its integrations for different producers in order to read the customer's usage data. This is very time consuming and resource demanding. A hardware engineer in SmartEl stressed:

> The smart meters do not always include everything they should. In Norway we luckily only have four different smart meters, or four different producers, so the problem is limited. But in the Netherlands and in Germany for instance it is crazy. I don't know how many producers of smart meters they have, but at least 20 different producers, and there is no standard saying what data to include and how often. There isn't even a standard for how to present the data. So we have to utilize the data we randomly have access to.

As shown in this section, SmartEl's ecosystem of partners involves dependencies to external actors. These dependencies imply several challenges such as attracting potential partners to the ecosystem, and reducing technical issues with integrated IoTs. In addition, unclear data ownership regulations and the lack of standardization of smart meters further increase the complexity of SmartEl's business model. To reduce the severity of these challenges, SmartEl needs a set of measures to manage them.

5.3 Managing ecosystem dependencies

SmartEl uses several measures to handle the above mentioned complexity and challenges caused by its tight dependencies to other companies. We have identified three of them: ensuring mutual value exchange, access to IoT devices through reverse engineering, and building tight cooperations with partners, and will in the following sections describe them more in detail.

5.3.1 Ensuring mutual value exchange

To handle the challenge of attracting potential partners and making them understand the value of the ecosystem, SmartEl works on communicating the ecosystem's benefits. This involves a clarification on the goal of initiating partnerships; to mutually benefit from the ecosystem and achieve simultaneous growth. For existing partnerships, it is important that this value is perceived by the partner in order to make sure that they want to continue to collaborate in the ecosystem. SmartEl's partnerships with its smart charger partner and its solar power partner are examples of this kind of value exchange:

> For our smart charger partner it has been of great advantage to be a part of the SmartEl platform. It has sold a lot of products and gotten a lot of happy customers. We were the first to launch the product and are one of the companies that sell the most of their chargers in Norway, but also in Sweden and Germany. [...] We also have a really good cooperation with our photovoltaic partner. We are probably the best lead-generator for them today. Because you can integrate your inverter to SmartEl, and you get an extra discount if you are a SmartEl customer and buy their solar panels. And we have a very advanced customer base with early adopters that are likely to choose solar.

By ensuring that the win-win-win is achieved in the ecosystem, SmartEl can also motivate the partners to take a bigger role in further developing the common value proposition. A representative exemplified this:

> We have some really good cooperation in our partnerships. With our smart heating partner for instance. We started with an integration, then we expanded to sell their products in our online store, and then we created a deeper integration with them that goes both ways. Now we also provide our insights in their app. [...] In the future we will have quite a few value proposition partnerships as I like to call them, strategic partners where we build things together.

In addition to ensuring that the partners experience the partnership as valuable at present, SmartEl is focused on also securing future value for its ecosystem. By utilizing its partner's APIs to temporarily switch off its customers' IoT appliances, SmartEl can offer granular flexibility to grid operators. Through its early strategic positioning in the flexibility market, SmartEl has secured future incomes that eventually can be split between itself, the customers and the partners. A representative in SmartEl explained:

> We have positioned ourselves as a balancing responsible party in the emerging flexibility market, so we are allowed to offer flexibility and can build another revenue stream there. Our partners do not have these rights and have to cooperate with a balancing responsible party like us to be able to contribute in the flexibility market. We can use electrical vehicles, heat pumps, hot water tanks, heaters, we can bring all of that into the flexibility market. [...] Per now we give the income from flexibility directly to the customer, but the market will grow a lot going forward, and there will be huge possibilities.

For new potential partners, SmartEl needs to convince them about the value of the partnership. In these cases, customer requests are used actively in the partnership meetings to show SmartEl's customers' interest in an integration with the given company. By giving the company an actual number of interested users, SmartEl manages to explain the potential value it can achieve through the partnership. One of the representatives explained the value of the customer requests in partnership meetings:

> We use the amount of customer requests to choose what to move forward with, and then we use them actively against potential partners. We use them for everything they're worth in these conversations.

Summarized, ensuring mutual value exchange between SmartEl and its partners is an important measure in order to retain existing partners and motivate them to contribute further in the ecosystem. By communicating the current and future value of participating in the ecosystem to potential partners, SmartEl can also attract new actors to its ecosystem.

5.3.2 Accessing IoT devices through reverse engineering

If potential partners don't see the value of the ecosystem, or if SmartEl does not manage to land a meeting with them at all to present its case, reverse engineering is often performed to get access to IoT devices. Through reverse engineering SmartEl can bypass the potential partner and build integrations to the IoT devices programmatically. This by using its customer's consent and login information to get access to the devices' API. This way, SmartEl can integrate IoT devices to its platform without having managed to land a partnership with the producer. However, if many customers make use of the integration, the customer numbers can be used in a new round of negotiations with the potential partners with a goal of establishing an official API integration. One of the SmartEl representatives explained how they integrate certain devices without official partnerships:

> For some of the integrations we don't have official APIs or agreements. For them we have used the customer's consent to build them, the customer gives us their login information, and we kind of build it into the company's app. That's a way of doing it that is a bit "hacky", we go around. We have done that with many of our integrations, we are not partners with all of them.

Reverse engineering is however seen as a temporary solution for SmartEl, and just a step on the way to establishing official partnerships with official API integrations. Because of the lack of collaboration between SmartEl and the IoT producer, the reverse engineered solutions often are less reliable. For instance, SmartEl does not receive information about upgrades and changes in the IoT devices' APIs which might make its integrations unstable. In addition, reverse engineering is considered a bit risky, as the IoT producers in the worst case can block SmartEl's access if they feel that SmartEl has violated their guidelines. To reduce these

technical issues and uncertainties, SmartEl focuses on building tight relationships with its partners.

2.3.3 Building tight collaborations with partners

To reduce the amount and severity of technical errors in its integrations, SmartEl focuses on establishing robust integrations and tight collaborations with its partners rather than expanding the ecosystem as much as possible. Through tighter collaborations, the technical issues related to different scaling pace is also reduced. A representative from SmartEl described how the quality of its integrations need to meet the customers' expectations:

> It makes sense for a disrupter to reverse engineer solutions to get going, but we cannot do that forever to be able to offer integrations to the customers. After a while when the customers get used to it, they expect a stable solution that always works.

Another representative also stressed the importance of strong integrations:

> Our IoT partners are the most important partnerships for us now and moving forward. When we scale to several hundred thousand customers, the integrations have to work. We cannot have downtime and challenges there, so it will be our number one priority. We will focus on new integrations and new products in the SmartEl Store, but the most important thing is to strengthen the technical part and our cooperation with all the integrations, so that we have good, solid APIs that we can scale. That is the future of our partnerships.

Tighter collaborations with partners are not only necessary for strengthening the API integrations, but also for building better support routines. By cooperating on these tasks, SmartEl and its partners can easier report technical issues and do troubleshooting. These measures reduce the downtime of SmartEls integrations and improves the customer experience. One of the representatives explained how SmartEl has solved this with one of its partners:

> With our smart charger partner, we have a common Slack channel where customer support can communicate with its developers. We try to build as close as possible to our partners to reduce problems and challenges. We still have work to do in this key account management area, trying to have a good relationship with them and strengthening it.

As shown, SmartEl seeks to build close relations with its partners to reduce technical issues and improve the reliability of its IoT integrations. Summarized, our findings describe the strong ecosystem focus of SmartEl's business model, and how it involves initiating partnerships with external companies in order to deliver value to the customers. The ultimate goal of SmartEl's ecosystem is to achieve a win-win-win for itself, its customers and its partners. However, this ecosystem focus creates tight dependencies between SmartEl and the integrated IoT producers. Typical challenges with these dependencies include convincing companies to engage in a partnership, and technical issues related to the IoT integrations. To manage these challenges, SmartEl seeks to ensure that its partners experience their partnership as valuable through mutual advantages, and therefore want to contribute further in co-development. Further, in cases where SmartEl has not managed to initiate partnerships with the IoT producers, reverse engineering is presented as a measure to enable IoT integrations. In addition, SmartEl focuses on achieving close cooperation with its partners in order to strengthen their technical integrations and increase the customer experience of the offerings.

6 Analysis

The objective of our thesis is to explore the dependencies presented within an ecosystem and how they affect value creation in business models. Our findings exposed SmartEl's ecosystem focused business model and how it is highlighted through its partnerships with IoT manufacturers. By using Adner's (2017) view on ecosystem-as-structure as a lens, where the value proposition is the cornerstone, we describe SmartEl and its surrounding ecosystem consisting of technology providing actors that contribute to the joint value proposition. Through our analysis, we have identified two central aspects of SmartEl's ecosystem business model: its dependency to external actors and its position in the ecosystem as the focal firm. In the first section of our analysis we describe how SmartEl is fully dependent on external actors in order to deliver its value proposition and the implications this involves. Further, the second section describes SmartEl's central position in the ecosystem as the focal firm and the responsibilities this includes concerning ensuring value creation for both the customers and the participating actors.

6.1 Partnership dependent value proposition

Value delivery to SmartEl's customers depends on several actors outside the firm's boundaries, and its ecosystem focus is therefore a crucial part of SmartEl's business model. SmartEl itself does not differentiate from other consumer oriented electricity providers other than offering visualization of real-time use of electricity in its app through its smart meter hardware. For SmartEl's value propositions, smart energy management and flexibility, they are dependent on access to IoT devices. This is through partnerships with IoT producers or unofficial integrations to the IoT devices' APIs. SmartEl's dependency to external actors can be exemplified by how it fails to deliver value to the customers when integrated IoT has technical issues. For instance, was the value proposition of smart energy management affected when one of SmartEl's smart charging partners had problems with its API, which resulted in the customer's smart EV charging not working. This entails that SmartEl's ecosystem of partners is essential for its value proposition. Viewing SmartEl's value creation within the firm's boundaries is therefore not sufficient to grasp its business model.

SmartEl has a customer-oriented business model with value creation for its customers as its top priority. When identifying actors for its ecosystem, SmartEl starts with its value

propositions of smart energy management and flexibility, and seeks to find partners that can assist them in delivering this value. We therefore understand the ecosystem as an ecosystem-as-structure where SmartEl is the focal firm that invites other companies with common goals to take part in creating value to the customers (Adner, 2017). In the beginning, SmartEl initiated these partnerships with other small, customer-oriented companies with common interests for digitalization and sustainability. Many of these companies also share SmartEl's interests in changing the energy sector and therefore collaborate closely with SmartEl in order to empower customers to use less energy.

As SmartEl has grown, it has seen that strengthening the value proposition also involves integrating bigger, global companies such as car manufacturers. However, these companies rarely share the same mission of empowering the consumers, but rather have interests such as capitalizing on customer data. These conflicting values and an imbalance of power often challenge SmartEl's attempts to initiate partnerships with these large, global actors. They either struggle to get in touch with the companies or do not agree on the terms of the partnership. When SmartEl believes an integration with a certain IoT product would strengthen its value proposition, but fails to land a partnership with the company, they often resort to reverse engineering an integration. Even though these unofficial integrations also intend to strengthen SmartEl's value proposition, "forcing" actors into the ecosystem often results in less robust integrations because of the lack of communication and cooperation between SmartEl and the actor. Depending on the actor's importance and connection to SmartEl, this might challenge the value proposition. For actors that are crucial for the value proposition, working for robust integrations through tight cooperation are essential for delivering the promised value to the customers. However, SmartEl seeks to make all of its ecosystem actors official partners and work on building closer relationships with them.

6.2 Responsibilities as focal firm

SmartEl's central position in the ecosystem as the focal firm and initiator of the ecosystem makes them responsible for aligning its partners in order to create a joint value proposition. This involves ensuring that the ecosystem delivers the promised offerings to its customers as well as creating value for the ecosystem participants (Adner, 2017). An essential goal of the

ecosystem business model is to achieve a win-win-win situation: a win for its customers, its partners and itself.

As our findings show, SmartEl's business model involves both delivering smart energy management to its private residential customers, and functioning as an aggregator by delivering flexibility to the grid operators through the flexibility market. In both cases, SmartEl is the responsible party for ensuring that the ecosystem delivers the promised offerings to its customers, at the right time and with the promised quality and reliability (Adner, 2017). An important responsibility of SmartEl is therefore strengthening the integrations that are central in its value propositions. This requires close collaborations with the ecosystem participants. By cooperating closely, technical issues and bottlenecks can be reduced through close communication and coordination of resources. This is exemplified by how SmartEl with one of its closest partners have a common communication channel where they can report bugs, inform about planned maintenance and plan for upcoming traffic on its APIs. This is a continuous job for SmartEl as the focal firm, which essentially promotes stable integrations and services.

Additionally, it is SmartEl's responsibility that the ecosystem continuously evolves in order to remain attractive towards its customers. This can be done either through integrating new IoT's or further creating value for its customers with existing partners. By collaborating closely with its ecosystem partners, SmartEl can take part in shaping its partners' future by discussing further development and suggesting improvements or ideas of new concepts. This can ensure that they evolve in the same direction and co-create new offerings that strengthen the value propositions, both for the residential customers and the grid operators (Hellström et al., 2015). Essentially, it is SmartEl's responsibility to sustain competitive advantage through ecosystem evolution.

SmartEl's responsibility as the focal firm also involves ensuring mutual value exchange between the participating actors in the ecosystem. In order to successfully collaborate on delivering value to its customers, SmartEl needs to assure that the ecosystem participants are satisfied with their positions within the ecosystem and benefit from them (Adner, 2017). This is vital as the value these participants receive from taking a part in the ecosystem is what motivates them to contribute to further cooperation and development (Moore, 1993). For SmartEl this requires a focus on how participation in its ecosystem allows actors to achieve

more value than they could have created on their own. Examples of value the partners can achieve from contributing in the ecosystem include simultaneous growth, access to the flexibility market, and expansion to new markets. This can be exemplified by the partnership between SmartEl and its smart charger partner. Through their collaboration SmartEl got access to smart chargers which strengthened the value propositions of smart energy management for the residential consumers and flexibility for the grid operators. Additionally, the cooperation led to the smart charger partner's entrance to the Swedish and German market and skyrocketed its customer numbers.

7 Discussion

In this thesis we set out to address the questions: (1) How is value creation in business models affected by ecosystem dependencies?, and (2) What are the mechanisms for handling these dependencies? By using the business ecosystem and business model lens in combination, we found that value creation in a firm's business model can be fully dependent on ecosystem actors. Further, we found that the different actors' relation to the value proposition varies. Their relation to the value proposition is what entails how close cooperation the focal firm is required to have with a given actor. We therefore propose a two-fold model to conceptualize an inner and outer ecosystem. By being aware of where the different ecosystem actors belong across the inner and outer ecosystem of our conceptualization, firms can focus their resources where it is needed. Consequently, mechanisms for handling ecosystem dependencies vary for the inner and outer ecosystems, prioritizing the inner ecosystem. For instance ensuring mutual value for the ecosystem actors is prioritized in the inner ecosystem.

Based on our analysis, we will discuss our research questions and our two-fold model contribution to the ecosystem literature in order to understand value creation in business models.

7.1 Value creation in ecosystem business models

To answer the first question, we confirm business model (e.g., Osterwalder, 2004; Rai & Tang, 2014; Zott & Amit, 2008) and ecosystem literature's (e.g., Adner, 2017; Jacobides et al., 2018; Moore, 1996) view of external relations as important in value creation. The literature views value creation as a collective task that derives from interaction with external firms' activities and resources. However, our findings extend this understanding of external relations' importance with a conceptualization of ecosystem dependencies in a two-fold model. Our analysis reveals that ecosystem dependencies affect value creation in business models by increasing inter-organizational relations, both to official partners and firms that are loosely connected to the focal firm. Thus, we argue that the inner and outer ecosystem differs in their relation to the value proposition. Further, we also confirm ecosystem literature's emphasis on the importance of value creation for ecosystem participants (Adner, 2017;

Mäkinen & Dedehayir, 2012; Moore, 1993) and extend this understanding by accentuating the inner ecosystem as where value creation for ecosystem actors should take place.

While value creation in business models derives from activities and resources that originate from the firm itself, and to some degree from key partners (Osterwalder & Pigneur, 2010), ecosystems are more outward bound in terms of the value proposition being more dependent on external actors (Adner, 2017; Jacobides et al., 2018). As our analysis shows, the resources and activities that contribute to the value proposition are often created in collaboration between the ecosystem actors, which results in the focal firm having tight dependencies to other companies. For SmartEl, external relations are crucial, as the value proposition of smart energy management would not exist without access to other actors' IoT devices through API integrations. Thus, our findings describing SmartEl's partnership dependent value proposition confirm the ecosystem literature's view of value in ecosystems being created through the interactions between the organizations and individuals involved (Adner, 2017; Jacobides et al., 2018; Moore, 1996).

Although it is well established in the ecosystem literature that a firm's value proposition depends on interactions with external firms (Adner, 2017; Autio & Thomas, 2014; Jacobides et al., 2018; Moore, 1993, 1996), the literature is vague in describing how the interactions might differ from each other in their relations to the value proposition and hence also to the focal firm. Based on our empirical findings, we contribute to the literature by proposing a two-fold model that conceptualizes how different ecosystem actors require varying degrees of cooperation with the focal firm in order for the value proposition to materialize. This is because we have identified a need for firms to understand and manage their dependencies.

The model, portrayed as figure 8, illustrates the ideal configuration of how an ecosystem of technology-providing actors is two-fold, consisting of an *inner ecosystem* and an *outer ecosystem.* In the center of the model is the focal firm, as the ecosystem is oriented around them. The inner ecosystem consists of central actors for delivering a value proposition, and consequently have close relations to the focal firm. The outer ecosystem consists of more peripheral nodes that are loosely coupled with the focal firm. The actors in the outer ecosystem also contribute to the value proposition to some degree, but their contribution is either not crucial for the value proposition, or the actor's resources are publicly accessible.

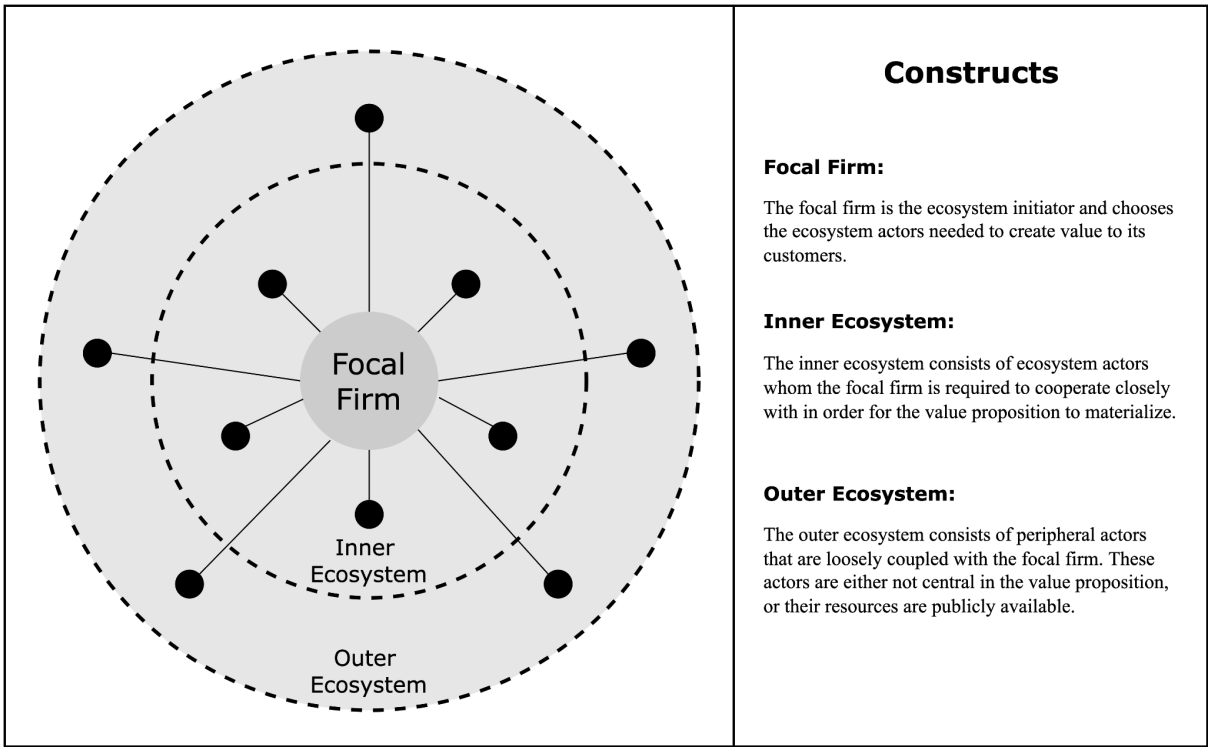


Figure 8: The two-fold ecosystem model

Ecosystem participants that have close relations to the focal firm and play an essential role in contributing to the value proposition form an inner ecosystem in a two-fold conceptualization. SmartEl's smart charger partner is an example of an actor positioned in the inner ecosystem, as the smart charger is essential in order to deliver both smart energy management to the residential customers and flexibility to the grid operators. When an actor is crucial for an ecosystem's value propositions, it is necessary for the focal firm to cooperate closely with the actor to ensure a strong offering to its customers.

The outer ecosystem consists of participants with loose connections to the value proposition. These loosely coupled actors are a result of the increased connectivity enabled by technology through for instance API integrations (Rai & Tang, 2014). The participants in the outer ecosystem also contribute to the value proposition, but in contrast to the actors in the inner ecosystem, close cooperation with the focal firm is not necessary in order to create value. This is either because the actor has a smaller impact on the value proposition, or because their resources are publicly accessible. Examples of the latter are large companies with official open APIs such as Google Maps. The understanding of the inner and outer ecosystem differing in terms of relations to the value proposition is novel and extends existing literature on value creation in ecosystems (Adner, 2017; Autio & Thomas, 2014; Jacobides et al., 2018;

Moore, 1993, 1996). Further, actors in the outer ecosystem are not necessarily aware that they are a part of the ecosystem. In SmartEl, we observed that the actors in the outer ecosystem that did not have open APIs often were linked through reverse engineering. As earlier mentioned, this results in less robust integrations, but we argue that if the actors are not crucial for the value proposition, this is endurable.

In addition to jointly creating value in form of a value proposition, value creation in ecosystems also involves creating value for the ecosystem participants (Adner, 2017; Mäkinen & Dedehayir, 2012; Moore, 1993). This differs from value creation in business models that mainly address value creation for customers from the focal firms perspective (Adner, 2017; Osterwalder & Pigneur, 2010). As both our analysis and prior literature expose, the ecosystem's ability to create value for its participants is vital for retaining its members and continuing to develop the ecosystem (Moore, 1993). SmartEl emphasizes the importance of achieving a win-win-win between itself, its customers and its partners. As SmartEl does not pay partner companies for integrations, it is important that the partners experience that they gain from their ecosystem participation, for instance through simultaneous growth. Further, firms with a central position in an ecosystem tend to receive a large share of the ecosystem's value (Hannah & Eisenhardt, 2018), whereas actors providing peripheral products in the ecosystem, or outside the ecosystem often have a disadvantage when it comes to value capture (Zhu & Liu, 2018). In line with this, the ecosystem actors that are the most important for the value proposition, hence belonging in the inner ecosystem, should gain the most from ecosystem participation. In answering our first research question we thus extend theorizing on value creation for ecosystem actors (Adner, 2017; Mäkinen & Dedehayir, 2012; Moore, 1993) .

7.2 Mechanisms for handling ecosystem dependencies

To answer the second question, we confirm ecosystem literature's focus on the focal firm's responsibility to align and create value for the ecosystem actors (Adner, 2017; Autio & Thomas, 2014; Moore, 1993), and we extend this understanding by highlighting that this is only important in the inner ecosystem. We argue that the focal firm needs to govern the ecosystem actors in the inner ecosystem by ensuring that they experience a gain from the ecosystem, and thus are motivated to contribute to value creation. We also identify a need for

the focal firm to continuously evaluate the placement of the ecosystem actors across the inner and outer ecosystem in order to optimize its use of resources.

Dependencies to other organizations require a different set of mechanisms than traditional intra-firm coordination because an ecosystem cannot be hierarchically controlled (Jacobides et al., 2018). In line with ecosystem literature, our findings and analysis exhibit that the focal firm in an ecosystem is responsible for aligning the participants to ensure that a common value proposition is materialized, while ensuring that all actors are satisfied with their position (Adner, 2017; Autio & Thomas, 2014; Moore, 1993). Mutual gains from ecosystem participation is therefore crucial for motivating actors to cooperate closer in order to build a strong value proposition together. Extending the current ecosystem literature, we have observed that some actors are more central in a firm's value proposition than others. Because tight cooperation requires time and resources, we argue that this alignment and focus on value creation for ecosystem actors only should take place where this is essential for the value proposition, hence in the inner ecosystem. Value creation in the outer ecosystem can also take place, but not as a result of a facilitated process. We argue that value creation for the actors in the outer ecosystem is not a responsibility of the focal firm, but rather happens indirectly. An example of this type of value creation is that customers in an ecosystem are likely to buy products that are compatible in that ecosystem, which ultimately can result in increased sales of the product. By dividing the ecosystem into an inner and outer ecosystem in our two-fold model, firms can prioritize where to focus their resources when ensuring mutual benefits for ecosystem actors, consequently strengthening the value proposition.

In our case study we observed that SmartEl has many loosely connected actors where it offers its customers integrations to IoT products without having official partnerships with the given IoT's manufacturing firm, and consequently these actors are positioned in the outer ecosystem of our two-fold model. However, SmartEl's ultimate goal is to eventually achieve robust integrations through close cooperation and official partnerships with every actor in the ecosystem. Because successful positioning of actors within an ecosystem is crucial for successful appropriation of value (Autio & Thomas, 2014), we argue that an important mechanism for handling ecosystem dependencies is deliberately considering which actors a close cooperation is necessary with, and consequently; which actors belong in the inner and outer ecosystem.

In our analysis, it becomes clear that SmartEl has some actors in its inner ecosystem that are not crucial for the value proposition of smart energy management, for instance a smart lights partner. It also has quite a few actors in its outer ecosystem that preferably should have been in the inner. Examples of the latter are the car manufacturers that will be important for strengthening the value proposition of flexibility. Because ecosystem strategies require understanding boundaries of dependence (Adner, 2017), we argue that positioning an ecosystem actor wrongly can have consequences. An actor that is wrongly placed in the outer ecosystem will result in a weakened value proposition, and the opposite, cooperating closely with an actor that is not essential for the value proposition might be an unnecessary use of scarce resources. We argue that the assessment of the ecosystem actors' position across the inner and outer ecosystem is a continuous process that should be identified by utilizing the current value propositions in a firm's business model, and assessing the need for a close cooperation with each actor in order for the value propositions to materialize.

Furthermore, in addition to evaluating which actors should be in the inner and the outer ecosystem, firms also have to consider which actors should be a part of the ecosystem at all. While some ecosystem literature expresses that an increased amount of actors in an ecosystem will increase the value for the focal firm (e.g., Jacobides et al., 2006), we argue that there is a sweet-spot for the number of actors in any given ecosystem. This sweet-spot will vary, but will be based on the available resources of the focal firm and the firm's chosen value propositions. Exemplified from our case study, SmartEl focused on finding partners that could be integrated into the value proposition of smart energy management. Other smart home appliances were not prioritized to pursue a partnership with.

This study confirms business model and ecosystem literature's focus on value creation as collectively happening between actors, ultimately forming the value proposition (Adner, 2017; Jacobides et al., 2018; Osterwalder & Pigneur, 2010; Shafer et al., 2005). We further confirm ecosystem literature's emphasis on the focal firm's responsibility for aligning and ensuring mutual value creation for ecosystem participants (Adner, 2017; Autio & Thomas, 2014; Moore, 1993). We extend this understanding with two contributions: a conceptualized two-fold ecosystem model, and insights to how this model can be applied.

Firstly, we contribute to the ecosystem literature with a two-fold ecosystem model that conceptualizes how different ecosystem actors vary in their relation to the value proposition, and consequently are positioned in an inner and outer ecosystem. The focal firm cooperates closely with the actors in the inner ecosystem, but has looser connections to the actors in the outer ecosystem without compromising the value proposition. The value creation in a two-fold ecosystem mainly happens in the inner ecosystem, both when it comes to the customer value propositions and the mutual value creation for ecosystem participants.

Secondly, we contribute to business model and ecosystem theory by proposing the application of the two-fold model as a mechanism for handling ecosystem dependencies in business models. By being aware of where each ecosystem actor belongs across the inner and outer ecosystem of our conceptualization, firms can focus their resources where it is needed. By solely focusing on close cooperation and mutual value creation among the participants that are central in the value proposition, the focal firm can optimize their resources and strengthen their value proposition. Continuously considering the position of each ecosystem actor across the inner and outer ecosystem therefore becomes one of the central responsibilities for the focal firm in order to manage ecosystem dependencies.

7.3 Limitations and future research

In this section we will present the limitations of our research due to limited time and the methods we have applied in our study. Further we will come with recommendations for future research.

As our thesis is only 30 credits, it was set to be conducted within 17 weeks. This entails that we have not studied the case company over time, but rather have based our study on a snapshot of the firm's business model and ecosystem. In addition, there was not enough time to conduct follow-up interviews throughout the project, which could have resulted in new findings. Another limitation in our study is related to our data gathering process. As our thesis seeks to examine value creation in ecosystem based business models, we interviewed both SmartEl and its customers. However, we did not interview SmartEl's ecosystem partners, as we did not manage to get in touch with them. By interviewing ecosystem partners

we could have developed a broader understanding of the ecosystem as a whole, and gotten their perspective on for instance their experienced gain of participating in the ecosystem.

Future research could address several of the aforementioned limitations of our thesis. Firstly, further research could involve partners when studying value creation in ecosystem focused business models. We also urge other scholars to view business model literature in relation to business ecosystem literature when further exploring ecosystem based business models in order to grasp value creation fully. Even though we argue that our contributions likely are transferable to other firms, our empirical findings are limited to this single case study. Future research should investigate the relevance and applicability of the two-fold model beyond the case of SmartEl and the energy sector.

8 Conclusion

This thesis has examined ecosystem dependencies in business models, how they affect value creation, and what mechanisms firms can utilize for handling these dependencies. By investigating a smart energy company, we have identified how the company creates value in collaboration with its ecosystem of partners, the challenges this involves as a result of tight dependencies, and how the company manages these dependencies.

Due to digitalization, business environments are becoming increasingly complex, making it difficult for firms to specialize in every area. This creates the need for inter-firm cooperation in order to exploit complementarities (Rai & Tang, 2014; Zott et al., 2011). Hence, the role of external actors in business model value creation represents a relevant context for business model research. Viewing business model and business ecosystem literature in combination contributes to understanding value creation in ecosystem focused business models. It is well established in ecosystem literature that a firm's value proposition depends on interactions with external actors (Adner, 2017; Jacobides et al., 2018; Moore, 1996), however, it lacks describing how the interactions with each individual ecosystem actor play out in regards to value creation, representing a gap in the literature.

As an effort to extend the literature, we found that different ecosystem actors differ in their relations to the value proposition and require varying degrees of cooperation from the focal firm. Based on this finding we propose two contributions: a conceptualized two-fold ecosystem model, and insights to how this model can be applied. The empirical foundation for the model comes from a 17 week long single case study where we have studied SmartEl, a first-mover within smart energy management in Europe. The study involved investigating how SmartEl in an ecosystem of technology-providing partners delivers its value propositions through IoT integrations.

The conceptualization of the two-fold ecosystem provides insight to firms as to how ecosystem dependencies in business models can be addressed. The two-fold ecosystem model portrays the ecosystem actors across an inner and outer ecosystem, where the positioning of the actors is based on whether the focal firm needs to cooperate closely with the given actor in order for the value proposition to take place. Based on our empirical findings and analysis, we contribute to ecosystem literature by highlighting the need for closer cooperation with

ecosystem actors that are central in the value proposition, and hence are positioned in the inner ecosystem. The mechanisms for handling ecosystem dependencies will consequently also take place among these central actors. In addition to being relevant to researchers, our proposed two-fold model can be relevant for practitioners by serving as a guidance for understanding and managing dependencies in ecosystem focused business models. By using the model, firms can be aware of where to position ecosystem actors across the inner and outer ecosystem based on the actor's relation to the value proposition. Consequently, firms can optimize their use of resources by ensuring that they have a close cooperation with the actors whom this is necessary with, and focus on them when ensuring mutual ecosystem value. This will ultimately result in robust technical integrations and a strengthened value proposition.

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Appendix 1

Interview guide employee

Innledning

- Kan du fortelle litt om hva du jobber med?
- Hvor lenge har du jobbet her?
- Hva slags bakgrunn har du?

Partnerskap

- Hvilke partnerskap har dere?
- Hva er strategien rundt valg av de ulike partnerskapene?
    - Hvorfor har dere valgt å utvide nettverket av partnere med en "lukket" strategi?
- Hva innebærer et partnerskap? Hva skiller et partnerskap fra en vanlig integrasjon?
    - Er det noe forskjell på de ulike partnerskapene dere har? (f.eks. smart elbillading vs. belysning)
- Hvilken data deles med partnerne (og andre i økosystemet)?
- Hva får partnere igjen for å være partner? Eks. betalt for å være på plattform, del av inntekt for IoT
    - Hvordan fordeles inntektene mellom SmartEl og partnere ved salg av IoT?
- Ved salg av fleksibilitet, hvordan fordeles betalingen?
    - Får IoT-partnerne en del av kaka? F.eks. smart elbillader partnere
- Hva er utfordringene med partnerskap? (utfordringer knyttet til å forholde seg til mange aktører, systemer osv.)
- Kapasitetsproblemer, hvor ligger problemet?

Vis modell

- Kort intro til modell og temaene vi skal snakke om

Innsikt i data og hvordan det inngår i forretningsmodellen(e)

- Hva slags typer data jobber dere med?
    - Bruker dere andres data?

- Hvordan bruker dere de ulike typene data?
- Ser dere noen muligheter med dataen som dere ennå ikke har utnyttet?

Innsikt i forretningsmodellen

- Hvordan vil du beskrive forretningsmodellen deres?
- Hva vil du si at er deres produkt/tjeneste?
- Hva tjener dere penger på?
    - I hvilket ledd av forretningsmodellen ligger majoriteten av inntektene?
- Hva er den største kostnaden virksomheten har? (Eks lønn, markedsføring, leie inn bestemt kompetanse osv.)
- Hvem er den største konkurrenten deres?
    - Hvordan skiller dere dere ut fra konkurrentene?
- Hva har strategien vært rundt utvelgelse av smarthjem-segmenter for IoT-produkter?

Innsikt i energibransjen

- Hvilken rolle har dere tatt i bransjen?
- Hvordan har dere påvirket bransjen?
- Hvilke endringer i energibransjen, muliggjort av teknologi tror du vi vil se mer av fremover?

Appendix 2

Interview guide customer

Innledning

- Kan du fortelle litt om deg selv?
- Hvilket forhold har du til teknologi?

Energibransjen

- Hva er ditt forhold til energibransjen?
- Hva er ditt forhold til strøm og eget strømforbruk?
- Har du et bevisst forhold til strømpriser?
    - Hvis ja:
        - Har du alltid hatt det?
        - Hvordan skaffer du denne informasjonen?
    - Hvis nei:
        - Hvorfor ikke?

Kundeforhold

- Hvor lenge har du vært SmartElkunde?
- Hvorfor valgte du å bli kunde?
    - Hva var det som først fikk deg interessert? (pris/miljø/teknologi)
- Hvilken verdi gir kundeforholdet deg?
- Hva mener du er hovedforskjellene mellom tidligere strømselskap du har vært kunde hos og SmartEl?
- Engasjerer du deg som kunde? F.eks. kommer med tilbakemeldinger eller forslag til SmartEl
- Er det noe du er misfornøyd med i ditt kundeforhold med SmartEl?

Smart strømstyring, app og data

- Har du el-bil?
- Hva er din primære kilde for oppvarming? (Strøm, fjernvarme, bergvarme, varmepumpe osv.)
- Produserer du noe egen strøm? (Solcelle, vindmølle osv.)

- Har du noen IoT-gjenstander som samler data om strømbruken ditt? Hvilke?
    - Hvorfor valgte du å kjøpe det og hvilken verdi gir det deg?
    - Hvilken verdi gir SmartEl sin smart meter dongle deg sammenlignet med vanlig AMS-data?
    - Har du automatisert noen apparater til å kobles inn og ut enkelte timer i døgnet eller etter strømprisene?
- Hvilken verdi får du av data om strømforbruket ditt?
- Er du bevisst på hvilken data som deles med SmartEl og andre aktører?
- Hva bruker du hovedsakelig SmartEls app til?
- Er det funksjonalitet du ønsker deg som SmartEl ikke tilbyr i dag?